



ORIGINAL PAPER

DOI: <https://doi.org/10.20883/jms.2016.199>

Is compliance with lifestyle modifications dependent on sociodemographic factors and awareness of HF symptoms? Impact of lifestyle changes on HF patients' wellbeing

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ABSTRACT

Aim. The aim of this study was to obtain information, whether patients with heart failure (HF) follow medical indications and if there are any sociodemographic differences between compliant and noncompliant patients and how lifestyle changes contribute to the patients' wellbeing.

Material and Methods. A survey was carried out in 198 patients hospitalized in I Clinic of Cardiology in Poznan. Patients were divided into groups: P1 – no lifestyle changes, P2 – 1 of 4 verified lifestyle modifications, P3 – 2 or 3 verified lifestyle modifications, P4 – all 4 verified lifestyle modifications.

Results. People over the age of 65 mostly constitute groups of low compliance ($p = 0.055$). Men are more eager to change their lifestyle (91.4% in P3 and 85.7% in P4). Women belong mainly to groups with low compliance ($p = 0.0001$). Respondents who reported condition improvement were less likely to describe decreased sexual activity (59.6% vs 38.2%, $p = 0.078$), which acted as an important determinant of family relations. However, our analysis demonstrated a non-significant impact of adherence to indicated lifestyle modifications on patients' wellbeing

Conclusions. Compliant patients are statistically younger and more often male. Level of education is the least important determinant of compliance. There is no significant impact of adherence to indicated lifestyle modifications on patient's wellbeing. Compliant patients are less likely to reduce their sexual activity, which showed to be an important family relationship factor.

Keywords: heart failure, compliance, lifestyle, sexual activity, wellbeing.

Introduction

Over 23 million people worldwide suffer from heart failure (HF) [1]. The European Society of Cardiology defines heart failure as a "clinical syndrome in which patients have typical symptoms and signs resulting from an abnormality of cardiac structure and function" [2]. It's a final stage of most forms of cardiovascular disease, not a disease per se [3].

Heart failure belongs to the category of cardiovascular chronic diseases which are characterized by long duration and slow progression and leads to premature death [4]. All kinds of people are affected by chronic diseases, but the prevalence tends to increase with age [5].

Heart failure can usually be controlled, but not cured. Daily symptoms and complications can shorten patient's life expectancy and worsen the quality of

life [6]. Despite more effective therapeutic interventions and surgical management of HF, prevalence is rising, with an estimated 2% prevalence in people over 45 years old in developed countries. The lifetime risk in the general population is 1 in 5, and according to the prognosis – the incidence in the next two decades will increase by 25 percent [1, 7]. Particularly important risk factors for HF, such as obesity, metabolic syndrome and DM can often be caused by unhealthy lifestyle [8–10].

Treatment of HF patients has proven to be challenging and requiring a multidimensional approach. Self – assessment of the disease depends on many aspects. Compliance to medication is important but is still only one of factors influencing the patient's condition [11]. Significant part of the HF treatment, as many other chronic conditions, is based on patient's self-management [12].

According to the research the biggest struggle is not a lifelong therapeutic treatment, but lifestyle modification [13] – increased exercise, lowering of body mass index, reduced-sodium diet, moderation of alcohol consumption or quitting smoking requires much effort and determination [14, 15]. These behavioral modifications, together with filling prescriptions and taking medication properly are the examples of therapeutic behaviors. Following these recommendations is referred to as compliance [16].

Materials and Methods

A cross – sectional study in patients with Heart Failure was conducted. There was a total of 198 patients – 49 females, 152 males, aged from 20 to 92 years, with a diagnosis of heart failure of any etiology. Patients were to be excluded due to intellectual disability, which could affect the awareness of participation and lack of agreement for participation in the study. Surveys had been taken between October 2014 and December 2015 in I Clinic of Cardiology, Poznan University of Medical Science (PUMS).

Collected demographic data included age, sex and education level. At baseline, patients had New York Heart Association functional class assessed. Patients were asked to complete questionnaires designed specifically for this project. Impact of behavioral modifications on HF patients' quality of life and satisfaction of the treatment were evaluated. All interviews were conducted verbally in Polish by the authors of this study. Patients agreeing to participate provided informed consent.

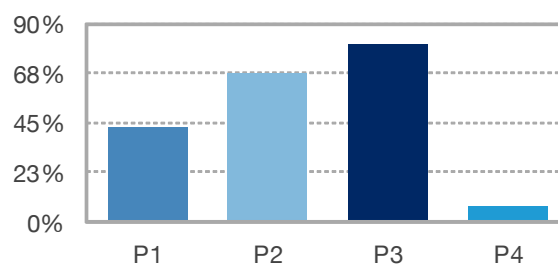


Figure 1. Number of patients in groups P1–P4

Patients were divided into 4 groups: P1 – medication adherent, no lifestyle changes, P2 – medication adherent and any 1 of verified lifestyle modifications, P3 – medication adherent, 2 or 3 of verified lifestyle modifications, P4 – medication adherent and all 4 verified lifestyle modifications. Patients' distribution is shown in **Figure 1**.

After dividing patients into 4 groups, it was analyzed whether age, NYHA class, gender, duration of HF or education levels influenced the patient's self-care behavior.

Moreover, reliance between awareness of symptoms and level of adherence within each group was investigated. For the purpose of this study, patients recognizing more than 4 symptoms as alarming (out of 8 assessed: shortness of breath at rest, edema, awakening shortness of breath, syncope, chest pain persisting even after administration of nitroglycerin, increased palpitations, inability to sleep in a supine position, rapid pulse rate) were found to be aware of their condition.

Verified lifestyle modifications

Amongst regimens influencing the incidence of chronic diseases regular physical activity, well-balanced diet, moderation of alcohol consumption and weight reduction were chosen [17, 18]. Regular physical activity improves the quality of life. Exercise training such as cycling or walking is indicated for HF patients. It is available and easily accessible [19, 20]. The European Society of Cardiology heart failure recommends regular physical activity for stable NYHA class I–III [21–23]. According to Heart Failure Society of America (HFSA) 2010 guidelines, HF patients should exercise in moderate intensity for 30 minutes each day, five days per week. Participants of this study were asked the question 'Do you exercise in compliance with your doctor's recommendations?' There was no investigation of intensity or type of exercise, determining the efficacy of the training [24]. Compliance to

dietary recommendations in HF is one of the most frequent self-care behaviors recommended to patients with heart failure. It is advised by many HF guidelines [23, 25] Striking a balance in sodium intake is essential – too much sodium may lead to fluid retention and hypertension [26], while too aggressive sodium restriction is found to worsen the neurohormonal profile of HF patients [27]. Obesity is an independent risk factor for the development of HF [28, 29]. Intentional weight loss in obese patients can reduce many components of obesity-related heart disease such as blood volume reduction and cardiac output reduction. It leads to regression of structural changes – left ventricular diastolic and systolic dysfunction improvement [6, 30]. The obesity paradox in HF patients cannot be forgotten – weight loss $\geq 5\%$ was associated with high long-term mortality [31]. Most epidemiologic data indicates possible benefits of moderate drinking on the risk and mortality of HF [32]. However, it should be considered that heavy alcohol consumption is a relevant problem in Poland [33]. The risk of HF in patients, who haven't had myocardial infarction, is 1.7-fold higher among heavy drinkers than in abstainers. Moreover, among patients with alcoholic cardiomyopathy and alcoholism without abstinence it is a strong predictor of cardiac death [34].

Statistical analysis

All data analyses were performed using Kruskal-Wallis ANOVA and chi-squared test in Statistica Version 12. $P < 0.05$ was regarded as statistically significant.

Aim

The aim of this study was to obtain information, on whether there are sociodemographic differences between patients who are compliant and noncompliant in following medical indications. The purpose was to assess how abiding by doctors' indications contributes to the HF patients' wellbeing.

Results

Sample characteristics

A total of 198 patients with a confirmed diagnosis of chronic heart failure accepted the invitation to participate in the study. One patient did not give the answer regarding age, 7 patients were not evaluated in terms of New York Heart Association Functional Classification, 1 patient didn't report the level of his education and in case of two patients the year of diagnosis is unknown. Despite missing data these patients weren't excluded. There was no influence on the investigated factors. 43 (21.7%) of 198 patients were taking medication only, without adjusting to any investigated lifestyle-change indication (well-balanced diet, sport activity, body weight loss, alcohol consumption reduction). 43 Patients belong to P1 group, 66 – P2, 80 – P3 and 7 to P4. More than a half of the participants (55.6%) were classified as P1 and P2, claiming to be non-adherent to behavior modifications indicated by a physician, or to be adherent to one lifestyle-change. It means that more than a half of patients were non-compliant. Sociodemographic characteristics of patients are presented in **Table 1**.

Table 1. Characteristic of patients with CHF at baseline (N = 198)

Characteristics N (%)	Generally	P1	P2	P3	P4
Gender (p = 0.0001)					
Male	150 (76%)	25 (58%)	45 (67%)	74 (91%)	6 (86%)
Female	48 (24%)	18 (42%)	22 (33%)	7 (9%)	1 (14%)
Age of patient (years) (p = 0.054)					
Average (standard deviation)	58.0 (± 14.4)	59.3 (± 15)	60.4 (± 16.3)	55.3 (± 12.4)	59.0 (± 5.7)
Educational level (p = 0.85)					
Primary education	35 (18%)	6 (14%)	15 (22%)	13 (16%)	1 (14%)
Secondary education	130 (66%)	28 (65%)	41 (61%)	56 (70%)	5 (71%)
Tertiary education	32 (16%)	9 (21%)	11 (16%)	11 (14%)	1 (14%)
NYHA classification (p = 0.29)					
I	10 (5%)	2 (5%)	2 (3%)	6 (8%)	1 (14%)
II	56 (29%)	10 (24%)	17 (26%)	26 (33%)	3 (43%)
III	74 (38%)	17 (40%)	28 (43%)	28 (35%)	1 (14%)
IV	51 (26%)	13 (31%)	18 (28%)	19 (24%)	2 (29%)
Duration of HF (years) (p = 0.023)					
Average (standard deviation)	11.7 (± 11.4)	16.2 (± 14.8)	10.9 (± 10.7)	9.5 (± 9.0)	16.3 (± 11.7)

The mean age of patients in the sample was 58 years. Over the half of the patients (70%) were not older than 65 years (**Figure 2**). The majority were men (75.53%). Most (81.5%) had at least secondary education. NYHA Classification distributions among the patients were as follows: Class I, 10 patients (5.15%); Class II, 56 patients (28.9%); Class III, 74 patients (38.1%); Class IV, 51 patients (26.29%). More than the half of the patients (59.3%) have suffered from HF not longer than 10 years (**Figure 3 and 4**).

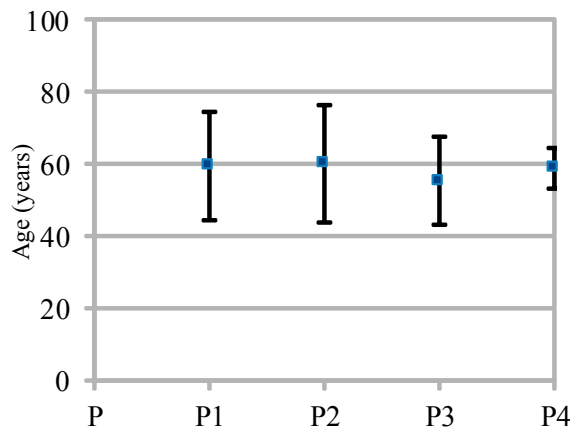


Figure 2. Mean age of patients in groups P1-P4

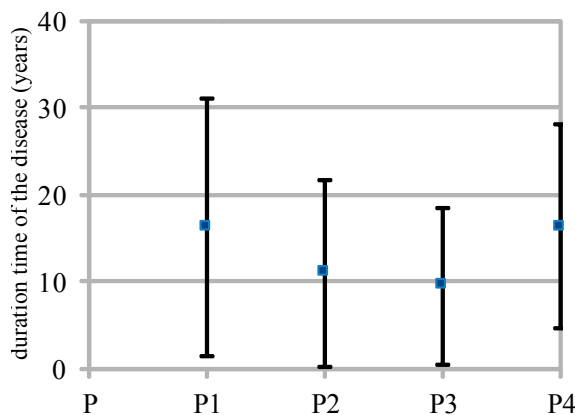


Figure 3. Mean durations time of HF in groups P1-P4

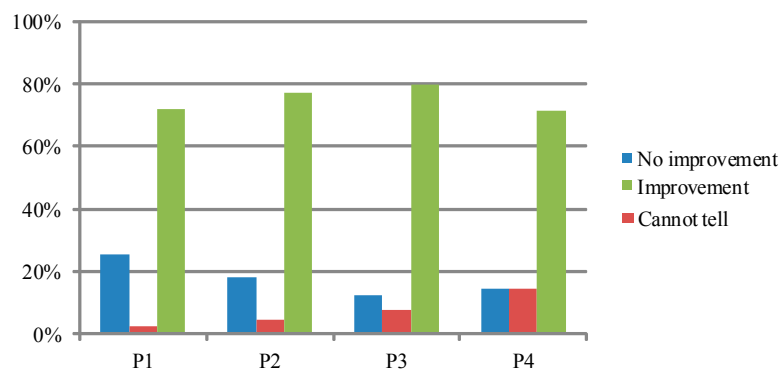


Figure 4. Condition perception by HF patients after treatment introduction ($p = 0.48$)

Characteristic of groups

P1 43 (21.7%) of 198 patients were taking medication only, without adjusting to any investigated lifestyle-change indication. Among them 31 participants (72%) observed the improvement of the quality of life. 1 person (2.3%) could not evaluate the impact of the treatment and 11 patients (25.6%) didn't see the improvement of the health condition. Adherence to prescribed medications to prevent and control symptoms is essential in the heart failure management [35]. According to the study from 2013, belief in the efficacy of the pharmacology and satisfaction of the treatment are positively correlated with the adherence to medication [36].

P2 Of the total sample, 67 (33.8%) patients were classified to group P2, as medication adherent and compliant with any 1 of 4 verified lifestyle modifications. Among them 51 (77.3%) observed reduction of heart failure symptoms. 3 of them (4.5%) couldn't assess the impact of the treatment, and 12 (18.2%) didn't see the enhancement.

Lifestyle modifications require more time and effort than adherence to medication [37]. An interesting study by Nieuwenhuis M et al. concluded that patients were less compliant with exercise regimen than to diet. It might be due to physical symptoms and a lack of energy [38]. In this study diet modification was the most common change in patients' behavior. 61 out of 198 patients declared to be adherent to balanced diet, while only 41 decided to exercise regularly.

P3 Group P3 is the most numerous group in the study. 81 (40.9%) out of 198 patients declared to be adherent to medication and to 2 or 3 lifestyle modifications. 64 (80%) of them were satisfied of the treatment, 6 (7.5%) didn't know, and 10 (12.3%) could not see the improvement of their health condition after indication of the treatment. Tremendous effects

were noticed when diet modification and regular physical activity were followed [39].

P4 7 patients (3.5%) were the most disciplined and compliant with all four non-pharmacological recommendations. Compliance with lifestyle modifications usually associated with condition improvement [40]. It reflects in this study – 5 (72.1%) P4 patients reported condition improvement. 1 person (14.3%) could not assess, and 1 (14.3%) observed worsening of the health condition.

Age

The mean age is the lowest in P3 (55 years) and the highest in P2 (60 years). Groups P1 and P4 show similar mean age (59 years). Significant differences were observed in the age structure of P groups. People over the age of 65 constitute 34% in P1 and 44% in P2, groups of lower compliance. In the groups of high compliance people over the age of 65 constitute a small group of patients, respectively 17% in P3 and 14% in the P4.

Education

All the P groups are characterized by similar educational pattern. Results are shown in **Table 1**. The highest percentage of patients with a higher education was observed in the group of worst compliance (21%), while in groups with better compliance (P3 and P4) the percentage of those patients was approximately 14%.

NYHA

P1 – a group of the worst compliance – constitutes the majority of patients with advanced heart failure – NYHA III and IV. The percentage of these patients becomes gradually smaller in groups of better compliance: P2 – 71% and P3 – 59%. In P4 patients constitute already a minority with 43%.

Duration of HF

Patients in P1 suffer from HF an average of 16.2 years. The mean time of duration of HF was the shortest in P3 – 9.5 years, not much longer in P2 – 11 years, and 16.3 years in P4. There is a statistically significant P (0.0234). 71% of the most compliant patients (P4) suffer from HF longer than 10 years. The percentage of

patients suffering for over 10 years is also very high in the group with the worst compliance – 55%. The majority of P2 (61%) and P3 (69%) patients suffer from HF not longer than 10 years.

Awareness of symptoms

HF patients should contact a healthcare provider in case of worsening symptoms. Patients were asked which symptoms they find alarming and requiring a medical intervention. Considering 3 or more out of 8 symptoms as alarming was recognized as the equivalent of awareness of the disease profile. A relationship between awareness of the symptoms and compliance was noticed. Patients, who would contact a physician when worsening of the symptoms, occur more compliant with the recommendations. Adherent to medication only patients (P1) did not consider worsening of the symptoms as requiring a contact with healthcare provider. In P4 patients were much more aware of the worsening the symptoms. Over 80% of patients would contact a doctor when they occur. 59% of patients in P2 and 67% in P3 indicated a gradual, growing trend (**Table 2**).

Satisfaction of the treatment

Of the total of 196 patients who answered this question, 151 (77%) observed condition improvement, 11 (5.6%) couldn't evaluate the impact of the therapy, and 34 (17.3%) reported, that there was no condition improvement despite the treatment.

Poor compliance was observed in P4. This group is the smallest in members (7 out of 196 follow all of the physician's indications). 72% of P1 patients declared to benefit from the treatment, nevertheless every fourth patient in this group reports no significant change in the intensity of symptoms. In P2 77% of patients declared a noticeable improvement, while among P3 it is up to 80%. Patients in P3 see no effects of the treatment twice rarely than patients in P3. The values in P4 do not appear quite as spectacular as compared to the previous groups. Only 71% of patients declared benefit from the treatment. These values should be read in the context of the low frequencies of the P4 group- the total of only 7 patients. 14% of patients who did not report symptoms were represented in fact only by one patient.

Table 2. Awareness of symptoms in groups P1–P4 (p = 0,16)

	P1	P2	P3	P4
Low awareness of symptoms	21 (49%)	27 (40.3%)	26 (32%)	1 (14.3%)
High awareness of symptoms	22 (51%)	40 (59.7%)	55 (68%)	6 (85.7%)

Gender

The majority of patients were men (75.8%), women constitute less than 1/4 of the patients. Women belong mainly to groups with low compliance (42% in P1 and 33% in P2). Men are more eager to change their lifestyle. 91.4% in P3 and 85.7% in P4 are men.

Sexual activity

Respondents who reported condition improvement were less likely to describe decreased sexual activity (59.6% vs 38.2%) ($p = 0.078$), which acted in our study as an important determinant of the family relations.

Discussion

While being discharged from the PUMS Hospital, every patient is given recommendations. They can be divided into 4 categories: pharmacological indications, lifestyle modifications impacting the quality of life and outcome prognosis, action plans and follow-up schedule. This study focuses on adherence to medication and lifestyle changes. These aspects were considered as easy to assess by the patient and not requiring a follow-up survey. Only 78.1% of patients introduced changes in their lifestyle. Taking medication is a passive act, while lifestyle modifications require self-discipline. There is no effect seen at the beginning, but persistence yields results. It greatly affects therapeutic efficacy. According to this study, patients more compliant and eager to modify their lifestyle were more satisfied with the treatment and had a better state of being, however there is no statistically significant P ($p = 0.48$). Jing Jin et al. conducted a study reviewing factors affecting therapeutic compliance. Correlation between adherence to medication and age was one of the conclusions – younger patients (middle aged patients and under 40 years old) take medication less regularly than older patients [41]. In our study all patients declared in compliance with medication, but the motives can be related to non-pharmacological compliance as well. Younger patients are often not adherent due to work and other commitments, which don't leave much time for the regimens. Younger patients have much better survival than older patients. Less comorbidities, such as diabetes, edema or atrial fibrillation, improve their overall health condition. Despite that, non-compliance to the indications worsens the symptoms more severely than in older patients [42]. Moreover, older age by itself is not a reason of worse adherence to medication. Amongst patients with HF only, age is not the determinant of lack of compliance with medical recommen-

dations [43]. Remarkably there was found no correlation between the level of education and compliance. Patients with secondary education were the majority in each group P1–P4, with the percentage accounting for 61–72%. It could have been expected that better educated patients should have more knowledge about the disease, should be more aware of the symptoms and be more compliant. There are several studies proving this theory [44–46]. Some studies, including this one, found no association between level of education and compliance [47]. In other, patients with lower educational level are more compliant [48], perhaps due to more trust in doctor's recommendation [41]. There was a low relationship found between NYHA functional class and compliance. The results are shown in **Table 1**. It's noticeable that patients from P1 and P2 groups were classified in majority as NYHA III (P1 – 41%, P2 – 44%). Patients with lower NYHA grade and better health condition – relieved of mild symptoms – abide by more indications [49]. Patients from P3 had NYHA II and NYHA III profile in similar percentage (NYHA II – 33%, NYHA III – 36%). In the most compliant group, P4, the great majority of patients – 43% – had NYHA II profile. Several studies have shown a correlation between gender and lifestyle modification [50]. It was shown, that there are gender differences in patterns of healthy behaviors. Men tend to be more compliant with diet and physical activity recommendations, perhaps due to fewer family duties than women [51, 52]. Our study confirms this theory. Men belong to groups with better compliance (P3, P4), introducing more lifestyle-changes to their lives than women.

Limitations

Participation in this study was voluntary, not all of the qualified patients agreed to sign a consent form. The survey was subjective, based on self – reporting and recalls bias. It is believed that what patients marked in the survey is true, but possibility of overestimating their compliance cannot be excluded. The study refers to patients from one hospital and one ward only.

Conclusion

Groups of different compliance levels turned out to be characterized with different social patterns regarding age, gender and duration of HF. Patients in groups of better compliance tend to be statistically younger and with rather mild HF. Men are more eager to modify their lifestyle and introduce more behavioral changes than

woman. Differences in education level were the least significant. Our analysis demonstrated a non-significant statistically ($p = 0.482$) impact of compliance to indicated lifestyle modifications on-improvement of patients' wellbeing. Patients in the high compliance groups (P3–P4) were less likely to reduce their sexual activity, which occurred to be an important family relationship factor.

Acknowledgements

Conflict of interest statement

The authors declare no conflict of interest.

Funding sources

There are no sources of funding to declare.

Ethical approval

All procedures in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants before conducting the survey.

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Acceptance for editing: 2017-01-10
Acceptance for publication: 2017-03-27

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