SOCIOECONOMIC STATUS AND PSYCHOLOGICAL FACTORS IN PATIENTS WITH ESSENTIAL HYPERTENSION

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Abstract

Systemic hypertension is a common disease in the population and is one of the most important risk factors whose prevalence reaches 28% in U.S.A, 44% in Europe, so that in 2025, it is estimated that hypertensive persons will reach 1.56 billion worldwide. In our country, the overall prevalence was 44.92%, mainly higher in males (50.17%) than females (41.11%). We conducted an assessment of social and psychological factors in association with medical and biological routine quantification in a group of 80 hypertensives newly diagnosed, compared with a control group. Questionnaires were for studying the marital status, education level, quantifying the number of working hours per day, the level of physical training and professional socio-familial stress, smoking, alcohol consumption, after which patients were tested to assess the psychometric anxiety and depression using the Hamilton Rating Scale for depression and the Hamilton Anxiety Rating Scale. The results may support an increased risk of hypertension in individuals who are undergoing to social and family stress, working over 10 hours/day and who record mild or moderate levels of anxiety and depression at evaluation tests. These data support the implementation of complex programs to decrease the risk of hypertension by working professionals in the medical, social and psychological fields of expertise.

Keywords: systemic hypertension; socioeconomic status; psychological factors; anxiety; smoking; depression.

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Introduction

Systemic hypertension is a pathological condition common in the population and is one of the most important risk factors that contribute to the occurrence of redoubtable cardiovascular complications: stroke, myocardial infarction, sudden death, heart failure, peripheral artery disease and chronic kidney disease. Considering the pathological values of over 140/90 mmHg (Mancia *et al.*, 2013), hypertension prevalence reaches 28% in U.S.A., 44% in Europe, so that in 2025, it is estimated to be 1.56 trillion worldwide hypertensive people (Endres, Heuschmann, Laufs, & Hakim, 2011). In our country, the overall prevalence was of 44.92%, mainly higher in males (50.17%) than females (41.11%), especially until the age of 55, due to protective hormone influences in women. Data belong to SEPHAR study have reported significant differences in prevalence between urban (41.58%) and rural (49.47%, p < 0.02) environment, indicating the possible influence of social and economic factors on the development of this pathological conditions in our country (Dorobantu, Darabont, Bădilă, & Ghiorghe, 2010).

The literature has documented that cardiovascular disease in general and hypertension in particular, have a socioeconomic and psycho-social component. In most populations, hypertension is more common in disadvantaged stratum of society, in people with low income and low educational level, where smoking is common and concerns for diet, exercise, relaxation, are sporadic and contribute to cluster components of metabolic syndrome, focused on hypertension, obesity and insulin resistance (Kaplan & Keil, 1993; Chandola, Brunner, & Marmot, 2006).

Most large epidemiological studies (Scottish Heart Health Study, WHO MONICA project) have documented not only an increased prevalence of hypertension and a lack of screening, treatment, and control that respects the rule of "halves" (half of patients with hypertension are diagnosed, among these only half are treated and of those treated, only half had effective control of blood pressure). Epidemiological studies are based on standardized measurements (usually two successive measurements at a single medical visit) but these are usually insufficient. Within the MONICA program, it was estimated that the shortage of measurements could lead to an overestimation of the prevalence of hypertension, and also an underestimation of the number of treated hypertensives who have a good control of blood pressure (Chen, Tunsdall-Pedoe, Morrison, Connaghan, & A'Brook, 2003). However, epidemiological surveillance MONICA or USA National Health and Nutrition Examination Survey (NHANES) programs confirmed a better detection and treatment of hypertension in recent decades due to the development of new therapeutic classes and the creation of social and medical education programs. A meta-analysis of 24 studies predicted that the 'halves' will no longer be valid in the future in developed countries, but only in developing countries (Marques-Vidal & Tuomilehto, 1997).

Social factors have an impact on the prevalence and mode of treatment or the risk of hypertensive complications. The authors reported positive and negative results about the impact of social factors. Lang and colleagues have published data supporting a better control of hypertension in people with higher educational and socioeconomic level, while Chen *et al*. argue that people with better educational level is often based on their own opinions, listen and make decisions without expert advice. In general, full time employed persons, with a fully daily program were insufficiently detected with hypertension due to sporadic medical controls. Among employees, medium aged females have addressed the doctor more frequently and received an earlier diagnosis (Chen *et al*., 2003; Lang, Pariente, Salem, & Tap, 1988).

The impact of social factors is explained by several pathogenic components that contribute to the onset and perpetuation of hypertension and emphasize the potential role of social work in addition with other specialized care systems. In addition to low interest of healthy eating, combating sedentary lifestyle and smoking were studies that said the job strain is especially important for males. In men, socio-occupational stress was associated with excessive activation of the sympathetic nervous system. Some stressors can act in the mother during the gestational period, and will have adverse effects on the fetus. Women with pregnancy hypertension, subjected to a stress during gestation had births with a poor fetal growth pattern, which subsequently had an exaggerated postnatal increase obesity, developed early obesity and type 2 diabetes mellitus. (Nilsson, 2009; Nilsson, Nilsson, Östergren, & Rasmussen, 2004).

According to recent studies, social factors are closely related to some psychological factors, especially anxiety and depression. However, the relationship between depression, anxiety, anger or panic attacks and the risk of hypertension are quite controversial. In 2010, Delaney J *et al*. perform the MESA (Multi-Ethnic Study of Atherosclerosis) study, which has discordant results from older studies. The study population consisted of 6814 adults belonging to 4 different ethnic groups. A slight association between the presence of depressive symptoms at baseline and subsequent increases in blood pressure has been reported, without any relationship with ethnic groups or sex of patients. Influence on depression symptoms was more important to systolic than diastolic blood pressure (Delaney, Oddson, Kramer, Shea, Psaty, & McClelland, 2010). Compared with this study, other results were previously published, in which the manifestations of depression were correlated with blood pressure values. Some differences can be explained also by the type of antidepressant medications used to treat patients, knowing that, for example, tricyclic antidepressants may have the side effect of increasing blood pressure. Other differences may arise from the type of questionnaire used to assess depression. In the study published by Delaney and colleagues, the score obtained by applying CES-D (Center for Epidemiological Studies Depression Scale) was also used in other researches applying scales such as: General Well-

being Schedule (GWB-D), the Diagnostic Interview Schedule (DIS), or the Composite International Diagnostic Interview Short Form (CIDI-SF). In psychiatry, depression is one of the pathological elements subjected to several studies and psychometric scales (Demyttenaere & De Fruyt, 2003). In our country we used several scales, the most popular being the Hamilton Depression Rating Scale - HDRS, introduced in 1960 by Hamilton, Montgomery-Asberg Depression Rating Scale – MADRS and the Beck's depression Inventory - BDI. Hamilton Rating Scale was significantly used in clinical trials because it is easily applied and developed in parallel with a Hamilton Anxiety Rating Scale - HARS, which allowed assessment of dissociative and time tracking features of depression and anxiety of patients studied (Hamilton, 1960; Maier, Buller, Philipp, & Heuser, 1988).

Anxiety is the second psychopathological symptom which was very much related to cardiovascular diseases, particularly hypertension and ischemic heart disease in a bisensual approach. In cardiology there are emergency situations (angina pectoris, myocardial infarction, hypertensive crisis) in which the alteration of hemodynamic parameters is so large that triggers catecholamines releasing that contribute to the occurrence of severe states of anxiety in the patient concerned. On the other hand, prolonged anxiety may occur in some patients under stressful situations encountered in social and professional lives, increases the risk of hypertension or ischemic heart disease at younger ages and with a reserved prognosis. Given the highly variable and psychosocial features in Romania in the last decades, we have proposed a prospective analysis of social and psychological factors, in a group of newly diagnosed hypertensives, compared with the control population.

Method

Participants

The study included 80 patients, over 18 years, with newly diagnosed systemic hypertension (at the first visit in ambulatory, blood pressure had values above 140/90 mmHg on at least two measurements), in parallel with a control group consisting of 69 subjects, comparable from the age and sex point of view. The patients signed informed consent to participate in the study and information resulting from specific questionnaires, medical history and clinical examination were used respecting the principle of confidentiality. Patients previously diagnosed and treated for hypertension, or chronic patients diagnosed with previous psychiatric disorders or other chronic diseases were excluded from the study.

Materials and Procedure

Medical evaluation. Initially, patients underwent a complete medical history and physical examination, highlighting the personal and family history, current symptoms; height and weight were measured and we calculated body mass index (BMI, kg/m^2) and abdominal circumference (AC) to assess nutritional status. For each patient, the systolic and diastolic blood pressure were measured while seated using an aneroid sphygmomanometer (ERKA, Germany) and heart rate was determined while resting (Hellige electrocardiograph registered, Germany). The next morning, blood was collected, fasting, for determining some biological parameters: glucose, total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides.

Evaluation of socio-economic variables. Socio-economic status could be assessed by conducting a questionnaire which sought to record more data: age, sex, marital status (married, single, divorced), education level, quantifying the number of working hours per day (an increased risk was considered in patients who work more than 10 h/day), level of physical training and professional and socio-familial stress, smoking status (current, ex-smoker, never), alcohol consumption (risk level is considered to over 20 g pure alcohol/day).

Psychological evaluation. Psychometric tests used Hamilton Depression Rating Scale (Hamilton, 1960b) and Hamilton Anxiety Rating Scale (Maier *et al.*, 1988b). In our study, we used the Hamilton Rating Scale for depression monitoring consisting of 17 items quoted at 0- 4, with which we could evaluate different aspects such as the states of depression and feelings of guilt, suicidal tendencies, insomnia, agitation, inhibition and somatic symptoms, hypochondriac, self-criticism, weight variations. Scores below 7 are considered normal, between 8 to 13 mild depressions, 14-18 moderate depression, 19-22 severe depression and more than 23 very severe depressions.

Hamilton anxiety rating scale is similar, can be performed in about 15-20 minutes, includes 14 items scored from 0-4, studying the anxiety, fear, insomnia, cognitive and organic symptoms. Between 0-17 the score is normally, between 18 to 25 mild anxiety, 26 -30 represents a moderate anxiety and between 31-56 severe anxiety. For each patient, were calculated the scores of depression and anxiety at entry into the study.

Data analysis

The data were processed using SPSS 14.0 for Windows (SPSS Inc., Chicago, IL). The descriptive statistics parameters for the two groups (cases and controls) were determined for all the variables included, using mean values ± standard deviation, frequency tables and cross-tabulation method. The significance of differences between groups was tested using t-Student test for all parametric

variables, which respected the normal distribution law and Mann–Whitney U test in the case of nonparametric variables. Statistical significance was considered at $p < .05$.

In order to test the association between ordinal variables (Hamilton scales) and the items of the applied questionnaire we used Chi-square test, through a crosstab dialog box, with nominal variables encoded in a binary form.

Results

We analyzed in terms of medical, social and anxiety and depression levels, 80 patients with newly diagnosed hypertension, compared with 69 control subjects. Descriptive analysis of the data indicated that patients in the two groups had comparable average ages ($51.22 \pm 4,083$ years versus 52.60 ± 4.610 years, $p = .054$), but there were statistically significant differences for anthropometric parameters (height, weight, BMI and AC), which had higher mean values in patients with hypertension. It is noted that the presence of overweight and obesity is more common in hypertensive persons who have especially abdominal obesity and low height, falling more frequently *picnic* physique of fat. Also, among the biological studied parameters, fasting blood glucose and serum triglycerides were higher in hypertensive, and HDL-cholesterol, with vascular protective effect, was significantly lower. Mean values and statistical significance for anthropometric parameters, systolic and diastolic blood pressure and biological constants are shown in *Table 1*.

The data studied has shown that abdominal obesity, atherogenic dyslipidemia and hyperglycemia, known components of the metabolic syndrome have accompanied in different proportions, the elevated blood pressure values, increasing the total cardiovascular risk.

Table 1. *Antropometric parameters, biologic values, systolic and diastolic pressure*

Studied variables	Cases (n=80) (mean±SD)	Controls (n=69) (mean±SD)	P value
Weight (kg)	75.91±14.37	68.28±11.00	**.000**
Size (m)	1.62±0.09	1.66±0.08	**.006**
Body mass index (kg/m^2)	28.53±5.08	24.51±2.50	.000
Abdominal circumference (cm)	94.41±11.45	84.61±8.65	**.000**
Patient age (years)	52.60±4.61	51.22±4.08	.054
Heart rate (b/ min)	75.34±13.67	73.20±11.95	.311
Diastolic BP (mmHg)	92.28±8.11	73.84±6.97	**.000**
Systolic BP (mmHg)	176.49±19.49	120.43±9.14	**.000**
Total cholesterol (mg /dl)	202.71±35.226	211.33±67.59	.321
Fasting glucose (mg /dl)	92.40±11.47	86.33±10.42	**.001**
HDL-cholesterol (mg /dl)	46.30±9.95	49.94±11.60	**.043**
LDL-cholesterol (mg /dl)	128.31±29.94	137.72±63.37	.239
Triglycerides (mg /dl)	140.48±80.80	118.35±57.08	.053

Analysis has indicated significant influence of social factors on the status of hypertension. One can see significant proportion of married and divorced persons in the category of patients with hypertension, for both sexes, while unmarried subjects seem protected in terms of developing hypertension; their percentage is very low in both sexes. In the group of patients with hypertension, 52.3% of women and 52.8% of men were married and 40.9% of women and 38.9% of men were divorced (*Table 2*).

Table 2. *Gender and marital status distribution of cases*

Sex patient				Hypertension presence		Total
				0	1	
F	Marital status	m	Count	26	23	49
			% within Hypertension	72,2%	52,3%	61,3%
		d	Count	4	18	22
			% within Hypertension	11,1%	40,9%	27,5%
		u	Count	6	3	9
			% within Hypertension	16,7%	6,8%	11,3%
	Total		Count	36	44	80
			% within Hypertension	100,0%	100,0%	100,0%
M	Marital status	m	Count	26	19	45
			% within Hypertension	78,8%	52,8%	65,2%
		d	Count	1	14	15
			% within Hypertension	3%	38,9%	21,7%
		u	Count	6	3	9
			% within Hypertension	18,2%	8,3%	13%
	Total		Count	33	36	69
			% within Hypertension	100,0%	100,0%	100,0%

Studying the lifestyle and mark of some social factors on the development of hypertension risk, we classified these factors in terms of protection or the potential risk. Figure 1 summarizes the effect of potentially harmful factors. It is noted that the impact of social factors is particularly important for the onset of systemic hypertension: in our study, the importance of factors such as socio-family and professional stress, prolonged work time of over 10 hours/day, sedentary lifestyle was higher than even some harmful well known factors, such as tobacco and alcohol medium consumption of 20 g/day. This underlines the necessity of a comprehensive approach at global, socio-psychological and medical level of public health issues of paramount importance to modern society as hypertension.
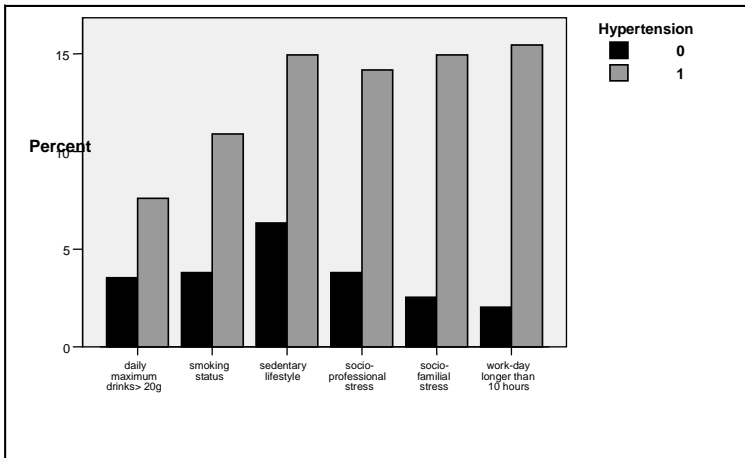
Figure 1. *Social and lifestyle harmful factors in patients with and without hypertension*

At the same time, a positive effect was the concern for healthy eating and health in general (adherence to health issues and articles devoted to health programs and regular health checks), especially among women (*Figure 2*).
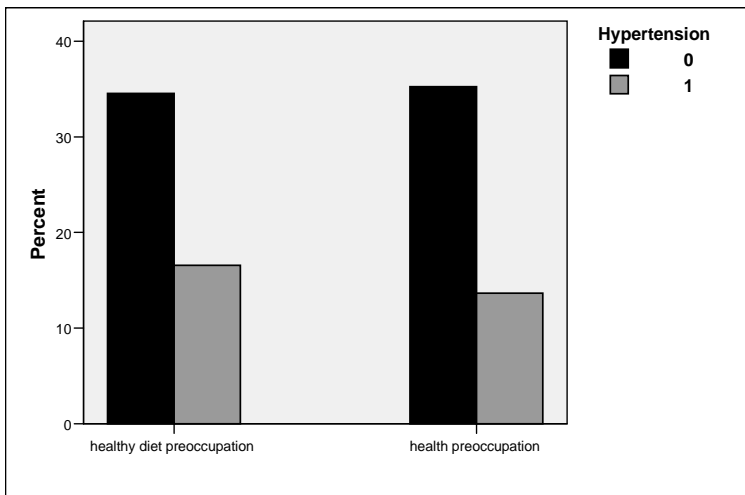

Figure 2. *Protective factors in patients with and without hypertension*

There were highly statistically significant differences between case-control groups regarding the scores obtained on the Hamilton Rating Scale for Anxiety (Z = -10.024, *p* = .000) and Hamilton Rating Scale for Depression (Z = -10.004, *p* =

.000) - Mann Whitney test. There is a slight preponderance, not statistically significant, of the mild and moderate forms of anxiety and depression in women. *Tables 3* and *4* present the distribution of patients according to sex and degrees of severity obtained in HAS and HDS scores.

Table 3. *Distribution of studied patients according to gender and score on HAS*

		Sex	Hypertension	
			Yes (n=80)	No (n=69)
Hamilton Anxiety Scale	**0-17**	F	11	36
		M	5	33
	18-25	F	17	0
		M	14	0
	26-30	F	11	0
		M	10	0
	31-56	F	5	0
		M	7	0

Table 4. *Distribution of studied patients according to gender and score on HDS*

		Sex	Hypertension	
			Yes (n=80)	**No (n=69)**
Hamilton Depression Scale	**0-7**	F	2	29
		M	2	24
	8-13	F	14	7
		M	6	9
	14-18	F	12	0
		M	13	0
	19-22	F	10	0
		M	7	0
	23-50	F	6	0
		M	8	0

Both in terms of HAS and HDS, there is an aggregation of cases in the lower scores in patients from the control group for both sexes, which suggests an early stage of anxiety or depression in non-hypertensive persons, while the high blood pressure predisposes most patients to moderately-severe forms of the disease. It is also noteworthy that patients with very severe forms of neuropsychological impairment are relatively few, probably due to their preferential hospitalization in psychiatric clinics. We tested if there is a relationship between HAS and HDS scores and the questioned items of our questionnaire/the nominal studied variables, using the Chi-square test, which can be obtained through the crosstabs dialog boxes, the significance of these associations being summarized in *Table 5* for all the patients included in our study.

Table 5. *Associations between studied variables and score on HAS or HDS*

Variable	Pearson Chi-Square Value (*p*)	
	Hamilton Anxiety Scale Score	**Hamilton Depression Scale Score**
Concern for health	46.031 (*p* = .023)	57.699 (***p* = .000**)
Concern for diet	47.690 (*p* = .016)	39.860 (*p* = .012)
Sedentariness	46.534 (*p* = .021)	38.864 (*p* = .021)
Professional stress	53.859 (*p* = .003)	47.748 (*p* = .002)
Social and familial stress	65.099 (***p* = .000**)	66.018 (***p* = .000**)
While working over 10 hours/day	67.869 (***p* = .000**)	69.211 (***p* = .000**)
Marital status	72.415 (*p* = .096)	72.699 (*p* = .007)
Sex	40.083 (*p* = .083)	19.397 (*p* = .678)
Alcohol ingestion min. 20g/zi	55.878 (*p* = .002)	19.304 (p = .683)
Smoking	60.827 (***p* = .000**)	36.551 (*p* = .036)
The presence of hypertension	123.145 (***p* = .000**)	117.940 (***p* = .000**)

Discussions

Our study provides results justified on socio-psychological comorbidity of hypertensive patients in a representative community of our country, in line with contemporary trends. More and more epidemiological studies draw attention to the pandemic size of cardio-metabolic diseases, especially of high blood pressure. Ever-increasing prevalence was explained by an aging population, the increase of smoking and chronic alcohol consumption, the changes produced in the hormonal regulatory systems under stress and unhealthy food but social factors were not always highlighted enough. Some studies have referred, lately, to two important social aspects: education level and monthly or annual income. In general, persons with a monthly income and a lower educational level had a higher probability of cumulative risk of hypertension and diabetes (Min, Chang, & Balkrishnan, 2010; Vrijkotte, van Doornen, & de Geus, 2000; Pieper, Warren, & Pickering, 1993).

After classification of the factors contributing to harmful and protective factors, we observed that a strong negative impact was the prolonged working hours of over 10 h/day and perception of a high level of stress, both in the family and in the professional life. Since MONICA surveillance program, which was initiated before 1990, it was stated that, regarding working hours, full-time employees and overtime have increased risk of developing late-diagnosed hypertension (Chen *et al*., 2003). The prevalence of hypertension was relatively equal between the sexes, explained by the average age that exceeded 50 years, age at which most women are in menopause and their cardiovascular risk increases, equalizes and sometimes exceeds that of males. This menopause phenomenon has important medical, psychological and social connotations. A large percentage of women are subject

to greater social and family pressure and hormonal changes predispose to depression, anxiety, sleep disorders. One of the studies that examined the risk of hypertension in women at menopause notes that after a multivariate analysis, the age of menopause, BMI and familial risk of hypertension were the strongest predictors of blood pressure (Räikkönen, Matthews, & Kuller, 2001).

Among the studied parameters, patients' gender was the only one uncorrelated with any of the Hamilton scales; also no significant association was revealed between alcohol consumption, HDS and marital status of subjects, nor between the marital status of the subjects and the HAS score. Otherwise, all items included in our survey were correlated with assessment scores on both Hamilton scales. Regarding assessment of anxiety, the most significant items were those related to social and family stress, working time more than 10 hours/day, smoking and the presence of hypertension and for investigating depression - concern for health, social and family stress, work time of more than 10 hours/day and the presence of hypertension. It is worth noting that hypertension has a strong statistically significant relationship with both the Hamilton depression scale and with the anxiety scale, highlighting the role of the two major neuropsychiatry disturbances in broader clinical cardiovascular diseases. Hence, results the utility of psychological assessment and counseling of hypertensive patient, for the most efficient management of the disease beyond medical pharmacological intervention. Also, reassessment and improvement of working daily time, shortening its period and by ensuring a protective family microclimate could be additional effective measures in reducing the impact of hypertension on quality of life.

The Whitehall II Prospective Cohort Study brings important data because it provides a long follow-up of 24 years, between 1985 and 2009, of a total number of 6 889 men and 3 413 women who were aged between 35 and 55 years at study entry. Patients were regularly monitored for the emergence of depressive episodes using the General Health Questionnaire-Depression subscale, and blood pressure values. Longitudinal analysis adjusted for socio-demographic characteristics, indicated that patients who could be included in the group "increasing depression" had a significantly higher risk of hypertension at the end of the follow-up, compared with patients in the low/transient group (Marmot & Brunner, 2005).

Conclusions

In summary, the present research provides a link between social factors and scores of depression and anxiety in patients with hypertension detected in our region. Patients who were classified into mild and moderate degrees of anxiety and depression had increased tension values and presented social and family risk factors. These results suggest the usefulness of comprehensive health blood pressure management programs in population, which represents a major public health problem. Depending on preliminary assessments performed by the general practitioner or specialist cardiologist, some patients should be included in regular assessment programs of anxiety and depression detection and improved of some harmful social factors, in collaboration with specialist sociologists and psychologists. The advantages of this study relate to a better track for a long time, which identifies the periods of depression and may correlate with the occurrence of hypertension. In addition, the study highlights the importance of psychosocial distress on the occurrence of prolonged cardiovascular consequences, as we highlighted in our patients study.

References

Chandola, T., Brunner, E., & Marmot, M. (2006). Chronic stress at work and the metabolic syndrome: prospective study. *BMJ*, 332, 521–525.

Chen, R., Tunsdall-Pedoe, H., Morrison, C., Connaghan, J., & A'Brook, R. (2003). Trends and social factors in blood pressure control in Scottish MONICA surveys 1986–1995: the rule of halves revisited. *J Hum Hypertens*, 17, 751-759. doi:10.1038/sj.jhh.1001612

Delaney, J., Oddson, B.E., Kramer, H., Shea, S., Psaty, B.M., & McClelland, R.L. (2010). Baseline depressive symptoms are not associated with clinically important levels of incident hypertension during two years of follow-up: The Multi-Ethnic Study of Atherosclerosis. *Hypertension*, 55, 408-414. doi:10.1161/HYPERTENSIONAHA.109.139824

Demyttenaere, K., & De Fruyt, J. (2003). Getting what you ask for: on the selectivity of depression rating scales. *Psychother Psychosom*, 72(2), 61-70.

Dorobanțu, M., Darabont, R.O., Bădilă, E., & Ghiorghe, S. (2010). Prevalence, awareness, treatment, and control of hypertension in Romania: results of the SEPHAR Study. *Int J Hypertens*, 1-6. doi:10.4061/2010/970694

Endres, M., Heuschmann, P.U., Laufs, U., & Hakim, A.M. (2011). Primary prevention of stroke: blood pressure, lipids and heart failure. *Eur Heart J*, 32, 545-555. doi: 10.1093/eurheartj/ehq472

Hamilton, M. (1960). A rating scale for depression. *J Neurol Neurosurg Psychiatry*, 23, 56-62.

Kaplan, G.A, & Keil, J.E. (1993). Socio-economic factors and cardiovascular disease: a review of the literature. *Circulation*, 88, 1973–1998.

Lang, T., Pariente, P., Salem, G., & Tap, D. (1988). Social, professional conditions and arterial hypertension: an epidemiological study in Dakar, Senegal. *J Hypertens*, 6, 271–276.

Maier, W., Buller, R., Philipp, M., & Heuser, I. (1988). The Hamilton Anxiety Scale: reliability, validity and sensitivity to change in anxiety and depressive disorders. *J Affect Disord*, 14, 61–68.

Mancia, G., Fagard, R., Narkiewicz, K., Redon, J., Zanchetti, A., Böhm, M., Zannad, F. (2013). 2013 ESH/ESC Guidelines for the management of arterial hypertension. The Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Eur Heart* J, 1-72. doi:10.1093/eurheartj/eht151, from http://eurheartj.oxfordjournals.org/

Marmot, M., & Brunner, E. (2005). Cohort Profile: The Whitehall II study. *Int J Epidemiol*, 34, 251-256. doi:10.1093/ije/dyh372

Marques-Vidal, P., & Tuomilehto, J. (1997). Hypertension awareness, treatment, and control in the community: is the 'rule of halves' still valid? *J Hum Hypertens*, 11, 213–220.

Min, H., Chang, J.W., & Balkrishnan, R. (2010). Sociodemographic risk factors of diabetes and hypertension prevalence in Republic of Korea. *Int J Hypertens*, 1-6. doi:10.4061/2010/410794

Nilsson, P.M., Nilsson, J.A., Östergren, P.O., & Rasmussen, F. (2004). Fetal growth predicts stress susceptibility in young adulthood independent of parental social class: cohort study of 161,991 Swedish male conscripts. *J Epidemiol Community Health*, 58, 571–573.

Nilsson, P.M. (2009). Adverse social factors can predict hypertension – but how? *Eur Heart* J, 30, 1305-1306. doi:10.1093/eurheartj/ehp131

Pieper, C., Warren, K., & Pickering, T.G. (1993). A comparison of ambulatory blood pressure and heart rate at home and work on work and non-work days. *J Hypertens*, 11, 177–183.

Räikkönen, K., Matthews, K.A., & Kuller, L.H. (2001). Trajectory of psychological risk and incident hypertension in middle-aged women. *Hypertension*, 38, 798-802.

Vrijkotte, T., van Doornen, L., & de Geus, E. (2000). Effects of work stress on ambulatory blood pressure, heart rate, and heart rate variability. *Hypertension*, 35, 880-886. doi: 10.1161/01.HYP.35.4.880