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ORIGINAL RESEARCH

Effect of frailty syndrome on treatment compliance in older hypertensive patients

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Background: Frailty syndrome (FS) is an important problem in older persons. It may develop concomitantly to many aging-related diseases, including arterial hypertension, and exerts detrimental effects on both their outcomes and treatment compliance.

Objective: To analyze the effect of FS on treatment compliance in older hypertensive patients.

Materials and methods: This study of 300 hypertensive patients (167 women and 133 men) aged between 65 and 91 years (mean 71.75±7.79 years) was based on the analysis of medical documentation and survey with the Tilburg Frailty Indicator (TFI) and Hill-Bone High Blood Pressure Compliance Scale.

Results: Mean systolic and diastolic blood pressure values of the study subjects were 141.97 and 85.16 mm Hg, respectively. Mean time elapsed since the diagnosis of arterial hypertension was 13.74 years. FS was diagnosed in 65.67% of the study subjects. Mean global score of the Hill-Bone High Blood Pressure Compliance Scale was 20.75 points. TFI scores correlated significantly with the global score of the Hill-Bone High Blood Pressure Compliance Scale (R=0.509, P<0.001) and the values of its 2 subscales: Appointment Keeping (R=0.34, P<0.001) and Medication Taking (R=0.537, P<0.001).

Conclusion: FS exerts a significant effect on treatment compliance of older hypertensive patients. Treatment compliance is modulated by patients' sex (worse compliance in men), education (better compliance in subjects with higher education), and TFI scores (worse compliance in patients with FS).

Keywords: frailty syndrome, compliance, adherence, arterial hypertension, older age

Introduction

Frailty is an important problem in older persons. This justifies the constant creation of specialist diagnostic tools and development of primary and secondary preventive measures. Frailty exerts detrimental effects not only on a disease outcome but also on treatment compliance. The term "frailty syndrome" (FS) has been existing for a long time in American geriatrics, to describe the presence of multiple comorbidities and deteriorated physical fitness in older persons. The current definition of FS was proposed by Fried who described this condition as "a biologic syndrome of decreased reserve and resistance to stressors, resulting from cumulative declines across multiple physiologic systems, and causing vulnerability to adverse outcomes".[1] According to the American Geriatrics Society, 3 principal determinants of FS are increased vulnerability to stressors, decline in physiological reserve, and malfunction across multiple organ systems, including endocrine disorders and immune dysfunction.[1]

While the prevalence of FS among European patients is estimated at ~17%–20%, it has been shown to increase with age, to up to ~40% in subjects older than 85 years.

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FS is more common in women, persons living alone, and those presenting with worse educational levels and/or lower socioeconomic status. Approximately 50% of individuals older than 65 years are at an increased risk of FS and classified as the so-called pre-frail.[2]

FS coexists with many aging-associated diseases, including arterial hypertension.[3] The prevalence of arterial hypertension is increasing with time. According to the global World Health Organization report, up to 40% of individuals older than 25 years present with an elevated arterial blood pressure, and the total number of hypertensive patients exceeds 1.5 billion.[4] Treatment compliance is a key determinant of efficient antihypertensive treatment. However, the proportion of patients who comply with their medication plans is estimated at no more than 30% worldwide; in Poland, this fraction is even lower and does not exceed 5%–15%.[5,6] The terms "compliance" and "adherence", used interchangeably in medical nomenclature, refer to some determinants of successful treatment outcomes, such as patient–physician cooperation, compliance with medication and dietary plans, and lifestyle modifications.[7] The fact that FS may contribute to noncompliance puts a special emphasis on understanding the specific needs of patients affected by this condition.

The influence of older age and concomitant FS on treatment compliance and adherence in patients with arterial hypertension is an important issue and as such has been frequently addressed in literature. Bastos-Barbosa et al emphasized the influence of concomitant FS and other cardiovascular risk factors on the outcome of antihypertensive treatment.[8] In addition, other authors pointed to frequent prevalence of FS in older patients with arterial hypertension.[9,10] However, to the best of our knowledge, the association between FS and compliance in older patients with hypertension has not been a subject of any published studies.

Objective

The aim of this study was to analyze the effect of FS on treatment compliance in older hypertensive patients.

Materials and methods

This study included 300 patients hospitalized at the University Clinical Hospital in Wroclaw due to hypertensive emergencies. The study protocol was approved by the Local Bioethics Committee at the Wroclaw Medical University (decision no 144/2016).

Informed consent was obtained from all participants. Each patient's right to withdraw from the study at any stage and the confidentiality of their responses was emphasized.

Basic sociodemographic and clinical data of the study subjects were extracted from their medical documentation. Furthermore, participants were surveyed with the following 2 validated instruments:

- Tilburg Frailty Indicator (TFI)
- Hill-Bone High Blood Pressure Compliance Scale.

TFI, developed by Gobbens et al,[11] consists of 2 parts with a total of 15 questions. Part A refers to physical determinants of FS (8 questions), and part B to the psychological and social determinants (4 and 3 questions, respectively). Therefore, aside from the global TFI score (maximum 15 points), the values of physical, psychological, and social subscales can also be determined. A global score of 5 points or more corresponds to FS.[11] In this study, we used the Polish version of TFI.[12]

Hill-Bone High Blood Pressure Compliance Scale is a measure of antihypertensive treatment compliance. The instrument includes 14 items grouped into 3 subscales: Salt Intake, Appointment Keeping, and Medication Taking. Each item is scored on a 4-point scale: none of the time, some of the time, most of the time, and all the time. The global score may range between 14 and 56 points; the higher the score, the lesser the treatment compliance. In this study, we used the Polish version of the Hill-Bone High Blood Pressure Compliance Scale.[13]

Statistical characteristics of quantitative variables are presented as means, standard deviations (SDs), lower and upper quartiles (Q1 and Q3), and minimum and maximum values (Min and Max), and the characteristics of qualitative variables are presented as numbers and percentages. Power and direction of the associations between the pairs of quantitative variables were assessed on the basis of Spearman's coefficients of rank correlation (R). Normal distribution of quantitative variables was verified with Shapiro–Wilk test. Multivariate analysis was based on multiple linear regression models. Quality of obtained models was verified on the basis of their coefficients of determination (R^2). Results of all the statistical tests were considered significant at $P<0.05$. All statistical calculations were carried out with R 3.3 software.

Results

The influence of FS on treatment compliance was studied in 300 hypertensive patients (167 women and 133 men) aged between 65 and 91 years (mean 71.75±7.79 years). Basic sociodemographic and clinical characteristics of the study subjects are summarized in Table 1.

Prevalence of FS determined with the TFI

FS was diagnosed in 197 out of the 300 study subjects (65.67%). The most significant relative contributor of frailty

Table 1 Basic sociodemographic and clinical characteristics of the study subjects

Parameters	Mean (SD)	Median (interquartile range)
Age (years)	71.75 (7.79)	68 (65–78)
Systolic pressure (mmHg)	141.97 (18.1)	140 (130–150)
Diastolic pressure (mmHg)	85.16 (14.23)	90 (80–90)
History of arterial hypertension (years)	13.74 (8.49)	12 (7–17)
Parameters	**N**	**%**
Sex		
Women	167	55.67
Men	133	44.33
Comorbidities		
Diabetes mellitus	161	53.67
Ischemic heart disease	86	28.67
Kidney failure	38	12.67
Rheumatic disorders	55	18.33
Marital status		
Married/common law	161	53.67
Single	17	5.67
Separated/divorced	12	4.00
Widowed	110	36.67
Education		
Primary or none	84	28.00
Secondary	138	46.00
Higher vocational or higher	78	26.00
Occupational status		
Employed	47	15.67
Retirement pension	202	67.33
Health pension	49	16.33
Unemployed	2	0.67
Type of therapy		
Monotherapy	129	43.00
Polytherapy	171	57.00

Abbreviation: SD, standard deviation.

was the social component of TFI (mean score 1.85 out of possible 3 points, that is, 61.67% of the maximum score), followed by physical (3.95 out of 8 points, 49.33%) and psychological component (1.3 out of 4 points, 32.42%) (Table 2).

Treatment compliance determined with the High Blood Pressure Compliance Scale

The mean global score of the study subjects was 20.75±4.11 (range: 14–34) with a median value equal to 20 (interquartile range: 18–23). The scale has 3 subscales, each with different number of questions. The Salt Intake subscale consists of 3 items, and its maximum score may range between 3 and 12 points; mean score of the study subjects was 4.79±1.17. The maximum score of the 2-item Appointment Keeping subscale ranges between 2 and 8 points; mean score of the study participants was 3.47±1.09. The Medication Taking subscale includes 9 items (maximum score 9–36 points); mean score of our respondents was 12.49±3.3 (Table 3).

Table 2 Prevalence of frailty syndrome determined with the TFI

TFI		N					%	
Non-frail		103					34.33	
Frail		197					65.67	
TFI subscales	**N**	**Mean**	**SD**	**Me**	**Min**	**Max**	**Q1**	**Q3**
Physical components	300	3.95	2	4	0	8	2	6
Psychological components	300	1.3	0.87	1	0	4	1	2
Social components	300	1.85	0.75	2	0	3	1	2

Abbreviations: TFI, Tilburg Frailty Indicator; SD, standard deviation; Me, median; Min, minimum value; Max, maximum value; Q1, lower quartile; Q3, upper quartile.

Effect of FS on treatment compliance

The analysis of correlation demonstrated that frailty, determined with the TFI, exerted a significant effect on both the global score of the Hill-Bone High Blood Pressure Compliance Scale and the scores of its 2 subscales: Appointment Keeping and Medication Taking ($P<0.05$). All these correlations were positive; that is the higher the TFI score (the more frail a given person), the lesser the treatment compliance (Table 4).

Multivariate analysis of the global score of the Hill-Bone Scale

The linear regression analysis demonstrated that the global scores of the Hill-Bone Scale were modulated by the following ($P<0.05$):

- Sex: compared to women, the global scores of the Hill-Bone Scale for men were 1.156 points higher on average.
- Education: compared to subjects with primary education or lack thereof, global scores of the Hill-Bone Scale for individuals with higher vocational or university education were 1.872 points lower on average.

Table 3 Treatment compliance determined with the Hill-Bone High Blood Pressure Compliance Scale

Global score	N	Mean	SD	Me	Min	Max	Q1	Q3
	300	20.75	4.11	20	14	34	18	23
Subscales	**N**	**Mean**	**SD**	**Me**	**Min**	**Max**	**Q1**	**Q3**
Salt Intake	300	4.79	1.17	5	3	12	4	5
Appointment Keeping	300	3.47	1.09	3.5	2	7	3	4
Medication Taking	300	12.49	3.3	12	9	24	10	14

Abbreviations: SD, standard deviation; Me, Median; Min, minimum value; Max, maximum value; Q1, lower quartile; Q3, upper quartile.

Table 4 Effect of frailty syndrome on treatment compliance

Hill-Bone High Blood Pressure Compliance Scale	Correlation with the TFI score			
	R	*P*-value	Direction	Power
Global score	0.509	<0.001	Positive	Strong
Salt Intake	–0.069	0.234	–	–
Appointment Keeping	0.34	<0.001	Positive	Moderate
Medication Taking	0.537	<0.001	Positive	Strong

Abbreviation: TFI, Tilburg Frailty Indicator.

- TFI score: a 1-point increment in the TFI score was associated with a 0.292-point increase in global score of the Hill-Bone Scale.

R^2 coefficient for this model was 40.01%, which means that variables included in the model explained 40.01% of variance in global scores of the Hill-Bone Scale. The remaining 59.99% of variance resulted from the influence of other variables that were not included in the model, as well as from random effects (Table 5).

Multivariate analysis of the Salt Intake scale

The linear regression analysis demonstrated that the Salt Intake scores were modulated by the following ($P<0.05$):

- Sex: compared to women, the Salt Intake scores of men were 0.288 points higher on average.
- Occupational status: compared to occupationally active persons, the Salt Intake scores of retired subjects were 0.572 points lower on average.
- Diabetes mellitus: presence of concomitant diabetes mellitus was associated with a 0.362-point increase in Salt Intake score.
- TFI score: a 1-point increment in the TFI score was associated with a 0.089-point decrease in Salt Intake score.

R^2 coefficient for this model was 13.43%, which means that variables included in the model explained 13.43% of variance in Salt Intake scores. The remaining 86.57% of variance resulted from the influence of other variables

Table 5 Multivariate analysis of the global score of Hill-Bone High Blood Pressure Compliance Scale

Variables	Parameter	SE	*t*	*P*-value
Sex				
Women – reference				
Men	1.156	0.414	2.79	0.006
Age (years)	–0.028	0.05	–0.569	0.57
Marital status				
Married/common law – reference				
Single/separated/divorced	1.309	0.739	1.77	0.078
Widowed	0.592	0.603	0.983	0.327
Education				
Primary or none – reference				
Secondary	–0.79	0.556	–1.421	0.157
Higher vocational or University education	–1.872	0.64	–2.923	0.004
Occupational status				
Employee – reference				
Retirement	–1.181	0.601	–1.965	0.05
Health pension/unemployed	–1.251	0.757	–1.651	0.1
Duration of the disease (years)	–0.037	0.028	–1.319	0.188
Diabetes mellitus				
No – reference				
Yes	0.662	0.43	1.54	0.125
Ischemic heart disease				
No – reference				
Yes	0.495	0.487	1.017	0.31
Kidney failure				
No – reference				
Yes	–0.118	0.619	–0.191	0.848
Rheumatic diseases				
No – reference				
Yes	0.359	0.524	0.685	0.494
Type of therapy				
Monotherapy – reference				
Polytherapy	0.312	0.691	0.452	0.651
TFI (points)	0.292	0.107	2.733	0.007

Abbreviations: SE, standard error; TFI, Tilburg Frailty Indicator.

that were not in the model, as well as from random effects (Table 6).

Multivariate analysis of the Appointment Keeping scale

No significant determinants of Appointment Keeping scale were identified in linear regression analysis ($P>0.05$).

R^2 coefficient for this model was 23.12%, which means that variables included in the model explained 23.12% of variance in Appointment Keeping scores. The remaining 76.88% of variance resulted from the influence of other variables that were not in the model, as well as from random effects (Table 7).

Multivariate analysis of the Medication Taking scale

The linear regression analysis demonstrated that Medication Taking scores were modulated by the following ($P<0.05$):

- Sex: compared to women, the Medication Taking scores of men were 0.792 points higher on average.
- Education: compared to subjects with primary education or lack thereof, the Medication Taking scores of individuals with higher vocational or university education were 1.579 points lower on average.
- TFI score: a 1-point increment in the TFI score was associated with a 0.335-point increase in Medication Taking score.

R^2 coefficient for this model was 41.48%, which means that variables included in the model explained 41.48% of variance in Medication Taking scores. The remaining 58.52% of variance resulted from the influence of other variables that were not included in the model, as well as from random effects (Table 8).

Discussion

Frailty is an important problem in older persons. This justifies the constant creation of specialist diagnostic tools

Table 6 Multivariate analysis of the Salt Intake scale

Variables	Parameter	SE	t	*P*-value
Sex				
Women – reference				
Men	0.288	0.142	2.03	0.043
Age (years)	0.009	0.017	0.538	0.591
Marital status				
Married/common law – reference				
Single/separated/divorced	0.366	0.253	1.444	0.15
Widowed	0.302	0.207	1.465	0.144
Education				
Primary or none – reference				
Secondary	–0.119	0.191	–0.622	0.535
Higher vocational or higher	–0.106	0.219	–0.485	0.628
Occupational status				
Employee – reference				
Retirement	–0.572	0.206	–2.776	0.006
Health pension/unemployed	–0.333	0.26	–1.284	0.2
Duration of the disease (years)	–0.01	0.01	–1.087	0.278
Diabetes mellitus				
No – reference				
Yes	0.362	0.147	2.459	0.015
Ischemic heart disease				
No – reference				
Yes	0.182	0.167	1.091	0.276
Kidney failure				
No – reference				
Yes	–0.064	0.212	–0.301	0.764
Rheumatic diseases				
No – reference				
Yes	0.013	0.18	0.071	0.943
Type of therapy				
Monotherapy – reference				
Polytherapy	–0.025	0.237	–0.106	0.916
TFI (points)	–0.089	0.037	–2.425	0.016

Abbreviations: SE, standard error; TFI, Tilburg Frailty Indicator.

Table 7 Multivariate analysis of the Appointment Keeping scale

Variables	Parameter	SE	*t*	*P*-value
Sex				
Women – reference				
Men	0.075	0.124	0.609	0.543
Age (years)	–0.01	0.015	–0.659	0.511
Marital status				
Married/common law – reference				
Single/separated/divorced	0.22	0.221	0.996	0.32
Widowed	0.295	0.18	1.635	0.103
Education				
Primary or none – reference				
Secondary	0.193	0.166	1.162	0.246
Higher vocational or higher	–0.186	0.192	–0.972	0.332
Occupational status				
Employee – reference				
Retirement	0.052	0.18	0.29	0.772
Health pension/unemployed	–0.038	0.227	–0.168	0.867
Duration of the disease (years)	–0.007	0.008	–0.881	0.379
Diabetes mellitus				
No – reference				
Yes	0.134	0.129	1.042	0.299
Ischemic heart disease				
No – reference				
Yes	0.163	0.146	1.118	0.265
Kidney failure				
No – reference				
Yes	0.059	0.185	0.322	0.748
Rheumatic diseases				
No – reference				
Yes	–0.003	0.157	–0.022	0.982
Type of therapy				
Monotherapy – reference				
Polytherapy	0.376	0.207	1.818	0.07
TFI (points)	0.046	0.032	1.437	0.152

Abbreviations: SE, standard error; TFI, Tilburg Frailty Indicator.

and development of primary and secondary preventive measures. FS may develop concomitantly to many aging-related diseases, including arterial hypertension, and exerts detrimental effects on both their outcomes and treatment compliance.[14]

Our study included 300 hypertensive patients aged 65 years or older, with an average 13-year history of arterial hypertension. More than a half of the respondents were women (55.67%). Up to 65.67% of our patients were diagnosed with FS. In the study conducted by Fried et al, FS was found in 7% of patients older than 65 years and in up to 30% of subjects above 80 years of age. Individuals with FS had a 59% greater rehospitalization risk and 28% greater risk of fall, and showed a 34% deterioration in physical fitness over a 3-year follow-up period.[15] In LASA (Longitudinal Aging Study Amsterdam) trial, FS was diagnosed in nearly 20% of subjects older than 65 years.[16]

More than 50% of our study subjects presented with concomitant diabetes mellitus, and up to 30% with ischemic heart disease. According to the literature, older age is associated with a higher prevalence of comorbidities and cardiovascular risk factors, which may unfavorably affect treatment compliance. Individuals with multiple comorbidities need to take more medications, which makes them less likely to comply with their treatment plans.[17,18] This was inter alia confirmed by the results of PACE (Pennsylvania Pharmaceutical Assistance Contract for the Elderly) analyzing the influence of comorbidities on treatment compliance. In this study, older patients with multiple comorbidities, including arterial hypertension, were found to be less compliant than their peers without concomitant diseases.[17] Presence of multiple comorbidities and lesser-level independence predispose hypertensive patients to FS. A link between arterial hypertension and frailty was first reported by Bastos-Barbosa et al.[8] These authors compared

Table 8 Multivariate analysis of the Medication Taking scale

Variable	Parameter	SE	t	*P*-value
Sex				
Women – reference				
Men	0.792	0.328	2.415	0.016
Age (years)	–0.028	0.039	–0.703	0.483
Marital status				
Married/common law – reference				
Single/separated/divorced	0.723	0.586	1.234	0.218
Widowed	–0.005	0.477	–0.01	0.992
Education				
Primary or none – reference				
Secondary	–0.865	0.44	–1.964	0.051
Higher vocational or higher	–1.579	0.507	–3.115	0.002
Occupational status				
Employee – reference				
Retirement	–0.661	0.476	–1.39	0.166
Health pension/unemployed	–0.879	0.6	–1.466	0.144
Duration of the disease (years)	–0.019	0.022	–0.863	0.389
Diabetes mellitus				
No – reference				
Yes	0.166	0.34	0.487	0.627
Ischemic heart disease				
No – reference				
Yes	0.15	0.386	0.389	0.697
Kidney failure				
No – reference				
Yes	–0.114	0.49	–0.233	0.816
Rheumatic diseases				
No – reference				
Yes	0.35	0.415	0.842	0.4
Type of therapy				
Monotherapy – reference				
Polytherapy	–0.038	0.547	–0.07	0.944
TFI (points)	0.335	0.085	3.958	<0.001

Abbreviations: SE, standard error; TFI, Tilburg Frailty Indicator.

blood pressure levels and cardiovascular risk profiles of frail and non-frail subjects. The mean age of the study subjects was 74.5 years. Compared to non-frail individuals, patients with FS had a higher blood pressure over the 24 h (135/74 vs 122/68 mm Hg) and during sleep (134/72 vs 120.67 mm Hg). Moreover, they more often presented with cardiovascular risk factors, such as abdominal obesity, dyslipidemia, and fasting hyperglycemia.[8] Furthermore, according to other authors, arterial hypertension frequently coexists with FS in older patients.[2,18] Fattori et al examined a group of Brazilian patients older than 65 years, and demonstrated frequent coexistence of FS with arterial hypertension. In their study, the prevalence of FS was higher in women than in men. Moreover, frail subjects more often reported weight loss and fatigue (18.3% vs 12.5%, P=0.034 and 22.5% vs 11.9%, P<0.001, respectively).[2] The prevalence of FS in geriatric patients (n=761) was also analyzed by Ricci et al. Up to 10% of their respondents presented with FS. Arterial hypertension was the most common cardiovascular risk factor, present in more than 80% of the study participants. Individuals with FS were exposed to multiple cardiovascular risk factors significantly more often than non-frail subjects.[18] In our study, the most significant contributor to frailty was the social component of TFI; this might reflect the deteriorated physical fitness of frail subjects and their greater dependence in activities of daily living.

Adequate treatment compliance is a key to efficient antihypertensive therapy. In our study, the mean global score of the Hill-Bone High Blood Pressure Compliance Scale was 20.75 points (range: 14–34); based on the median value, ~50% of the subjects scored less than 20 points on this scale. The lower the global value of the Hill-Bone High Blood Pressure Compliance Scale, the lesser the treatment compliance. As emphasized by Cessak and Spławiński, adequate

compliance (up to 100%) is typically observed frequently in hospitalized patients. In contrast, the treatment compliance of outpatients is alarmingly low.[19] According to literature, the proportion of outpatients who refill their prescriptions after 6 months of treatment is lesser than 50%.[20]

Multivariate analysis demonstrated that patients' sex exerted significant effects on the global scores of the Hill-Bone Scale as well as on the Medication Taking scores; the levels of treatment compliance in men turned out to be significantly lower than in women. Published data on sex-specific differences in treatment compliance are inconclusive. In NATPOL study, women showed better compliance than men and less often discontinued therapy.[21] Better compliance of female patients has also been documented by Zaghloul and Goodfield.[22] Slightly different results were published by Gokdemir et al who did not find a significant association between patients' sex and treatment compliance.[23] The study conducted by Matschay and Turostowska included 103 patients aged 30–70 years. The subjects were divided into 2 groups: group I – younger (30–49 years) and group II – older (50–70 years). Adequate compliance was found in 47% and 69% of women from groups I and II, respectively, as well as in 55% and 71% of younger and older men, respectively.[24] Our study demonstrated that higher education was associated with lower global scores of the Hill-Bone Scale and with lower Medication Taking scores; this means that subjects with higher education showed better compliance than those with only primary education or lack thereof. While many previous studies documented better compliance and adherence in patients with higher education,[25–28] some authors did not observe this association.[29–34] Intuitively, it may be expected that patients with higher educational level should have better knowledge about the disease and therapy, and therefore, be more compliant. Our study showed that the presence of FS was associated with worse compliance, namely with higher global scores of the Hill-Bone Scale and higher Medication Taking scores. In Medicaid study, only 20% of hypertensive patients older than 65 years showed adequate treatment compliance, which was attributed to the process of aging, inter alia to concomitant FS.[35] Our multivariate analysis demonstrated that aside from male sex which contributed to a significant decrease in Salt Intake scores, values of this scale were also significantly modulated by occupational activity. Subjects who did not work due to retirement presented with significantly lower Salt Intake scores than occupationally active individuals, which points to better compliance of the former. Perhaps, this phenomenon should be explained by the fact that retired persons pay more attention to their health, including energetic value of their meals. In turn, occupational activity frequently enforces consumption of processed foods with a higher content of salt. Treatment compliance of our subjects turned out to be negatively affected by concomitant diabetes mellitus. Unfavorable effect of comorbidities on the outcome of antihypertensive treatment has been previously emphasized by Bastos-Barbosa et al.[8] Interestingly, the presence of FS was associated with better compliance of our patients in terms of salt intake. Equally surprising findings have been previously published by other authors as well.[36,37] The results of these studies imply that older persons with FS may be more concerned about their health and realize that medication intake is necessary, which makes them more motivated for treatment compliance.[36,37] To our best knowledge, studies on the association between FS and adherence in patients with hypertension have not been conducted to date.

Treatment compliance is a prerequisite of efficient antihypertensive therapy. Noncompliance may result in deterioration of health status, life-threatening complications, or even death. Chronically diseased patients require extensive education and complex medical care. Medical and nursing interventions are equally important for the prevention of unfavorable consequences of frailty in older persons, and for the improvement of their treatment compliance.

Study limitations

We are well aware of the potential limitations of this study. The most important of these stem from the fact that our study sample was relatively small and recruited from a single center.

Conclusion

Frailty syndrome exerts a significant effect on treatment compliance of older hypertensive patients. The higher the TFI score, that is, the greater the frailty, the lesser the treatment compliance. Furthermore, treatment compliance was modulated by patients' sex (worse compliance in men), education (better compliance in subjects with higher education) and TFI scores (worse compliance in patients with frailty syndrome).

Disclosure

The authors report no conflicts of interest in this work.

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