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RESEARCH ARTICLE



Patient perceptions, motivations and barriers to treatment adherence in hypertension: results of a questionnaire-based survey in five European countries

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ABSTRACT

Aims: To assess perceptions, motivations and barriers to treatment adherence depending on emotional, lifestyle, medical and non-adherence risk profiles in hypertensive patients.

Methods and results: Cross-sectional data were obtained using an online anonymous survey. Four distinct global risk scores (medical, lifestyle, emotional and quality of life (QoL) and non-adherence risk scores) were calculated based on the responses to specific groups of questions. A total of 2615 treated hypertensive patients (≥ 18 years of age) from 5 European countries completed the questionnaire. Mean (SD) age was 69.6 years (5.8); 54% males. Overall, antihypertensive therapy represented a low burden in patients' daily life (2.9/10 in the Likert scale). Perfect self-reported adherence was claimed by 59.8% of participants. Reporting of non-adherence episodes to physicians was low (13% always/often). Participants with a high non-adherence risk score had a greater number of associated diseases (obesity, sleep disturbances, depression and cardiac complications), a higher treatment-associated burden on daily life, a greater stress level and more antihypertensive pills per day ($p < 0.001$ for all). No correlation was found between the clinical and lifestyle risk scores and the risk of non-adherence. The emotional score correlated significantly with the non-adherence risk score ($p < 0.001$). Comparing patients with a low/middle risk to those with a high risk of non-adherence, female gender and age > 65 years were associated with a lower odd ratio of non-adherence whereas depression, stress, family hardships, negative information on drugs and poor information were associated with higher odds of non-adherence.

Conclusions: This large survey reveals several underestimated issues regarding patients' perspective in hypertension. It highlights the impact of emotions, exposure to family hardships, and stress on the risk of non-adherence. Non-adherence is underreported by patients; hence it remains mostly unrecognised.

PLAIN LANGUAGE SUMMARY

- A good knowledge of patients' perception, beliefs, motivations and barriers to antihypertensive treatment adherence is essential to improve blood pressure (BP) control in the population.

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- In this large survey conducted in five European countries, we assessed patients according to their medical, emotional, lifestyle and non-adherence risk profiles.
- Results show that emotional aspects and exposure to family hardships have a significant impact on the risk of non-adherence.
- Moreover, a poor adherence to medications remains often unknown because patients do not report their difficulties to their physicians.

Introduction

In asymptomatic chronic diseases, such as arterial hypertension, long-term adherence to prescribed medications poses a significant challenge for patients [1]. In the absence of clinical symptoms and/or perceived individual short-term benefits, patients often discontinue their antihypertensive treatments over time, as they may not fully understand that maintaining a well-controlled blood pressure (BP) is crucial for preventing major cardiovascular, cerebrovascular and kidney events [2–7]. Additionally, many patients dislike lifelong drug therapies and cite various reasons for stopping their medications, including early or late drug-induced side effects, fear of addiction and socio-economic factors, particularly in low- and middle-income countries [8].

European Hypertension guidelines have acknowledged that low patient adherence to pharmacological treatments is a major factor contributing to inadequate BP control in treated hypertensive patients, together with physicians' inertia and deficiencies in health care systems [9,10]. To improve the situation, several studies have assessed the determinants of poor adherence and persistence among hypertensive patients [2,11–16] and clinical guidelines have provided recommendations on how to deal with adherence/persistence issues in uncontrolled hypertensive patients [9,17,18]. In addition, large surveys have evaluated how healthcare professionals (physicians, nurses, pharmacists) support patients with taking medications and how these professionals perceive the efficacy of the proposed strategies [19–21]. This is of importance since providers' beliefs and attitudes can have an impact on the care and outcomes of patients. These surveys highlighted that only ~50% of healthcare professionals inquire about medication adherence and few of them intervene when issues are identified [20]. Even among European hypertension specialists, where one would expect more attention or sensitivity to this matter, the implementation of tools to detect, support or improve medication adherence was found to be low [19].

Studies have also investigated the perspectives of patients treated for hypertension [4,8,22]. A systematic review of 53 small qualitative studies from 16 countries consistently identified insufficient patient

knowledge and understanding of the causes and treatments of hypertension as one of the most important sources of misbeliefs leading to a low adherence [8]. However, this review did not cover several specific aspects associated with the patients' perception and attitudes in relation to their medical risk, beliefs and emotional profile.

The objective of the present prospective questionnaire-based survey was to assess patients' perception, beliefs, motivations and barriers to treatment adherence depending on their medical, emotional, lifestyle and non-adherence risk profiles in large groups of treated hypertensive patients from five large European countries, i.e. France, Germany, Italy, Spain and the UK.

Patients and methods

This survey was conducted by the Working Group on Lifestyle, Cardiovascular Pharmacotherapy and Adherence of the European Society of Hypertension (ESH). Eligible participants were men and women aged >18 years, living in France, Germany, Italy, Spain and UK, with a diagnosis of hypertension made by a physician and receiving antihypertensive medications and who were accessible by email or by phone. Data were collected through patients' organizations and their websites/phone from 3 January to 22 April 2022. The recruitment was done in collaboration with the Senior International Health Association (SIHA), a federation that brings together the associations involved at European and International level on matters concerning older people with the aim of coordinating their action on health, and *via* the Carenity community, a social network dedicated to persons with a chronic disease, which has a large online access to patients and caregivers in Europe. Members of this hypertension community were invited to participate in the survey by email (invitations and reminders sent by email). Members of the SIHA were contacted by email and phone.

The questionnaire of 32 questions was created by Carenity and the ESH Working Group. After being translated into each country-specific language, it was reviewed by SIHA and Global Heart Hub, a global non-profit organization established to provide a voice for patients affected by cardiovascular diseases and

validated by the ESH Working Group. Subjects were free to participate and provided their consent before starting the questionnaire, clicking positively on a specific page informing them of the objectives and conditions of the survey including data management and confidentiality of the data collected (consent was included in the questionnaire corresponding to an implicit consent). All data were collected anonymously. Participants answered the questionnaire by themselves or sought assistance from a healthcare provider if needed. Incomplete datasets were deleted, and quality criteria were defined to validate each questionnaire, such as the time to complete the questionnaire. For example, it was determined that reading all the questions and answering them in less than 7min was not feasible and hence such questionnaires were not included in the analyses.

Statistical analysis

The percentage of answers in each answer category for every item was expressed as median $\pm 25\%$ (inter-quartile range [IQR]), continuous variables were expressed as means $\pm$ standard deviation (SD). Missing data were excluded from the analysis. A Likert scale (1–10) was used to answer some questions, such as the level of stress. Data were analyzed globally and stratified by sex, age and country.

Using the responses to specific groups of questions, four distinct global scores were calculated. These scores were determined by assigning arbitrary individual values based on the severity of the situations addressed with each group of questions. We calculated a medical risk score (range 0–22), a lifestyle risk score (range 0–8), an emotional and quality of life (QoL) risk score (range 0–8) and a non-adherence risk score (range 0–25). The medical risk score was driven primarily by age and severe comorbidities (heart failure, +4, stroke, +4, diabetes, +3, chronic kidney disease, +3, depression, +3, or angina, +3) and the lifestyle risk by known cardiovascular risk factors (BMI, +1 to +3, physical activity, +1 if <3 times a month, alcohol consumption, +1 if <3 times a week, and smoking intensity, +1 to +3).

The emotional and QoL risk score was based mainly on the presence or absence of depression, +1, sleep disorders, +1, as well as family or work conflicts, loss of a close relative and severe illness (+1 for each item). The perceived level of stress was graded +1 if scored 4–5/10 and +2 if scored 6–10/10 on the Likert scale.

The non-adherence risk score was based on specific patients' answers regarding the frequency at which they reported either missing medication doses

or changing the therapy without informing their physicians. The risk score was established on patients reporting treatment discontinuations, unintentionally (+6 if frequent) or intentionally (+12 if frequent) or changes in the prescribed doses without consulting a healthcare professional (+5 if frequent). Within each of these scores, patients were stratified according to their low, medium, high and very high-risk profile by quartiles or tertiles for non-adherence score. The burden of medications in daily life was assessed on a Likert scale. Correlations between the scores were performed using a Pearson correlation coefficient.

Ordinal logistic regression models were used to assess the association between one or more risk factors and the non-adherence risk score coded as: lower risk (score of 0), intermediate risk (score of 1 or 2), higher risk (score ≥ 3). Multivariate ordinal logistic regression analyses were undertaken using the variables shown in [Supplemental Table 1](#) and model fitting undertaken using a stepwise approach. The Necessity-Concerns Framework was used to guide some of the analyses [23]. The final model only retained risk factors that were significant.

Data were analyzed using SAS software, version 9.4 (SAS Institute, Cary, NC). A p value of <0.05 was considered significant. p -values were adjusted for multiple testing using the Benjamini–Hochberg procedure when necessary.

Results

The survey included 2757 valid answers; but 142 answers were then excluded because patients were not on antihypertensive treatment at the time of the survey. Hence, 2615 questionnaires were retained and further analyzed: 81.6% were recruited by SIHA and 18.4% by Carenity. Only 5% of subjects were younger than 60 years of age.

Characteristics of the population

The general characteristics of participants and their characteristics according to the risk of non-adherence are shown in [Table 1](#). Within these characteristics, the distribution of participants across countries was equilibrated. Ninety five percent of patients were older than 60 years and were treated for hypertension for more than a 1 year. Associated diseases were frequent, only 22% of participants reported no concomitant disease. High cholesterol, obesity or overweight, diabetes, sleep disorders and depression were the most frequently associated clinical conditions. Participants received a mean of 1.7 (SD ± 1.1) (median: 1.0, IQR

Table 1. Characteristics of the global cohort and patients based on the non-adherence risk score ($n=2615$).

	Overall set ($n=2615$)	Lower risk of non- adherence ($n=1645$)	Intermediate risk of non-adherence ($n=547$)	Higher risk of non- adherence ($n=423$)	P-value*
Gender, n (%)					0.938
Male	1,412 (54.0%)	886 (53.9%)	299 (54.7%)	227 (53.7%)	
Age, years mean (SD)	69.6 $\pm$ 5.8	69.9 $\pm$ 5.5	69.4 $\pm$ 6.1	68.3 $\pm$ 6.6	<0.001
Country, n (%)					<0.001
France	567 (21.7%)	368 (22.4%)	106 (19.4%)	93 (22.0%)	
Germany	538 (20.6%)	320 (19.5%)	151 (27.6%)	67 (15.8%)	
Italy	534 (20.4%)	326 (19.8%)	107 (19.6%)	101 (23.9%)	
Spain	510 (19.5%)	350 (21.3%)	79 (14.4%)	81 (19.1%)	
UK	466 (17.8%)	281 (17.1%)	104 (19.0%)	81 (19.1%)	
Duration of hypertension diagnosis n (%)					0.097
<1 year	212 (8.1%)	124 (7.5%)	39 (7.1%)	49 (11.6%)	
1–5 years	513 (19.6%)	324 (19.7%)	104 (19.0%)	85 (20.1%)	
>5 years	1,890 (72.3%)	1,197 (72.8%)	404 (73.9%)	289 (68.3%)	
Associated conditions, n (%)					
High cholesterol	1,092 (41.8%)	681 (41.4%)	240 (43.9%)	171 (40.4%)	0.560
Obesity or overweight	719 (27.5%)	426 (25.9%)	141 (25.8%)	152 (35.9%)	<0.001
Diabetes	590 (22.6%)	366 (22.2%)	128 (23.4%)	96 (22.7%)	0.863
Sleep disorders	568 (21.7%)	317 (19.3%)	130 (23.8%)	121 (28.6%)	<0.001
Depression	272 (10.4%)	130 (7.9%)	67 (12.2%)	75 (17.7%)	<0.001
Kidney disease	234 (8.9%)	150 (9.1%)	40 (7.3%)	44 (10.4%)	0.283
Heart failure	197 (7.5%)	107 (6.5%)	45 (8.2%)	45 (10.6%)	0.024
Angina symptoms	171 (6.5%)	95 (5.8%)	33 (6.0%)	43 (10.2%)	0.008
Stroke-associated complications	106 (4.1%)	54 (3.3%)	34 (6.2%)	18 (4.3%)	0.020
None	575 (22.0%)	400 (24.3%)	112 (20.5%)	63 (14.9%)	<0.001
Family history of hypertension, n (%)					0.255
Yes	1,535 (58.7%)	948 (57.6%)	330 (60.3%)	257 (60.8%)	
Number of daily pills, total, n mean (SD)	4.1 $\pm$ 2.7	4.0 $\pm$ 2.7	4.4 $\pm$ 2.6	4.3 $\pm$ 3.0	<0.001
Min-Max	0.0–17.0	0.0–16.0	0.0–13.0	0.0–17.0	
Number of antihypertensive daily pills, n mean (SD) BMI, kg/m ² mean (SD)	1.7 $\pm$ 1.1 28.6 $\pm$ 6.0	1.6 $\pm$ 1.0 28.5 $\pm$ 5.9	1.8 $\pm$ 0.9 28.7 $\pm$ 5.6	1.9 $\pm$ 1.5 28.8 $\pm$ 7.1	<0.001
Smoking status, n (%)					
Non-smoker	1,219 (46.6%)	769 (46.7%)	258 (47.2%)	192 (45.4%)	0.570
Former smoker	821 (31.4%)	501 (30.5%)	185 (33.8%)	135 (31.9%)	0.594
Occasional smoker	112 (4.3%)	72 (4.4%)	19 (3.5%)	21 (5.0%)	
Regular smoker (everyday)	463 (17.7%)	303 (18.4%)	85 (15.5%)	75 (17.7%)	
Physical activity levels, n (%)					0.580
>3 times a week	764 (29.2%)	487 (29.6%)	170 (31.1%)	107 (25.3%)	
1–3 times a week	775 (29.6%)	490 (29.8%)	158 (28.9%)	127 (30.0%)	
1–3 times a month	250 (9.6%)	151 (9.2%)	52 (9.5%)	47 (11.1%)	
Stress levels (1–10 scale) mean (SD)	4.2 $\pm$ 2.3	3.9 $\pm$ 2.3	4.3 $\pm$ 2.2	5.0 $\pm$ 2.3	<0.001

SD: standard deviation; BMI: body mass index.

1.0,2.0) antihypertensive medications on a total mean of 4.1 ($\pm$ 1.7) medications per day (median 4.0, IQR 2.0,6.0). The overall level of global perceived stress was 4.2 ($\pm$ 2.3, median 4.0) on a 1–10 scale with a greater level of perceived stress reported by women (5 vs. 3 in men) and patients aged <70 years (4.5 vs. 3 in patients > 70 years). The treatment-associated burden on daily life was relatively low, respectively 2.9 ($\pm$ 2.4) for the overall QoL, 2.1 ($\pm$ 2.2) for the professional life, 2.5 ($\pm$ 2.3) for the social life, 2.5 ($\pm$ 2.3) for the family life and 2.7 ($\pm$ 2.6) for the intimate life.

Figure 1 shows the distribution of the four global risk scores in the studied population. Within the

emotional and QoL score, 89% of participants experienced the loss of a close relative, 54% of them in the last 5 years. Furthermore, 42% of participants experienced a severe illness, 34% encountered a major familial conflict and another 34% went through a separation or a divorce. Further, 27% faced job loss and 25% dealt with a significant conflict at work. Overall, a heavy emotional background was associated with a higher tendency to take treatments very irregularly during the day, to change or modify prescribed dose without consultation and to intentionally stop/interrupt treatments, resulting in a lower overall adherence score.

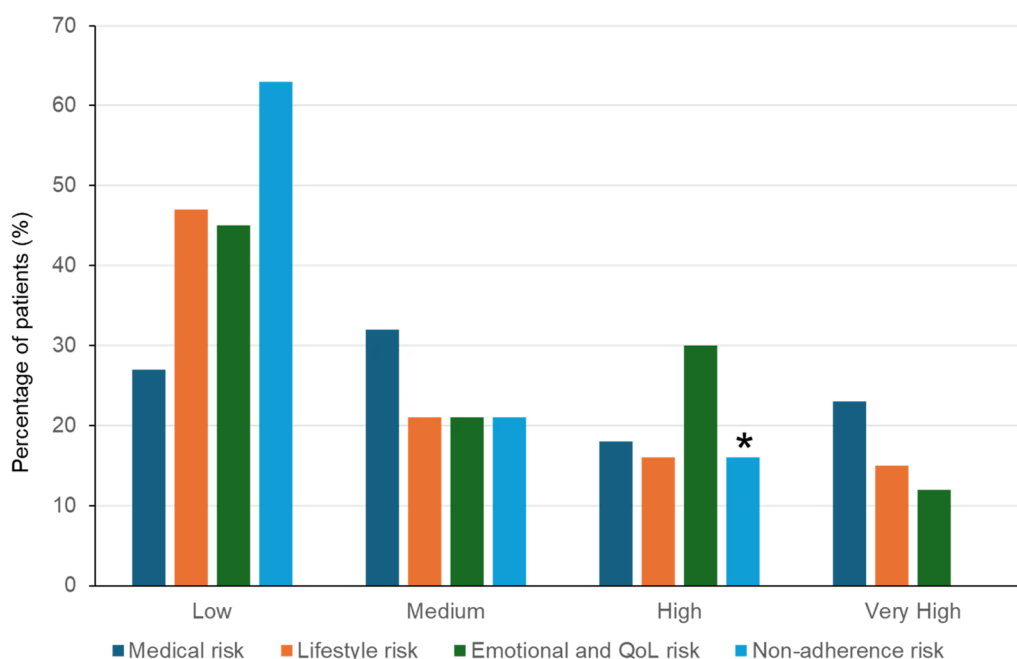


Figure 1. Percentage of participants with the various risk scores in the studied population ($n=2615$) according to the level of risk from low to very high risk (X axis). The * indicates that the column includes high and very-high-risk patients.

Finally, there was no significant correlation between the non-adherence risk score and the medical risk score ($p = 0.055$) or the lifestyle score ($p=0.31$). However, the non-adherence and the emotional and QoL risk score were significantly correlated (Pearson coefficient = 0.18, $p < 0.001$).

Analyses based on the non-adherence risk score

The characteristics of participants according to the non-adherence risk score are shown in Table 1. In total, 63% of participants were at low risk of non-adherence, 21% at intermediate risk and 16% at high or very high risk of non-adherence (Table 1 and Figure 1). Patients with a high non-adherence risk score were younger ($p < 0.001$) and had more associated conditions (Table 1). They also had a slightly higher number of antihypertensive pills per day and a higher level of stress ($p < 0.001$). In high-risk patients, the treatment-associated burden on daily life was also greater in all aspects (overall QoL 3.7, professional 2.7, social 3.2, family 3.2, and intimate 3.5 on the 1–10 Likert scale, $p < 0.001$ vs. low/intermediate non-adherence risk score).

Overall, self-reported adherence was high; 25% of patients reported unintentionally missing their treatment, 12% reported intentionally missing their treatment, and 87% reported never modifying their prescribed dose without consulting their physicians. Table 2 presents the reported causes of poor

adherence in participants who mentioned episodes of non-adherence according to their risk of non-adherence ($n=1271$). As expected, forgetfulness, unwanted side effects and running out of doses were the most frequent and significant causes of non-adherence. Interestingly, exposure to negative feedback about their treatment, whether through reading or hearing, significantly influenced patients at high risk of non-adherence ($p < 0.029$, Table 2).

When participants failed to take treatments as prescribed, only 13.1% of participants always or often notified their physicians about this issue. Low reporting rates were more frequent among participants with a high non-adherence risk score (21.3%). The main reasons included: (i) the perception that notifying their physicians was unnecessary (36%), (ii) not willing to bother their physician (21.8%), (iii) forgetfulness (19%), (iv) the belief that their physicians lacked time (11%), and (v) fear of judgment/disappointment (8.8%). All these results were similar across gender and age. They were not associated with the risk of non-adherence and were not different among categories of non-adherence.

Treatment perception and barriers to medication adherence

Most patients acknowledged and agreed on the long-term nature of their treatment. On the 1–10 scale, nearly all participants acknowledged the lifelong

Table 2. Reasons for poor adherence in patients who reported at least one adherence issue in question 25 ($n=1270$).

	Overall set ($n=1270$)	Lower risk of non-adherence ($n=300$)	Intermediate risk of non- adherence ($n=547$)	Higher risk of non-adherence ($n=423$)	p Value*
Reasons for poor treatment adherence, n (%)					
Forgetfulness	569 (44.8%)	124 (41.3%)	271 (49.5%)	174 (41.1%)	0.024
Running out of doses	174 (13.7%)	36 (12.0%)	71 (13.0%)	67 (15.8%)	0.326
Unwanted side effects	154 (12.1%)	34 (11.3%)	49 (9.0%)	71 (16.8%)	0.002
Patient feeling well/better	122 (9.6%)	20 (6.7%)	35 (6.4%)	67 (15.8%)	<0.001
Prescription not renewed in time	109 (8.6%)	26 (8.7%)	37 (6.8%)	46 (10.9%)	0.113
Concomitant event preventing treatment intake	86 (6.8%)	22 (7.3%)	33 (6.0%)	31 (7.3%)	0.682
Too many medications to take	84 (6.6%)	18 (6.0%)	28 (5.1%)	38 (9.0%)	0.078
Wish for medication-free AHT management	67 (5.3%)	6 (2.0%)	22 (4.0%)	39 (9.2%)	<0.001
Heard/read negative feedback on treatment	50 (3.9%)	9 (3.0%)	15 (2.7%)	26 (6.1%)	0.029
Lack of treatment efficacy	43 (3.4%)	7 (2.3%)	15 (2.7%)	21 (5.0%)	0.122
Unsuitable medication	43 (3.4%)	7 (2.3%)	14 (2.6%)	22 (5.2%)	0.064
Intakes are too frequent and burdensome	42 (3.3%)	4 (1.3%)	17 (3.1%)	21 (5.0%)	0.052
Treatment is too expensive	31 (2.4%)	7 (2.3%)	11 (2.0%)	13 (3.1%)	0.601
Other reasons	30 (2.4%)	2 (0.7%)	12 (2.2%)	16 (3.8%)	0.040
Perfect self-reported treatment adherence	97 (7.6%)	36 (12.0%)	47 (8.6%)	14 (3.3%)	<0.001

* p Value was adjusted for multiple testing using the Benjamini–Hochberg procedure.
AHT: antihypertensive therapy.

need for medication to manage their BP (mean score 8.6/10). They also recognized that treatment effectively controls BP (mean score 8.4/10) and that their health depends on how consistently they take their medications (mean score 7.8/10). The non-adherence risk score was inversely correlated to these three parameters ($p<0.001$). However, many participants did not recognize the negative consequences of forgetting treatment doses (mean score 4.8/10). Results were similar across sex, age and number of daily medications. There was a significant, positive correlation between patients' perceived stress levels and their awareness of the long-term consequences of missing their antihypertensive treatment ($p<0.001$). There was a statistically significant, positive correlation between patients' general stress levels and their awareness of the long-term consequences of missing their antihypertensive treatment (Pearson correlation coefficient = 0.14, $p<0.001$). Therefore, patients with higher general stress levels were more likely to be aware of the long-term consequences of missing their antihypertensive treatment.

Motivations and adherence

In total, 57.8% of participants answered that they did not need additional motivation to adhere to their prescription. This percentage was significantly lower

(35.7%, $p<0.001$) in patients with a high risk of non-adherence. The proposed sources of motivation for improving medication adherence include more health care physician appointments, additional information on treatment and on the disease, more digital support and help from friends and family (Table 3). Few participants seek help from a pharmacist or from a nurse. These needs were significantly more frequent among patients at high risk of non-adherence ($p<0.001$).

In total, 64.6% of patients were satisfied by the information received from their health care providers and considered it sufficient except patients at high risk of non-adherence (44.9%, $p<0.001$). When asked about helpful strategies to support medication adherence, most frequent answers were to reduce the number of pills (56.7%), smarter packages (44.8%), leaflets with treatment information (36.6%) and smaller pills (33.2%) with no difference according to the level of risk of non-adherence.

Lastly, patients at higher risk of non-adherence expressed a greater need for more information on hypertension and its complications in general, on drug side-effects, on lifestyle measures and practical guidance on how to take their medications. The demand for information was also significantly higher among patients with a high emotional risk score ($p<0.001$).

Table 3. Sources of motivation proposed by patients to improve treatment adherence.

(%) <i>N</i>	Overall set (<i>n</i> = 2615)	Lower risk of non-adherence (<i>n</i> = 1645)	Intermediate risk of non-adherence (<i>n</i> = 547)	Higher risk of non-adherence (<i>n</i> = 423)	<i>p</i> Value
More physician appointments	345 (13.2%)	187 (11.4%)	72 (13.2%)	86 (20.3%)	<0.001
More information on treatment	239 (9.1%)	116 (7.1%)	38 (6.9%)	85 (20.1%)	<0.001
Creating 'rituals'	198 (7.6%)	116 (7.1%)	41 (7.5%)	41 (9.7%)	0.239
More information on AHT	189 (7.2%)	96 (5.8%)	35 (6.4%)	58 (13.7%)	<0.001
More digital assistance	156 (6.0%)	77 (4.7%)	37 (6.8%)	42 (9.9%)	<0.001
More paper information on treatment	134 (5.1%)	71 (4.3%)	24 (4.4%)	39 (9.2%)	<0.001
Help from friends and family	130 (5.0%)	69 (4.2%)	30 (5.5%)	31 (7.3%)	0.042
Help from a pharmacist	117 (4.5%)	61 (3.7%)	21 (3.8%)	35 (8.3%)	<0.001
Help from a nurse	70 (2.7%)	40 (2.4%)	10 (1.8%)	20 (4.7%)	0.024
No need for additional motivation	1,511 (57.8%)	1,022 (62.1%)	338 (61.8%)	151 (35.7%)	<0.001
Nothing would motivate better treatment adherence	117 (4.5%)	80 (4.9%)	18 (3.3%)	19 (4.5%)	0.362

AHT: antihypertensive therapy.

Figure 2 shows the results of the ordinal logistic regression used to assess the association between one or more risk factors and the non-adherence risk score after selection of the relevant items among all potential risk factors collected in the study questionnaire (reduced model). Note that depression, family conflicts, stress and quality of the information received were major risk factors of poor adherence whereas female sex and older age were rather associated with a lower risk of poor adherence.

Discussion

In patients with asymptomatic chronic diseases who need to take lifelong medications, like hypertension, understanding their perspectives, beliefs, motivations and barriers to pharmacological treatment is of utmost importance as it may influence their adherence and help health professionals to find the right paths to guide that engagement [24]. Indeed, poor adherence to prescribed medications and lifestyle recommendations is recognized as a major contributor to poor BP control worldwide [1,10,18,25]. Our survey conducted in five large European countries in more than 2000 mainly older hypertensive patients prescribed less than 2 antihypertensive treatments on average shows the following: (1) more than 80% of participants acknowledge the need to be treated lifelong and that medications are necessary to control their BP and maintain their good health; (2) antihypertensive therapy represents a low burden in their daily life except for participants with a high-risk of non-adherence; (3) self-reported adherence is high and unintentionally missing doses is the most common cause of non-adherence; (4) patients seldom report episodes of

non-adherence to their physicians; (5) the risk of non-adherence is highest in patients with a high emotional and QoL risk score; and (6) the majority of patients (58%) report that they have no need for additional motivation to adhere to their prescription, but this was not the case of patients with a high risk of non-adherence or a high emotional risk score who had a high demand for more support and information on hypertension and its treatment.

Various studies have assessed patient perspectives in relation to adherence in chronic diseases, including in hypertension [4,8,22,24,26–29]. Nevertheless, our survey stands out as one of the largest European surveys in the field of hypertension with 2615 old patients enrolled in 5 countries. In Marshall's review mentioned before [8], all studies included less than 150 patients and were based on qualitative interviews or focus groups.

Even though 80% of participants recognized that their BP-lowering treatment was necessary to lower their BP and maintain their good health status, missing medication doses was not considered as an important issue for half of them. Unexpectedly, taking medications for hypertension was not felt as an important burden in their daily life. Hence, the self-reported burden of therapy was considered low or intermediate in 84% of participants. The perspective was different in participants with a high risk of non-adherence for whom the reported therapy-associated burden was significantly higher. However, self-reported adherence is unreliable and tends to overestimate the true adherence level [30,31]. Moreover, there is a possible selection bias since patients accepting to participate in such surveys are frequently older and retired and thus more likely to be

Gender - Male
 Gender - Female
 Age - <=66y
 Age -]66y-69y]
 Age -]69y,73y]
 Age - >73y
 Depression - No
 Depression - Yes
 Family history of AHT - No
 Family history of AHT - Yes
 Family history of AHT - Not sure
 Number of AHT daily pills - <2
 Number of AHT daily pills - >=2
 Number of AHT daily pills - Not known
 Severe illness - No
 Severe illness - Yes
 Major familial conflict - No
 Major familial conflict - Yes
 Stress levels - Low stress levels
 Stress levels - Moderate stress levels
 Stress levels - Higher stress levels
 Changes in alcohol consumption since AHT diagnosis - Reduced it
 Changes in alcohol consumption since AHT diagnosis - Have not changed it
 Changes in alcohol consumption since AHT diagnosis - Increased it
 Changes in alcohol consumption since AHT diagnosis - Not applicable
 Changes in stress levels since AHT diagnosis - Pay more attention to it
 Changes in stress levels since AHT diagnosis - Have not changed it
 Changes in stress levels since AHT diagnosis - Pay less attention to it
 Changes in stress levels since AHT diagnosis - Not applicable
 Explanations on treatment provided by HCPs - As much information as needed
 Explanations on treatment provided by HCPs - Patient would have liked more information
 Explanations on treatment provided by HCPs - Information on some treatments only
 Explanations on treatment provided by HCPs - No information received

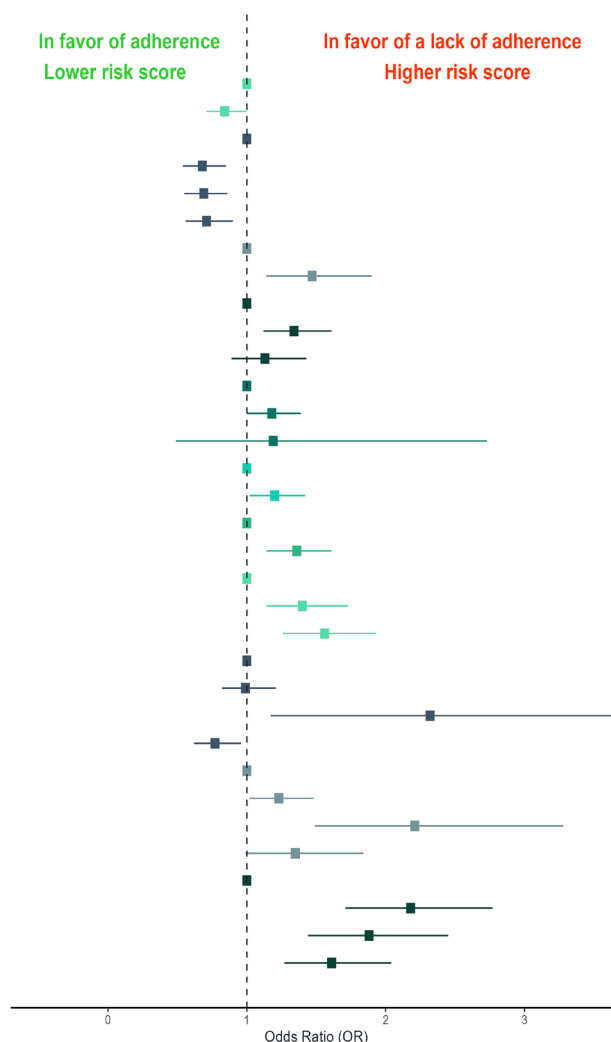


Figure 2. Results of the ordinal logistic regression used to assess the association between one or more risk factors and the non-adherence risk score. AHT: antihypertensive therapy; HCPs: health care physicians.

adherent. Previous survey in large populations of treated hypertensive patients have previously shown that treatment persistence is lower in younger patients [13] as well as in women when compared to men [12]. Nevertheless, our observation is consistent with other findings in chronic diseases. In an analysis based on the Necessity-Concerns Framework in patients with various chronic conditions, a high adherence was significantly associated with a stronger perception of treatment necessity [24]. In our survey, results were independent of the country in which the research was conducted. In that respect, our observation differs from that of Marshall et al. [8] who included studies with patients from several ethnic-minority groups. In their narrative synthesis, a high percentage of participants considered that treatment was not needed when they were either asymptomatic or not stressed. Hence, most patients disliked treatment and feared addiction, leading to frequent intentional reduction or withdrawal of treatments without consulting their doctors.

There are several potential reasons why our population differs. First, the mean age of our population was high (69.6 years) and patients were motivated since they were recruited mainly by a patient organization. However, this mean age is representative of the general population of hypertensive patients in our European countries [32]. Second, 70% of them were treated for more than 5 years (91% for more than 1 year) and had relatively few comorbidities. This may account for a greater treatment acceptability, a lower perceived burden and possibly a better overall adherence to treatment [33].

In our analyses, we calculated several risks scores based on the answers to specific questions. As mentioned previously, the non-adherence risk score was based on the frequency at which patients reported either missing medication doses or changing the therapy without informing their physicians. This score probably underestimates the true risk of non-adherence if one considers the numbers of factors affecting

medication adherence. Interestingly, the non-adherence risk score correlated positively and significantly with the emotional and QoL risk score but not with the medical or lifestyle scores. The prevalence of depression and sleep disorders was significantly higher among patients at high risk of non-adherence. In addition, the number of pills per day and the perceived treatment-associated burden on daily life were greater in patients with a high risk of non-adherence. In our older population, the main causes of hardships were the loss of a close relative (89% within the last 5 years), severe illness (42%) and family conflicts. Burn out and harassment were infrequent in this patient group who was mainly retired from work (12–14%). Half of the 52% of patients experienced 2–4 hardships in their life. In recent years, there has been an increasing interest in understanding the impact of post-traumatic stress disorders and psychological trauma as risk factors of hypertension and cardiovascular diseases [30,34,35]. This issue was investigated mainly in the context of war and conflicts. Our data suggest that more attention should be given to emotional aspects in people at risk of poor adherence.

There are multiple determinants of medication non-adherence. In a recent review of 51 reviews having assessed non-adherence to chronic therapies, several hundred individual factors affecting adherence and 47 determinants of persistence with medication were identified [36]. In our survey, the four most frequent causes of non-adherence reported by patients who mentioned problems of adherence were: forgetfulness, running out of doses, unwanted side effects and patients feeling better. These factors are frequently reported including in older patients with hypertension [1,13,28]. These determinants were significantly more frequent in patients at high risk of non-adherence.

One interesting observation of our survey is that patients inform their physicians only infrequently about episodes of non-adherence, and this was true also for participants with a high-risk of non-adherence. This suggests that patients are respectful and do not want to disturb physicians with this information. Some patients consider that reporting these issues is unnecessary as physicians cannot do anything about it and others fear that such information would impair the patient–physician relation and alter the quality of care. These answers might indicate that the level of confidence with their physician may not be optimal and should be improved to reduce the impact of non-adherence on BP control. Communication aspects deserve more attention to leave an open channel of communication enabling patients to feel free and comfortable to report their difficulties.

When questioned about how to support their motivation to take their treatment as prescribed, if needed, most of the participants answered that they did not need any additional motivation (57%). This answer probably reflects the fact that most of these older participants who had been treated for more than 5 years had fully understood the need to be treated for life. In terms of motivation, more regular appointments with their physicians were the main reported action to improve adherence. Participants also asked for more information about treatments and consequences of non-adherence as well as for more explanations from their physician on the disease itself. The higher the risk of non-adherence was, the lower the satisfaction regarding information about treatments seemed to be. These answers clearly emphasize the global need for more patient education, improved communication among providers and patients and patient empowerment as suggested by several previous surveys [8,17,22,37]. However, education on adherence should be developed at all levels, including health care providers [8,19,38]. Participant suggestions to further improve adherence were the use of multiple drug combinations in a single pill (56%) and the development of smarter packaging with reminders when to take treatment. Not surprisingly, these proposals were favored by patients with a high medical risk score and a higher number of pills per day. Adherence risk score did not appear to have a major impact on propositions to improve adherence. As discussed above, these data support the ESH therapeutic strategy recommending the use of single pill combinations as first-line therapy to reduce the pill burden [10].

This survey has several limitations. Although inclusion criteria were wide, we cannot exclude a selection bias as most of the included patients collaborated with the SIHA and hence were motivated to participate in such surveys and interviews as well as a survival bias in the elderly population. Moreover, we do not have information on the total number of patients who were approached and do not have data on how much those who completed the questionnaire differed from those that did not complete the survey. The assessment of adherence was based on self-report, which is known to be overestimated. We did not use any specific questionnaire to quantify more precisely the level of adherence, and we did not have information on the ethnicity of participants. The survey was focused only on hypertension. Unfortunately, we did not have access to recent valid BP measurements enabling us to assess whether hypertension was well-controlled or not in the survey participants. The availability of measured

BP data would have been very useful to analyze associations between hypertension control and patient perspectives, beliefs and barriers to treatment. Similarly, we did not have detailed information on other drug therapies except for the total number of pills taken every day. At last, statistical tests were not adjusted for multiple comparisons.

In conclusion, the present survey highlights several important issues regarding the perspective of hypertensive patients being treated with antihypertensive medications. Some issues are common to all chronic diseases, but others are less frequently addressed, e.g. the impact of the emotional profile, hardships or the QoL on the risk of non-adherence or the absence of reporting of non-adherence episodes to healthcare providers, which limits the recognition of non-adherence in clinical practice. These aspects would deserve additional specific studies as they are possible points of improvement. Poor adherence to antihypertensive medications is such an important issue worldwide [25] that all efforts should be done to better understand patients concerns and improve accordingly our hypertension management strategies in the future [39,40].

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