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Clinical Epidemiology, 2014; 6(1):81-87

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Originally published at:  
<http://doi.org/10.2147/CLEP.S53706>

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# Self-reported knowledge and awareness about blood pressure and hypertension: a cross-sectional study of a random sample of men and women aged 60–74 years

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**Background:** In general, it is assumed that patient education, by increasing knowledge, may change behavior and lifestyle and promote health. In this context, it is a surprise that knowledge and awareness about blood pressure and hypertension among elderly people is poor. We hypothesized that knowledge about blood pressure and hypertension would be better among individuals with self-reported hypertension compared with subjects without self-reported hypertension.

**Methods:** We mailed a questionnaire to a random sample of 1,000 subjects living in the municipality of Silkeborg, Denmark. The study sample was drawn from the Central Person Registry.

**Results:** The response rate was 72%. Of these, 43% of responders had self-reported hypertension. The people with self-reported hypertension were older, less educated, had higher self-reported blood cholesterol levels, had higher body weight, and more often had a family history of hypertension. More than 80% reported that overweight and obesity increases blood pressure. More than 60% reported that untreated hypertension may cause heart disease or stroke. More than half of the responders did not know their blood pressure, and only 21% knew that hypertension can occur without symptoms. Knowledge about hypertension was independent of self-reported hypertension status, but awareness about blood pressure was most prominent among those with self-reported hypertension.

**Conclusion:** General knowledge about blood pressure and hypertension was reasonable, but there is still room for improvement in elderly people's knowledge and awareness of blood pressure.

**Keywords:** self-reported hypertension, questionnaire, elderly, blood pressure

## Introduction

Primary prevention of heart disease and health promotion has been in focus for decades. Health care in the primary and secondary care sector has evolved to strengthen the citizen's opportunities to engage in prevention and health promotion.<sup>1</sup> Half of patients with hypertension are unaware of their condition.<sup>2–7</sup> The prevalence of hypertension in the adult Danish population is estimated to be 22.3%. The prevalence spans from 1% in those aged 20–29 years to 69% among those aged 80–89 years.<sup>8</sup> Among Danish patients with known hypertension, only 40%–50% are treated to the guideline recommended blood pressure of less than 140/90 mm Hg.<sup>7–9</sup> The situation is far worse in less-developed countries. For patients with coronary heart disease or stroke, the use of blood pressure-lowering drugs decreases from 69% in high-income countries to 16% in low-income countries.<sup>10</sup> There is a genetic

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predisposition for hypertension, and men develop hypertension earlier than women. Obesity,<sup>11,12</sup> high salt intake,<sup>13,14</sup> physical inactivity,<sup>15,16</sup> and excess alcohol consumption<sup>17</sup> increase the risk of hypertension. Proven interventions to prevent the development of hypertension include reduction of weight and alcohol intake; increase in leisure time exercise; healthy diet, with low saturated fat; and reduced salt intake.<sup>11,12,15–20</sup>

Health campaigns have been addressed to entire populations, but a systematic patient education program for hypertensive patients does not exist. In this context, it is surprising that there is little information about elderly people's knowledge and awareness of their blood pressure.

In this study we examined self-reported hypertension knowledge in a population-based random sample of people aged 60–74 years. We hypothesized that knowledge and awareness about blood pressure would be better among individuals with self-reported hypertension compared with subjects without self-reported hypertension. Individuals with “self-reported hypertension” were defined as those who reported use of antihypertensive drugs.

## Study population and methods

### Source population

The source population consisted of 6,803 men and 6,923 women aged 60–74 years who were living in the municipality of Silkeborg, Denmark. In the year 2010, the population of the municipality of Silkeborg comprised 42,396 inhabitants. The mean income per inhabitant in the municipality of Silkeborg was DKK 282,000 vs DKK 283,000 in the general Danish population. The employment rate in the municipality of Silkeborg was 74.9% vs 72.2% in the general Danish population. The sample population was randomly drawn from the Central Person Registry of Denmark by the research department at the Danish Health and Medicines Authority. The age interval of 60–74 years was chosen because of a high prevalence of hypertension in this age group. To increase the internal validity of our study, we did not include subjects older than 74 years because we anticipated a low response rate among people older than 75 years.

The study was approved by the Danish Data Protection Agency. There was no requirement for approval from an ethical committee because the responses from the participants were anonymous.

### The questionnaire

The questionnaire was developed by the investigator in cooperation with nurses and doctors working in cardiology wards, dialysis units, outpatient clinics, and general practices,

based on relevant and useful questions that emerged from the literature<sup>21</sup> and clinical experience.

The questionnaire asked for information on sex, age, civil status, number of children, and education. There were additional questions about height, weight, cholesterol, and hypertension risk factors. The questions on the knowledge of hypertension symptoms were in multiple-choice format and focused on the following areas: a) factors that influence blood pressure, b) the symptoms of hypertension, c) the consequences of hypertension, and d) awareness of one's own blood pressure.

The questionnaire was tested in a pilot study of 31 subjects aged 60–74 years and adjusted accordingly. The questionnaire was then mailed to the study population, together with a letter explaining the purpose of the study. We did not validate the questionnaire by repeating it because we assumed participants might seek information between examinations.

### Statistics

We used the two-sample Student's *t*-test, chi-square test, and Wilcoxon rank sum test, where appropriate. Odds ratios (ORs) were calculated with 95% confidence intervals (CIs). We used STATA 9 statistical software (StataCorp, College Station, TX, USA).

### Results

The sample population consisted of 493 men and 507 women. Of those, 727 subjects responded. Seven of the returned questionnaires were excluded because they were received after the response deadline. Two respondents were excluded due to missing data. Thus, the final study population (ie, the responders) consisted of 718 subjects, which corresponds to a 72% response rate.

Table 1 shows characteristics of the responders and non-responders. These two groups were comparable with respect to sex and age, but fewer of those living alone responded (OR=0.38 [95% CI: 0.28–0.52]).

Table 2 shows the demographic, social, anthropometric, and self-assessed general health characteristics, in participants with and without self-reported hypertension. A total of 307 participants (43%) reported having hypertension, and 411 (57%) reported not having hypertension. Those with self-reported hypertension were more often men, were older, were overweight or obese, and had a lower educational level. Those with self-reported hypertension more often had a family history of hypertension, increased cholesterol levels, and a lower self-estimated general health condition than did those with no self-reported hypertension.

**Table 1** Characteristics of the responders and nonresponders

	Responders N (%)	Nonresponders N (%)	Odds ratio (95% CI)	P-value
Sex				0.57
Men	358 (50.6)	135 (47.9)	Reference	
Women	360 (49.4)	147 (52.1)	0.92 (0.69–1.23)	
Age (mean $\pm$ SD)	66.6 $\pm$ 4.2	66.7 $\pm$ 4.2		0.735
Men	66.6 $\pm$ 4.2	66.8 $\pm$ 4.3		0.640
Women	66.6 $\pm$ 4.1	66.7 $\pm$ 4.2		0.580
Civil status				<0.001
Living with a partner	575 (80.1)	171 (60.6)	Reference	
Living alone	143 (19.9)	111 (39.4)	0.38 (0.28–0.52)	
Men				<0.001
Living with a partner	312 (87.2)	97 (71.9)	Reference	
Living alone	46 (12.8)	38 (28.1)	0.38 (0.23–0.63)	
Women				<0.001
Living with a partner	263 (73.1)	74 (50.3)	Reference	
Living alone	97 (26.9)	73 (49.7)	0.37 (0.25–0.57)	

**Abbreviations:** CI, confidence interval; SD, standard deviation.

**Table 2** Demographic, social, anthropometric, and self-assessed general health characteristics in subjects with and without self-reported hypertension

Variable	Self-reported hypertension Mean $\pm$ SD/N (%)	No self-reported hypertension Mean $\pm$ SD/N (%)	Odds ratio (95% CI)	P-value
Number	307 (42.8)	411 (57.2)		
Age	66.9 $\pm$ 4.3	65.6 $\pm$ 4.0		<0.001
Sex				0.072
Men	165 (53.8)	193 (47.0)	Reference	
Women	142 (46.2)	218 (53.0)	0.76 (0.57–1.02)	
Civil status				0.686
Living with a partner	248 (80.8)	327 (79.6)	Reference	
Living alone	59 (19.2)	84 (20.4)	0.93 (0.64–1.34)	
Children				0.642
Yes	277 (90.2)	375 (91.2)	Reference	
No	30 (9.8)	36 (8.8)	1.13 (0.68–1.88)	
Education				0.005
Higher education, more than 4 years	13 (4.2)	26 (6.3)		
Higher education, 3–4 years	53 (17.2)	89 (21.6)		
Higher education, less than 3 years	29 (9.5)	52 (12.7)		
Skilled training	132 (43.0)	161 (39.2)		
Basic schooling + short supplement	29 (9.5)	39 (9.5)		
Basic schooling	51 (16.6)	44 (10.7)		
Height (cm)	171.3 $\pm$ 7.9	171.0 $\pm$ 8.5		0.671
Weight (kg)	79.3 $\pm$ 15.2	73.2 $\pm$ 13.6		<0.001
BMI (kg m <sup>2</sup> )	27.0 $\pm$ 4.6	24.9 $\pm$ 3.9		<0.001
Self-reported high cholesterol level				<0.001
No	111 (36.1)	195 (47.4)	Reference	
Yes	170 (55.4)	133 (32.4)	2.25 (1.62–3.11)	
Do not know	26 (8.5)	83 (20.2)	0.55 (0.33–0.91)	
Self-reported family history of hypertension				<0.001
No	26 (8.5)	124 (30.2)	Reference	
Yes	130 (42.3)	109 (26.5)	5.69 (3.47–9.32)	
Do not know	151 (49.2)	178 (43.3)	4.05 (2.52–6.51)	
Self-reported general health condition				<0.001
Excellent	18 (5.9)	53 (12.9)		
Good	149 (48.5)	238 (57.9)		
Fair	123 (40.1)	103 (25.1)		
Bad	14 (4.5)	14 (3.4)		
Very bad	3 (1.0)	3 (0.7)		

**Abbreviations:** CI, confidence interval; SD, standard deviation; BMI, body mass index.

In general, knowledge about the lifestyle factors that may influence blood pressure was good, irrespective of the self-reported hypertension status (Table 3). More than 80% of the respondents reported that blood pressure is influenced by stress and obesity.

Table 3 shows the knowledge about hypertension symptoms, according to the self-reported hypertension status. In general, the knowledge about hypertension symptoms was sparse. For example, less than one-third reported that hypertension may not cause symptoms, and a minority knew that hypertension may cause nosebleeds. There were no systematic differences between the groups, although more people with self-reported hypertension knew that hypertension may not cause symptoms, and more people without self-reported hypertension knew that hypertension may cause headache and palpitations.

The knowledge about complications related to hypertension was good, irrespective of the self-reported hypertension status (Table 4). Eight out of ten subjects reported that hypertension may cause stroke.

Table 5 shows the data on the awareness of blood pressure and blood pressure control, according to the self-reported blood pressure status. A total of 81% of those with self-reported hypertension reported that they knew their blood pressure value, while 55% of those without self-reported hypertension knew their blood pressure (OR=3.51 [95% CI: 2.46–5.04]). More subjects with self-reported hypertension planned to have their blood pressure measured within one year (OR=5.0 [95% CI: 2.47–10.0]).

## Discussion

### Comparison with prior literature

Our finding of an association between age, weight, self-reported cholesterol level, a family history of hypertension, education level, and self-reported hypertension is in concordance with previous findings.<sup>22–24</sup> In comparison with our study, a survey in the USA among people older than 65 years found a similar knowledge about the lifestyle factors that may influence blood pressure but a higher prevalence of knowledge about the complications of untreated high blood pressure.<sup>25</sup> A survey in Canada among people older than 40 years found a limited knowledge of the lifestyle issues affecting hypertension and a poor understanding of the consequences of high blood pressure or hypertension. The Canadian study also showed that two-thirds of the respondents thought hypertension had clearly identifiable signs or symptoms.<sup>26</sup> We found that only 20% knew that hypertension can occur without symptoms, which is in line with the results of a study from Austria, among a sample aged 15 years and older.<sup>27</sup>

It was not surprising that people with self-reported hypertension had better blood pressure-related knowledge because they are assumed to have blood pressure measured more frequently and to have more frequent contact with health care services. On the other hand they did not have more knowledge regarding lifestyle influences on blood pressure than those without self-reported hypertension. This finding could be explained by the fact that hypertensive patients were older and less educated. This accords with the Euroaspire III

**Table 3** Knowledge about factors that may influence blood pressure and knowledge about symptoms of hypertension, according to self-reported hypertension status

	Self-reported hypertension		No self-reported hypertension		Odds ratio (95% CI)
	Yes	No	Yes	No	
	N (%)	N (%)	N (%)	N (%)	
Do you think your blood pressure is affected either positively or negatively by?					
Alcohol	173 (56.4)	134 (43.6)	233 (56.7)	178 (43.3)	0.98 (0.72–1.34)
Smoking	216 (70.4)	91 (29.6)	311 (75.7)	100 (24.3)	0.76 (0.54–1.08)
Exercise	173 (56.4)	134 (43.6)	240 (58.4)	171 (41.6)	0.91 (0.67–1.25)
Obesity	256 (83.4)	51 (16.6)	352 (85.6)	59 (14.4)	0.84 (0.55–1.29)
Stress	249 (81.1)	58 (18.9)	334 (81.3)	77 (18.7)	0.99 (0.67–1.47)
Other	6 (1.9)	301 (98.1)	6 (1.5)	405 (98.5)	1.35 (0.36–5.08)
What kinds of symptoms are seen in high blood pressure?					
None	92 (30.0)	215 (70.0)	87 (21.2)	324 (78.8)	1.59 (1.12–2.27)
Headache	156 (50.8)	151 (49.2)	257 (62.5)	154 (37.5)	0.62 (0.45–0.85)
Nosebleeds	68 (22.1)	239 (77.9)	95 (23.1)	316 (76.9)	0.95 (0.65–1.37)
Palpitations	121 (39.4)	186 (60.6)	207 (50.4)	204 (49.6)	0.64 (0.47–0.87)
Shortness of breath	101 (32.9)	206 (67.1)	154 (37.5)	257 (62.5)	0.82 (0.59–1.29)
Other	11 (3.5)	296 (96.5)	6 (1.5)	405 (98.5)	2.51 (0.84–8.34)

**Abbreviation:** CI, confidence interval.

**Table 4** Knowledge of hypertension complications, according to self-reported hypertension status

	Self-reported hypertension		No self-reported hypertension		Odds ratio (95% CI)
	Yes N (%)	No N (%)	Yes N (%)	No N (%)	
Can high blood pressure cause?					
Heart disease*	212 (69.1)	95 (30.9)	256 (62.3)	155 (37.7)	1.35 (0.97–1.87)
Cancer	2 (0.7)	305 (99.3)	1 (0.2)	10 (99.8)	
Myocardial infarction*	252 (82.1)	55 (17.9)	327 (79.6)	84 (20.4)	1.78 (0.79–1.75)
Osteoarthritis	9 (2.9)	298 (97.1)	3 (0.7)	408 (99.3)	
Diabetes	52 (16.9)	255 (83.1)	57 (13.9)	354 (86.1)	
Atherosclerosis*	126 (41.0)	181 (59.0)	162 (39.4)	249 (60.6)	1.07 (0.78–1.45)
Renal disease*	51 (16.6)	256 (83.4)	51 (12.4)	360 (87.6)	1.41 (0.90–2.18)
Stroke*	237 (77.2)	70 (22.8)	332 (80.8)	79 (19.2)	0.80 (0.55–1.18)
Pulmonary disease	9 (2.9)	298 (97.1)	15 (3.6)	396 (96.4)	
Allergy	1 (0.3)	306 (99.7)	3 (0.7)	408 (99.3)	
Impaired vision*	88 (28.7)	219 (71.3)	107 (26.0)	304 (74.0)	1.10 (0.81–1.61)
Thyrototoxicosis	18 (5.9)	289 (94.1)	35 (8.5)	376 (91.5)	
Liver disease	12 (3.9)	295 (96.1)	9 (2.2)	402 (97.8)	

**Note:** \*Complication of hypertension.

**Abbreviation:** CI, confidence interval.

survey, which documented that patients with coronary heart disease and obesity, diabetes, or dyslipidemia need better management and control of their hypertension.<sup>28</sup>

## Strengths and weaknesses

The study sample was drawn randomly and restricted to elderly people, a population with a high prevalence of hypertension. The response rate was good, making the risk of nongeneralizability of study results low. Our study findings may well be extended to the general Danish population because the population of the municipality of Silkeborg shares income and employment rate characteristics with the general Danish population. The study is unique because it was specifically designed for a population with a high prevalence of hypertension, in contrast to other studies that were aimed at the general public.<sup>2,3,5,7,26,27</sup> The multiple choice questionnaire was adjusted after a pilot study. Only a few questionnaires had missing data.

Among those who did not respond, the majority of people were living alone. It may be that the lack of support from a partner contributed to nonresponse. Less knowledge of the subject may also be a reason why almost 28% did not answer

the questionnaire. It was not possible to examine for potential selection bias by education and income levels. However, it is well known that participation rates are lower among deprived people.<sup>29</sup> We consider it very likely that those with self-reported hypertension did indeed have hypertension. In cases of self-reported hypertension, part of the questionnaire would have been impossible to fill out if there was no use of antihypertensive drugs or contact with the health care system.

Some of the participants without self-reported hypertension may have had hypertension.

In this age group it is likely that about 40%–50% of those who are unaware of their blood pressure do have high blood pressure.<sup>2,3,5–7</sup> Studies that use self-reported hypertension underestimate the true prevalence of hypertension.<sup>30,31</sup> We did not include questions on the effect of salt on blood pressure because a reduction in population intake of salt primarily is a public health issue that involves governments, regulatory authorities and the food industry.<sup>32</sup>

The diagnosis and management of hypertension can be improved by opportunistic screening for hypertension, together

**Table 5** Awareness of own blood pressure and blood pressure control, according to self-reported blood pressure status

		Self-reported hypertension		No self-reported hypertension	Odds ratio (95% CI)
		N (%)		N (%)	
Do you know the result of your latest blood pressure measurement?	No	59 (19.2)	No	187 (45.5)	Reference
	Yes	248 (80.8)	Yes	224 (54.5)	3.51 (2.46–5.04)
Do you plan to have your blood pressure measured within the next year?	No	10 (3.3)	No	49 (11.9)	Reference
	Yes	287 (93.5)	Yes	283 (68.9)	5.00 (2.47–10.0)
	Do not know	10 (3.3)	Do not know	79 (19.2)	0.62 (0.24–1.60)

**Abbreviation:** CI, confidence interval.



with complex interventions in the health care system to support health care for those with hypertension. In that respect nurse-led clinics have been recommended in the management of hypertension<sup>33</sup> and promising results have been reported.<sup>34</sup>

Finally, the multiple choice format of the questionnaire is likely to cause “false positive” responses. This may have caused us to overestimate the knowledge about hypertension.

## Future research

Much more knowledge about the efficacy of patient-education strategies need to be gained to improve general knowledge, behavior, lifestyle and hopefully prognosis related to hypertension.

## Conclusion

The knowledge about blood pressure and hypertension was reasonable in general. However, nearly half of the study population without self-reported hypertension was unaware of their blood pressure, and 80% of the respondents did not know that hypertension can occur without symptoms. There is still room for improvement in elderly people's knowledge and awareness about blood pressure.

## Acknowledgments

We thank Leif Spange Mortensen, MSc, of the UNI-C, The Danish Information Technology Centre for Education and Research, Aarhus, Denmark, for helpful comments in relation to the statistical analyses.

The study was supported in part, by a grant from the Research Foundation at Silkeborg Hospital.

## Disclosure

The authors report no conflicts of interest in this work.

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