

Original Article

LEVEL OF ADHERENCE TO LIFESTYLE CHANGES AND MEDICATIONS AMONG MALE HYPERTENSIVE PATIENTS IN TWO HOSPITALS IN TAIF; KINGDOM OF SAUDI ARABIA

ABUABKER IBRAHIM ELBUR

Pharmacy Practice Research Unit, College of Pharmacy, Taif University, P. O. Box: 888, 21974, Al-Haweiah, Taif, Kingdom of Saudi Arabia.
Email: bakarelbu@yahoo.co.uk

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ABSTRACT

Objective: The main aims were to measure adherence to diet, exercise and medications among hypertensive patients and to identify determinants of adherence if any.

Methods: A cross-sectional study was conducted during October-December 2013 at Al-Hada Armed Forces Hospital and Princess Mansour Community Hospital; Taif; Kingdom of Saudi Arabia. All adult patients (>18 year) diagnosed with essential hypertension were recruited. A convenience method of sampling was adopted. Data was processed using the software Statistical Package for Social Science (SPSS). P values of <0.05 were considered as statistically significant.

Results: Overall, 144 patients were included. Of them 92 (63.9%) were recruited from Princess Mansour Hospital and 52 (36.1%) others from Al-Hada Hospital. Rates of adherence to exercise, a healthy diet and medications were 20.1%, 11.8% and 34.7% respectively. The level of monthly income was found to be strongly associated with adherence to both a healthy diet ($P=0.046$) and regular exercise ($P=0.004$). Presence of other co-morbidity was found to be an important factor in the commitment to a healthy diet ($P=0.012$), regular exercise ($P=0.028$) and medications ($P=0.002$). Patients of ages <65 year were found to be more adherent to a healthy diet compare to elderly ones ($P=0.007$). Only 6 (4.2%) patients were found to be adherent to all studied domains. Adherence to all domains increased significantly with educational level ($P=0.002$).

Conclusions: Adherence to all studied domains was sub-optimal. Well-organized and individualized patient-oriented education is needed.

Keywords: Adherence, Diet, Exercise, Medications, Hypertension.

INTRODUCTION

Hypertension is a major health problem throughout the world with high morbidity and mortality rate. Globally the disease affects over one billion people, seven million of them die each year as a consequence of severe complications and lack of adequate control [1]. In Saudi Arabia, the prevalence of hypertension is high with a considerable number of patients with uncontrolled disease [2].

Among hypertensive patients adherence to medications and lifestyle changes are important to achieve the desired therapeutic goal. Major lifestyle changes that should be considered and that help in lowering the blood pressure include: adoption of Dietary Approach to Stop Hypertension (DASH) –eating plans [3], dietary sodium reduction [4], weight reduction in overweight and obese patient with regular exercise [5], adequate intake of fruits and vegetables [6] and decrease saturated fat intake [7].

Several studies were conducted around the world to assess adherence to lifestyle changes and medications among hypertensive patients and to identify factors associated with non-adherence. Itoh et al [8] studied adherence to lifestyle changes among adults with essential hypertension and identified very low adherence rate especially to physical activity measure. Uzun et al [9] studied adherence to treatment, diet, exercise, measurement of blood pressure and smoking. They concluded that the rates of adherence to medications and lifestyle changes were generally low and the causes of non-adherence is different according to the type of adherence of the studied domains. In addition, researchers identified multiple independent factors that influence patients' compliance with lifestyle behaviors like; patient's beliefs about hypertension management, knowledge of hypertension and its management, physician counseling on healthy lifestyle and self-care practices [10]. Lyalomhe et al [11] noted a low rate of adherence to medications and fewer patients practiced lifestyle changes. They attributed this to psychosocial factors like depression and anxiety, fear of medication addiction and intolerable drug adverse effects which may have a negative impact on patients' attitude towards treatment.

To our knowledge, no attempt has been made to assess hypertensive patients' adherence to lifestyle changes together with compliance with to pharmacological therapy among Saudi patients. Therefore, this study was carried out to measure patients' adherence to exercise, diet, and medications and to identify determinants of adherence if any.*

MATERIALS AND METHODS

Study design

A cross-sectional study was conducted over a three month period, October-December 2013.

Settings

The study was conducted at Al-Hada Armed Forces Hospital and Princess Mansour Community Hospital. Both hospitals provide medical services for military personnel and their families in Taif Area; Kingdom of Saudi Arabia. Most of the patients who initially diagnosed with certain chronic illnesses at Al-Hada Hospital finally refer for follow up at Princess Mansour Community Hospital, which provide ambulatory care services.

Inclusion criteria

All adult patients (> 18 years) diagnosed with essential hypertension and who were on medical treatment at least for one month period before commencement of the study were recruited. The objectives of the study were clearly stated for the patients.

Exclusion criteria

Female patients, patients diagnosed with secondary hypertension and those with cognitive impairment were excluded. Verbal consent to participate in the study was obtained from each patient. Patients refused to participate were immediately excluded from the study.

Sampling technique and sample size

A convenience method of sampling was adopted and one hundred forty four patients were included from both hospitals.

Data collection

Data was collected through face-to-face interview method by final year pharmacy students. The data collectors received training on how to conduct interviews with patients. A structured questionnaire was used for data collection. It was composed of two parts. The first one was designed to collect data on patients' background characteristics (age in year, body mass index, residence, educational level, employment status, level of monthly income, and duration of the disease). The second part was designed to collect data on adherence to exercise and diet through direct questions.

The responses in this part were recorded as "Yes" or "No". Medication non-adherence was measured using the self-reported 4-item Morisky scale [12] which assesses patients' forgetfulness about taking medications, carelessness about taking medications, stopping medication when feeling better and stopping medication when feeling worse.

Questions were answered as 'Yes' and 'No' and scored one point for 'Yes' and zero point for a 'No' response. Scores were summed to give total scores, ranging from 0 to 4. Non-adherence was defined as a score greater than zero. The questionnaire was tested with a group of ten patients to ensure applicability. Minor changes were suggested and consequently adopted in the final questionnaire.

Data analysis

Data was processed using the software Statistical Package for Social Science (SPSS) (Version 21). Descriptive statistics were used to describe all variables. Frequency and percentage were calculated for categorical variables. Patients' background characteristics which showed significant association on univariate analysis with adherence to diet, exercise and medications were fitted into multiple logistic regression models to identify the independent predictors for the three studied domains. P values of < 0.05 were considered statistically significant.

Ethical approval

Ethical approval for the conduction of the research was obtained from the Research committee, Al Hada Hospital; Taif, KSA.

RESULTS

Patients' background characteristics

Overall, 144 patients met the inclusion criteria and agreed to participate. Of them, 92 (63.9%) were interviewed at Princess Mansour Hospital and 52 (36.1%) at Al-Hada Hospital. Above 50% of the patients aged > 65 year old. Overweight and obese patients constituted nearly 85%. One hundred and twenty four (86.1%) was residents of urban areas and 112 (77.8%) attained the educational level below secondary. Nearly 65% of the respondents were suffering from other chronic illnesses concomitantly with hypertension, of them 70% had diabetes. Table (1) showed patients' demographic characteristics.

Table 1: Patients' background characteristics

| Background characteristic | No | Percentage |
|---|-----|------------|
| Age group in year | | |
| =<65 | 68 | 47.2 |
| >65 | 76 | 52.8 |
| Body mass index (Kg/m²) | | |
| =<25 | 21 | 14.6 |
| >25 | 123 | 85.4 |
| Residence | | |
| Town | 124 | 86.1 |
| Outside town | 20 | 13.9 |
| Educational level | | |
| Secondary & above | 32 | 22.2 |
| Below secondary | 112 | 77.8 |
| Employment status | | |
| Working | 63 | 43.8 |
| Not working | 81 | 56.2 |
| Level of monthly income (SR) | | |
| =<5000 | 62 | 43.0 |
| >5000 | 78 | 54.2 |
| Missing | 4 | 02.8 |
| Co -morbidity | | |
| Yes | 93 | 64.6 |
| No | 51 | 35.4 |
| Time since diagnosis with HTN | | |
| =<5year | 30 | 20.8 |
| >5 year | 114 | 79.2 |
| Total | 144 | 100 |

Adherence to regular exercise

Only 29 (20.1%) of the patients admitted adherence to regular exercise 30 minutes per day for at least 5 days per week. Multivariate analysis identified level of monthly income [OR 0.08 (0.01-0.4), (*P= 0.004)] and the presence of other disease/s state [OR 4.7(1.2-18.8), (*P= 0.028)] as important background characteristics that significantly associated with commitment to exercise activity as shown in table (2).

Adherence to a healthy diet

Only 17(11.8%) patients admitted full adherence to a healthy hypertensive diet. Predictors of compliance to this important lifestyle measure were age<65 year, level of monthly income and the presence of other co-morbidity [OR 4 (1.5-10.5), (*P= 0.007)], [OR 0.4 (0.2-1.0), (*P =0.046) and [OR 0.2(0.07-0.7), (*P = 0.012)] respectively. In addition, the patients interviewed at Princess Mansour Hospital were found to be significantly more adherent to a healthy diet compared to those recruited from Al-Hada Hospital [OR 0.3 (0.1-0.9), (*P= 0.027)]. Predictors of adherence to a healthy diet were presented in table (3).

Adherence to antihypertensive medications

Fifty (34.7%) patients were classified as adherent to medications. The most important predictor of adherence to medications identified by multivariate analysis was co-existence of other disease/s with hypertension [OR 3.8 (1.6-9.4), (*P = 0.002)].

Table 2: Predictors of adherence to regular exercise

| Covariates | % | n | Univariable analysis crude OR(95% CL) | P value | Multivariable analysis adjusted OR(95% CL) | P value |
|---|------|-----|---------------------------------------|---------|--|---------|
| Hospital | | | | | | |
| Princess Mansour | 10.9 | 52 | 1 | | | |
| Al-Hada | 36.5 | 92 | 4.7(2.0-11.2) | <0.001 | | |
| Age group in year | | | | | | |
| >65 | 9.2 | 76 | 1 | | | |
| =<65 | 32.4 | 68 | 4.7(1.9-12.0) | 0.001 | | |
| Body mass index (Kg/m²) | | | | | | |
| >25 | 17.1 | 123 | 1 | | | |
| =<25 | 38.1 | 21 | 3(1.1-8.1) | 0.032 | | |
| Residence | | | | | | |
| Outside town | 15 | 20 | 1 | | | |
| Town | 21 | 124 | 1.5(0.4-5.5) | 0.539 | | |

| Educational level | | | | | | |
|--------------------------------------|------|-----|---------------|--------|----------------|-------|
| Below secondary | 10.7 | 112 | 1 | | | |
| Secondary & above | 53.1 | 32 | 9.5(3.8-23.6) | <0.001 | | |
| Employment status | | | | | | |
| Not working | 9.9 | 81 | 1 | 0.001 | | |
| Working | 33.3 | 63 | 4.6(1.9-11.2) | | | |
| Level of monthly income (SR) | | | | | | |
| =<5000 | 3.2 | 62 | 1 | <0.001 | 1 | |
| >5000 | 32.1 | 78 | 0.07(0.2-0.3) | | 0.08(0.01-0.4) | 0.004 |
| Missing | | 4 | | | | |
| Co -morbidity | | | | | | |
| No | 9.8 | 51 | 1 | | 1 | |
| Yes | 25.8 | 93 | 3.2(1.1-9.0) | 0.027 | 4.7(1.2-18.8) | 0.028 |
| Time since diagnosis with HTN | | | | | | |
| >5 years | 15.8 | 114 | 1 | | | |
| =<5year | 36.7 | 30 | 3.0(1.3-7.6) | 0.014 | | |
| Total | | 144 | | | | |

Table 3: Predictors of adherence to a healthy diet

| Covariates | % Yes | n | Univariable analysis crude OR(95% CL) | P value | Multivariable analysis adjusted OR(95% CL) | P value |
|---|-------|-----|---------------------------------------|---------|--|---------|
| Hospital | | | | | | |
| Al-Hada | 69.2 | 52 | 1 | 0.045 | 1 | 0.027 |
| Princess Mansour | 83.7 | 92 | 0.4(0.2-1.0) | | 0.3(0.1-0.9) | |
| Age group in year | | | | | | |
| >65 | 71.1 | 76 | 1 | 0.025 | 1 | 0.007 |
| =<65 | 86.8 | 68 | 2.7(1.3-6.3) | | 4(1.5-10.5) | |
| Body mass index Kg/m² | | | | | | |
| | 71.4 | 21 | 1 | 0.398 | | |
| | 79.7 | 123 | 0.6(0.2-1.8) | | | |
| Residence | | | | | | |
| Town | 77.4 | 124 | 1 | 0.448 | | |
| Outside town | 85.0 | 20 | 0.6(0.2-2.2) | | | |
| Educational level | | | | | | |
| Below secondary | 77.7 | 112 | 1 | 0.665 | | |
| Secondary & above | 81.3 | 32 | 1.2(0.5-3.7) | | | |
| Employment status | | | | | | |
| Working | 76.2 | 63 | 1 | 0.557 | | |
| Not working | 80.2 | 81 | 0.8(0.4-1.7) | | | |
| Level of monthly income (SR) | | | | | | |
| =<5000 | 71.0 | 62 | 1 | 0.054 | 1 | 0.046 |
| >5000 | 84.6 | 78 | 0.4(0.2-1.0) | | 0.4(0.2-1.0) | |
| Co -morbidity | | | | | | |
| Yes | 72.0 | 93 | 1 | 0.015 | 1 | 0.012 |
| No | 90.2 | 51 | 0.3(0.1-0.8) | | 0.2(0.07-0.7) | |
| Total | | 144 | | | | |

Table 4: Predictors of adherence to antihypertensive medications

| Covariates | % Yes | n | Univariable analysis crude OR(95% CL) | P value | Multivariable analysis adjusted OR(95% CL) | P value |
|-------------------------------------|-------|-----|---------------------------------------|---------|--|---------|
| Hospital | | | | | | |
| Princess Mansour | 27.2 | 92 | 1 | 0.045 | | |
| Al-Hada | 48.1 | 52 | 0.4(0.2-1.0) | | | |
| Age group in year | | | | | | |
| >65 | 34.2 | 76 | 1 | 0.892 | | |
| =<65 | 35.3 | 68 | 1.0(0.5-2.0) | | | |
| Residence | | | | | | |
| Outside town | 25.0 | 20 | 1 | 0.329 | | |
| Town | 36.3 | 124 | 1.7(0.6-5.0) | | | |
| Educational level | | | | | | |
| Below secondary | 30.4 | 112 | 1 | 0.042 | | |
| Secondary & above | 50.0 | 32 | 2.3(1.0-5.1) | | | |
| Employment status | | | | | | |
| Not working | 32.1 | 81 | 1 | 0.454 | | |
| Working | 38.1 | 63 | 1.3(0.7-2.6) | | | |
| Level of monthly income (SR) | | | | | | |
| =<5000 | 29.0 | 62 | 1 | 0.244 | | |
| >5000 | 38.5 | 78 | 0.7(0.3-1.3) | | | |

| | | | | | | |
|--------------------------------------|------|-----|---------------|-------|--------------|-------|
| Co –morbidity | | | | | | |
| No | 15.7 | 51 | 1 | 0.001 | 1 | 0.002 |
| Yes | 45.2 | 93 | 4.4(1.9-10.4) | | 3.8(1.6-9.4) | |
| Time since diagnosis with HTN | | | | | | |
| >5 years | 33.3 | 114 | 1 | 0.496 | | |
| =<5year | 40.0 | 30 | 1.3(0.6-3.1) | | | |
| Total | | 144 | | | | |

Adherence to all studied domains

Only 6 (4.2%) patients admitted full adherence to the all studied domains. Educational level was the only noted predictor of adherence to all domains. Five (15.6%) patients who attained secondary and above educational level were significantly more adherent compared to only 1 (0.9%) patient with lower education [OR 20.6 (2.3-18.3), (*P= 0.002)].

DISCUSSION

Control of hypertension represents a major challenge and requires attention to both pharmacological and non-pharmacological treatment. Suboptimal commitment among hypertensive patients to these measures was reported in the literature and the consequences were well demonstrated. Measurement of the rates of adherence to lifestyle changes and medications together with the identification of its determinants is of utmost importance for the design and provision of health education.

In Saudi Arabia as reported in the above mentioned national survey for only 37.0% of the hypertensive patients the blood pressure blood pressure was considered to be controlled [2]. There is a gap in knowledge on what factors that may influence the control of blood pressure. The current study main aim was to measure the rates of adherence to selected lifestyle changes (diet and exercise) and medications.

Understanding of hypertensive patients' characteristics is important in improving the disease management. Older age (>65 year) was one of the most important noted demographic variable among interviewed patients, as elderly constituted more than 50%. Older age represents a major risk factor among others that influence the control of blood pressure [13]. Researchers noted a high prevalence of cardiac complications e. g. left ventricular hypertrophy, diastolic dysfunction, coronary artery disease and left ventricular failure among patients with essential hypertension aged above 60 years [14].

Considering the body mass index, the majority of the interviewees were either overweight or obese. Obesity and overweight are increasing in the KSA [15]. Obesity remains strongly associated with diabetes, hypercholesterolemia, and hypertension in the KSA [16]. The nutritional problems in Saudi are mainly due to changes in food habits, illiteracy and ignorance [17]. Obesity was identified as independently associated with uncontrolled blood pressure, both in patients with or without cardiovascular disease [18].

Hypertension and diabetes are a critical combination responsible for the development of both micro-and macro-vascular diseases [19]. A considerable number of the participants in this study had diabetes concomitantly with hypertension. In the presence of diabetes, blood pressure control is difficult as diabetes was found among other risk factors as independently associated with uncontrolled disease specifically among elderly patients [20].

In the presence of above mentioned important risk factors that have a negative impact on the control of blood pressure, adherence to lifestyle changes and medications was found to be low among the participants. The presence of other disease/s was found to be significantly associated with adherence to all studied domains. Patients suffering from other chronic disease/s were found to be more adherent than those living with hypertension alone. Most probably, coexistence of other disease and the burden of multiple illnesses enforced the patients to adopt healthy lifestyles. The situation was more or less as reported in another gulf country and the factors for non-adherence were similar [21]. Researchers in Kuwait identified multiple barriers for non –adherence to diet

among patients at risk of cardiovascular diseases like unwillingness, difficulty in adhering to a diet different from that of the rest of the family, and social gatherings [21].

The adoption of a special healthy dietary regimen is expensive and most probably low economic status may stand as a barrier to the commitment among patients with low income. This was obviously noted in this study. In another study, researchers identified economic constraints as an important factor that limit adherence to both diet and exercise among patients with chronic diseases [22]. In the above mentioned study [9], researchers obtained similar results and identified both the level of income and the presence of any other chronic disease as independent predictors of adherence to medications and other lifestyle changes.

It was worse to find that elderly patients (age > 65 year) were less adherent to a healthy diet compared to younger ones. A dietary modification is an important non pharmacological intervention to reduce blood pressure in elderly patients [23]. Cultural factors, lack of knowledge, weak communication with healthcare providers, illiteracy and the absence of health education may be responsible factors that justify this finding. Future educational programs should focus on this subgroup of patients and should be provided in a simple and a culturally acceptable way.

We hypothesized that the adherence rates to lifestyle changes and medications among patients followed in Princess Mansour Hospital to be better than those received medical care at Al-Hada Hospital. The assumption was made because the latter by its nature provides ambulatory care services. Healthcare providers in ambulatory setting have better chances to deliver intensive and proper health education compared with practitioners at the tertiary care level. The only noted difference between the two groups was in adherence to dietary recommendations. Patients interviewed at Princess Mansour Hospital were found to be more adherent. The obtained results demonstrated the absence of health education for hypertensive patients in both settings.

About 35% of the participants were classified as adherent to medications. Comparatively, in another study researchers found 57.9% of the patients did not use their medicines as prescribed and poor knowledge of hypertension complications was the only predictor of non-adherence [24].

Adherence to all studied domains was hard to achieve. Only 4.2% of the participants were found to be fully adherent. The level of adherence was significantly associated with higher educational status. Definitely a higher educational level helps the patients in understanding educational messages. Moreover, highly educated patients have better chances to come across considerable information on the disease from different educational sources.

The study had some limitations. Firstly, only male hypertensive patients were included from only two hospitals in Taif city, this limit the generalizability of the obtained results. In the future this limits can be overcome by the inclusion of a representative sample from the whole region or the entire country. Secondly, the rates of adherence to all studied domains were obtained through self-report method. The method is easy and cheap, however it is less reliable, especially among those patients who deny poor adherence.

CONCLUSION

Adherence to all studied domains (diet, exercise and medications) was low. The identified predictors were important in the design of health education. Well-organized and individualized patient-oriented education is needed. Inclusive information on the importance of

adherence to pharmacological and non-pharmacological treatment should be provided equally. Patient motivation and continuity of education are important as hypertension is a chronic disease. The role of social support, especially close family members of elderly patients, should not be ignored.

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CONFLICT OF INTERESTS

Declared None

REFERENCES

- World Health Organization. Prevention of cardiovascular disease: Guidelines for assessment and management of cardiovascular risk. Geneva: WHO; 2007.
- Saeed AA, Al-Hamdan NA, Bahnassy AA, Abdalla AM, Abbas MA, Abuzaid LZ. Prevalence, Awareness, Treatment, and Control of Hypertension among Saudi Adult Population: A National Survey. *Int J Hypertens* 2011;2011:174-35.
- Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, *et al.* A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *N Engl J Med* 1997;336(16):1117-24.
- Vollmer WM, Sacks FM, Ard J, Appel LJ, Bray GA, Simons-Morton DG, *et al.* Effects of diet and sodium intake on blood pressure: subgroup analysis of the DASH-sodium trial. *Ann Intern Med* 2001;135(12):1019-28.
- Fletcher G. Physical inactivity as a risk factor for cardiovascular disease. *Am J Med* 1999;107(2A):10S-11S.
- Rimm EB, Ascherio A, Giovannucci E, Spiegelman D, Stampfer MJ, Willet WC. Vegetables, fruits and cereal fibre intake and risk of coronary heart disease among men. *JAMA* 1996;275:447-51.
- Willett WC. Diet and health: what should we eat? *Sci* 1994;264:532-7.
- Iloh GUP, Amadi AN, Okafor GOC, Ikwudinma AO, Odu FU, Godswill-Uko EU. Adherence to lifestyle modifications among adult hypertensive Nigerian with essential hypertension in a primary care clinic of a tertiary hospital in resource-poor environment of Eastern Nigeria. *Br J Med Med Res* 2014;4(18):3478-90.
- Uzun S, Kara B, Yokuşoğlu M, Arslan F, Yilmaz MB, Karaeren H. The assessment of adherence of hypertensive individuals to treatment and lifestyle change recommendations. *Anadolu Kardiyol Derg* 2009;9(2):102-9.
- Heymann AD, Gross R, Tabenkin H, Porter B, Porath A. Factors associated with hypertensive patients' compliance with recommended lifestyle behaviors. *Isr Med Assoc J* 2011;13(9):553-7.
- Lyalomhe G, Lyalomhe S. hypertension-related knowledge, attitudes and lifestyle practices among hypertensive patients in sub-urban Nigerian community. *J Public Health Epidemiol* 2010;2(4):71-7.
- Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care* 1986;24(1):67-74.
- Knight EL, Bohn RL, Wang PS, Glynn RJ, Mogun H, Avorn J. Predictors of uncontrolled hypertension in ambulatory patients. *Hypertension* 2001;38(4):809-14.
- Vibha G, Singh GR, Bano Hajra B. Prevalence of cardiac complications in elderly patients of hypertension. *JARBS* 2013;5(3):234-7.
- Al-Nozha MM, Al-Mazrou YY, Al-Maatouq MA, Arafah MR, Khalil MZ. Obesity in Saudi Arabia. *Saudi Med J* 2005;26(5):824-9.
- Memish ZA, El Bcheraoui C, Tuffaha M, Robinson M, Daoud F, Jaber S, *et al.* Obesity and associated factors-Kingdom of Saudi Arabia, 2013. *Prev Chronic Dis* 2014;11:140-236.
- Madani KA. Obesity in Saudi Arabia. *Bahrain Med Bull* 2000;22(3):1-9.
- Cordero A, Bertomeu-Martínez V, Mazón P, Fácila L, Bertomeu-González V, Cosín J, *et al.* Factors associated with uncontrolled hypertension in patients with and without cardiovascular disease. *Rev Esp Cardiol* 2011;64(7):587-93.
- Lowe J. Hypertension in diabetes. *Aust Prescr* 2002;25:8-10.
- Yang L, Xu X, Yan J, Yu W, Tang X, Wu H, Parkin CL. Analysis on associated factors of uncontrolled hypertension among elderly hypertensive patients in Southern China: a community-based, cross-sectional survey. *BMC Public Health* 2014;14:903.
- Serour M, Alqhenaei H, Al-Saqabi S, Mustafa A, Ben-Nakhi A. Cultural factors and patients' adherence to lifestyle measures. *Br J Gen Pract* 2007;57(537):291-5.
- Orzech KM, Vivian J, Torres CH, Armin J, Shaw JS. Diet and exercise adherence and practices among medically underserved patients with chronic disease: variation across four ethnic groups. *Health Educ Behav* 2013;40(1):56-66.
- Acelajado MC. Optimal management of hypertension in elderly patients. *Integr Blood Pressure Control* 2010;3:145-53.
- Karakurt P, Kasikci M. Factors affecting medication adherence in patients with hypertension. *J Vas Nurs* 2012;30:118-25.