

Original Article

The Effects of Non-Pharmacological Intervention in the Management of Essential Blood Pressure

Ahlam Elkheshbi*^{ORCID}, Fadwa Alakhder, Shifaa Zarti

Department of Physiotherapy, Faculty of Medical Technology, University of Tripoli, Libya.

ARTICLE INFO

Corresponding Email. g.d.m.t.16@gmail.com

Received: 22-06-2021 Accepted: 30-06-2021 Published: 06-07-2021

Keywords: Essential hypertension, Calcium channel blocker, Life style modification, Control hypertension.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>

ABSTRACT

Background and Objective. Although current European and American hypertension guidelines recommend treating high blood pressure using pharmacological and no pharmacological interventions, it is unusual to use such treatment in Libyan society. This study assessed the impact of the change in lifestyle of 229 patients with essential blood pressure who are receiving medication at a follow up clinic in Central Tripoli Hospital. **Methods.** The study based on a questionnaire that included sociodemographic characteristics, physical activity, and medication used to regulate blood pressure during the last four months preceding the survey. Based on the blood pressure levels, patients were classified in two groups, a controlled group that did not exceed the internationally recommended level of 140/90 and another group that exceeded this level (uncontrolled group). **Results** The risk of hypertension was higher among elder patients (65%), men are slightly more affected by the disease (54.6%), the job stress may increase the blood pressure (71.6%), and smoking was the major cause of uncontrolled blood pressure (50.8%). On the other hand, following a patient's diet, moderate BMI of the patient, physical activity, regardless of where and when they practiced, had a very positive effect on controlling high blood pressure. **Conclusion.** Patients with essential hypertension can reduce their blood pressure by changing their normal lifestyle through improving quality of nutrition and performing physical activity, in addition to continuing traditional conventional drug therapy.

Cite this article: Elkheshbi A, Alakhder F, Zarti S. The Effects of Non-Pharmacological Intervention in the Management of Essential Blood Pressure. *Alq J Med App Sci.* 2021;4(2):143-151. <http://doi.org/10.5281/zenodo.5075368>

INTRODUCTION

High blood pressure [BP] is one of the most common diseases among most of the world [1]. Some scientific references indicate that the incidence of the disease reaches between 30% - 45% of the total number of adults in the world [2,3]. Essential, primary, or idiopathic hypertension defined as high BP that not associated with identifiable causes such as renovascular disease, renal failure, pheochromocytoma and aldosteronism. The proportion of people with essential blood pressure are about 95% of cases of rising blood pressure [4]

The patient's constant neglect to treat the disease in its early stages may negatively affect his/ her health and may lead to serious complications on their life such as; heart disease, vascular disease, and even lack of attention to treatment may lead to suffering from kidney failure [5,6]. Increased prevalence of essential blood pressure in this era may be due to the pressures of modern life, besides people's dependence on means of transportation, communication and modern technologies in their movement and the fulfillment of their needs, and away from daily physical activity [7]. In addition to excessive intake of saturated fat and fast food [8] and addiction to smoking, all of which are recognized as modifiable risk factor for hypertension. Treatment of the underlying

blood pressure disease and reducing its severity can be done by an integrated treatment plan based on the pharmacological and non-pharmacological treatment [9,2].

Drug therapy usually includes the patient's commitment to take different types of drugs as diagnosed by his health and according to the decision of the physician such as angiotensin-converting enzyme inhibitors, angiotensin II-receptor blockers, diuretics, α - and β -blocking agents and calcium-channel blockers [10,11]. The non-pharmacological treatment strategy includes the regular exercise of physical activity with a healthy diet free of salt in addition to quit smoking and stay away as much as possible from psychological stress [12,10]. Attendance to non-pharmacological therapy has a significant impact on the patient's health state, help him to succeed in the treatment plan, and may lead to reduce or perhaps prevent the complications of the disease [8]. It is common in Libya for patients with essential blood pressure to continue their treatment by attending health complexes and outpatient clinics in public and private hospitals. Although the prescription for treatment in most of these clinics includes adherence to drug therapy and a set of guided medical advices, the patient is supposed to abide by it. The medical advices usually include reducing the amount of salts in diets, quitting smoking, and continue to exercise some kind of physical activity. However, most patients do not give these advices sufficient importance due to the lack about their awareness of the importance of the positive impact that may be caused by non-pharmacological treatments. This study aimed to investigate the impact of non-pharmacological interventions on the treatment plan followed by the patient to control their essential blood pressure.

METHODS

This exploratory study based on a cross-sectional survey carried out during the period of May to August 2018 on random sample consisting of 229 patients with essential blood pressure who attend the outpatient clinics of Tripoli Central Hospital. Before distributing the questionnaire to the participants and collecting the required data, the research team obtained the approval from the Tripoli Central Hospital administration's office to start the research study.

This study based on two stages, firstly preparing questionnaires and collecting data, and secondly data analysis stage. In the first stage, a questionnaire form was prepared based on previous published article [13] and filled by face-to-face interview. The questionnaire organized and arranged its questions into two parts; the first part contains eight different questions related to patient's demographics (age, gender, body mass, smoking). In addition to other questions about the nature of the patient's life, such as job, social status and the quality of the used medications. The second part consists of four questions focused on the details of physical activity practiced by participants as an attempt to determine the impact of the quality of physical activity on regulator blood pressure. Along with the reasons for the lack of practicing exercise for some patients due to medical condition, loss of desire to exercise, absence of a suitable place, sufficient time for exercise, and unaware of proper type of exercise. For avoiding ambiguity in patients' answers, the questionnaire identified and directed the answers in terms that easily understood by all respondents and accurately describe the patient's condition.

Upon receiving the questionnaires from the patients, the research team measured the blood pressure level of each participant, and divided the sample of the study into two groups according to the level of blood pressure. A group that includes patients with controlled blood pressure that does not exceed 140/90 and another group that includes patients whose blood pressure exceeds 140/90, as uncontrolled group. The research team then calculated an average of three readings of the patient's blood pressure level and were compared with an average of prior readings recorded during the four months preceding the questionnaire that are found in the patient's file. It is important to clarify that in the first stage all medical conditions that suffer from heart disease, gland and sleep disorders, as well as patients who were newly infected or have been for less than a year were exclude. All participants were volunteers, and their ages were between 35-65 years.

The collected data were then analyzed using Statistical Package Program (SPSS) version 22 for statistical analysis. Variables were analyzed by chi-square test or Fisher's exact test.

RESULTS AND DISCUSSION

The results of this study highlight the effect of non-pharmacological therapy in reducing the risk of hypertension than the internationally known rate (140/90) [10]. According to the data presented in Table 1, about 65.5% of the patients surveyed had their blood pressure under control throughout the treatment period. The results also indicated the similarity of the two groups (controlled and uncontrolled) in the age, gender, marital status of the patients and whether they were affiliated with a job or not.

Throughout the analysis of the questionnaire results, it is clear that the greater the age of the patient the greater the likelihood of developing hypertension disease, where 65% of the total patients suffering from the disease were aged over fifty years, only 8% were below forty. Of the 149 elderly patients, 54 had uncontrolled blood pressure. This means that approximately 36% of the elderly were at risk of developing hypertension beyond the acceptable level (uncontrolled blood pressure). The convergence of proportions can be clearly observed in the two groups for different ages and the percentages of participants with uncontrolled blood pressure increase with age, as shown in Table 1. The results were consistent with scientific reports revealed that the aging of the population is one of the most important factors contributing to the increase in the prevalence of blood pressure [14]. The results also were very close for the gender of respondents with uncontrolled blood pressure (no significance difference $p=0.89$), with a slight rise in the proportion of male patients. Out of 229 patients with high blood pressure, 55% were men, and 45% were women. It was consistent with a review that found 68.4% of Libyan males and 48.4% of Libyan females who suffer from high blood pressure are under treatment [15]. Table 1 also indicates that the incidence of uncontrolled hypertension in this study seems to be close to both genders, about 34% of female, and 35% of the male patients.

The majority (83%) of the respondents were married. About 24 of patients were single, 71% of them had uncontrolled blood pressure, while the limited number of divorced and widowed ($n=14$ patients), only 36% of them had uncontrolled blood pressure. The percentage of married participants with uncontrolled blood pressure did not exceed 30% ($p<0.001a$). The results indicated the positive effects of marriage in controlling high BP compared to the development of the disease in singles despite the small number. Similar studies found that marriage had a significant protective effect against adverse health outcomes, as cardiovascular disease [16,17,18]. The difference in lifestyle of patients with controlled blood pressure and patients with uncontrolled hypertension can be seen in other aspects of the questionnaire. Such as the effect of increasing patient's Body Mass Index [BMI], the patients' commitment to consume healthy food, stay away from cigarettes smoking and regularly exercising physical activity.

Most of the patients (73.4%) did not smoke and the proportion of those who suffered from rising blood pressure approximately 27%, which confirms the increase of health awareness among members of the community. The decrease of Libyan people who smoke was confirmed by another study [15], which stated, "The percentage who currently smoke tobacco from Libyan adults was 25.1%". While the incidence of uncontrolled blood pressure among smokers was doubling to 50.8%, it is clear evidence that smoking had a negative impact on the patient's health and may cause deterioration. This finding was consistent with the results of several studies [19-21] that agreed with the negative impact of smoking on hypertension patients, and mentioned to the medically recognized factors that are smoking-related as, impairment of endothelial function, arterial stiffness, inflammation, lipid modification as well as an alteration of antithrombotic and prothrombotic factors.

Table (1); The frequency and percentages of responses of different questions asked through the questionnaire among 229 patients.

Categories	All n:229 n (%)	Controlled Hypertension (n:150) n(%)	Uncontrolled Hypertension (n:79) n (%)	p-value
Age in years				
<40	18(7.8)	13 (72.3)	5(27.7)	0.705^a
40-49	62(27.1)	42 (67.8)	20(32.2)	
≥50	149(65.1)	95 (63.8)	54(36.24)	
Gender				
Male	125 (54.6)	81 (64.8)	44 (35.2)	0.8891^b
Female	104 (45.4)	69 (66.3)	35(33.7)	
Material status				
Single	24 (10.5)	7 (29.2)	17 (70.8)	>0.001^a
Married	191 (83.4)	134 (70.2)	57 (29.8)	
Divorced/widowed	14 (6.1)	9 (64.3)	5 (35.7)	
Working status				
Employed	164 (71.6)	101 (61.6)	63 (38.4)	0.030^a
Retired	31 (13.5)	24 (77.4)	7 (22.6)	
Unemployed	34 (14.8)	25 (73.5)	9 (26.5)	
BMI				
<25	28 (12.2)	27 (96.4)	1 (3.6)	>0.001^a
25-30	98 (42.8)	80 (81.6)	18 (18.4)	
≥30	103 (45.0)	43 (41.7)	60 (58.3)	
Smoking				
No	168 (73.4)	120 (71.4)	48 (28.6)	0.030^a
Yes	61(26.6)	30 (49.2)	31 (50.8)	
On diet				
No	123 (53.7)	61 (49.6)	62 (50.4)	>0.001^b
Yes	106 (46.3)	89 (84)	17(16)	
Medication to regular blood pressure				
ACE inhibitor	8 (3.5)	4 (50)	4 (50.0)	0.003^a
Beta blocker	5 (2.2)	4(80)	1 (20)	
Calcium channel blocker	106 (46.3)	79 (74.5)	27 (25.5)	
combination	110 (48)	63 (57.3)	47 (42.7)	
Low salt diet	0 (0.0)	0 (0.0)	0 (0.0)	

p-values were calculated by (a): chi-square test, and (b): Fisher's exact test.

Table 1 and Figure 1 shows that increasing the patient's BMI had a negative impact on health and might lead to uncontrolled hypertension when BMI approaching or exceeding 30 kg / m². This confirmed by one of the references [22], when mentioned that reducing the patient's weight and maintaining BMI in the range of 18.5–24.9 kg / m² makes the patient's blood pressure decreases by 5–20 mm Hg per 10 kg.

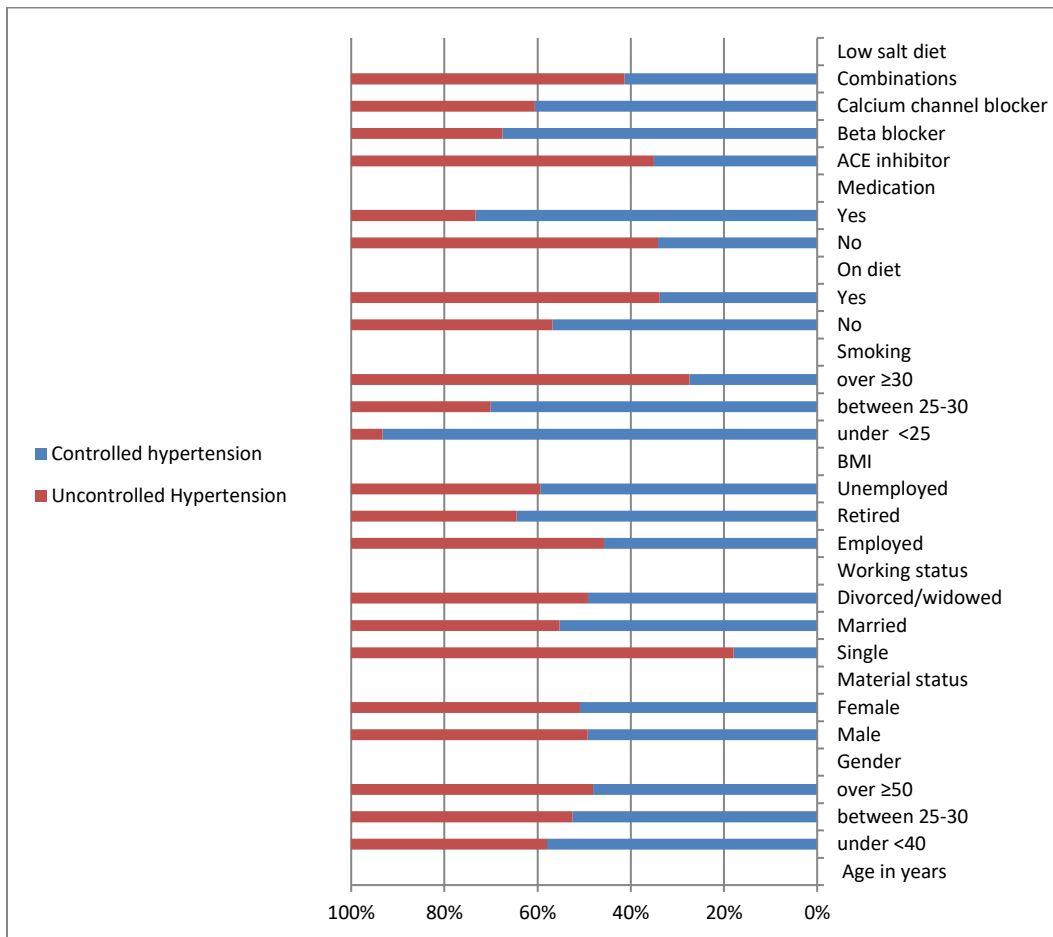


Figure (1); the responses % of each variable among controlled group and uncontrolled group.

Regarding the effect of diet intake, the responses of patients as mentioned in the questionnaire, and according to the data recorded in Table 1 showed that 46.3% of patients were committed to consume healthy food. The effect of patients' interest in healthy food has clearly reflected in the decreasing of the number of patients with uncontrolled blood pressure to only 17 patients compared to the total number of patients (n=106), it is a simple percentage and did not exceed 16%. While the percentage of those who were in different to eating healthy foods in their diets reaches 50.4% as shown in Table 1. The results illustrated the importance of commitment to healthy diets. Studies [23,8, 3] mentioned to the relationship between low blood pressure and a healthy diet that includes fruits and vegetables and reducing fat intake. They suggested a guide for American people, known as The Dietary Approaches to Stop Hypertension (DASH), in which they explained that in following a patient's blood pressure diet includes fresh fruits and vegetables, fiber, cereals, and a reduction in fat-containing food it would help lower blood pressure.

Regarding the medication taken by patients for treatment, the results of the questionnaire (Table 1) showed that medication such as calcium channel blocker (CCB) and beta inhibitors had a positive effect in controlling patients' pressure compared with other drugs. The study noted that the highest rate of drug dispensed by Central Tripoli Hospital was (CCB) group, although the result of beta-blocker drugs was significant as well. The proportion of patients that used (CCB) while their blood pressure is not controlled is about 26%, while the proportion of patients with uncontrolled blood pressure that used beta blocker did not exceed 20%. It might be due to therapists whom were convinced that calcium channel blocker is the most useful medication in controlling high blood pressure.

This can be supported by other studies concluded that CCB are not influence the hemodynamic homeostasis during maximal and submaximal exercise [24], and unimpaired performance of physical activity, especially for patients practicing regular physical activity and suffering from mild hypertension [25]. The results of this study were worthwhile with regard to the use of the drug, the calcium channel blocker group, whether used alone or with different medication, in both groups (controlled and uncontrolled) was the most commonly used medication. It is contrary to a similar study conducted in Kuwait [13], which showed the percentage of patients whose blood pressure was controlled and engaged in regular physical activity during the week was 55.6% of the study sample. Angiotensin inhibitors was the most prescribed medication. Another concordance of the results of this study with the results of the Kuwaiti study showed that beta inhibitors had a significant effect on the regularity of blood pressure coincided with a change in lifestyle, but the small sample prevents the assertion. The current study showed in Table 2 that 52% of the study sample, which represents 119 patients, practiced physical activity at different rates. Patients with uncontrolled blood pressure said that they were advised by the physician to exercise, but they did not usually abide by these instructions. A large percentage of them (68%) reported the main barrier was the lack of desire to exercise and about 12.7% returned with the reason that they did not have free time Figure 2. This result was different from the reasons given by patients in a study conducted in Kuwait [13]. Patients agreed that the reason was the lack of space for sport time (51.1%), while other patients attributed the reason was the loss of desire to exercise (19.6%). The importance of regular activity was evident in a study conducted in Eastern New Zealand where the study pointed to the positive effects of the counselling of hypertension patients in increasing physical activity and improving quality of lifestyle that lead to lower blood pressure by an average of 1-2 mm Hg over a period of 12 months [26]. It also confirmed by a scientific study based on survey that, patients who follow a physician's instructions for physical activity may lower their blood pressure by 3-4 mm Hg than patients who do not care [27].

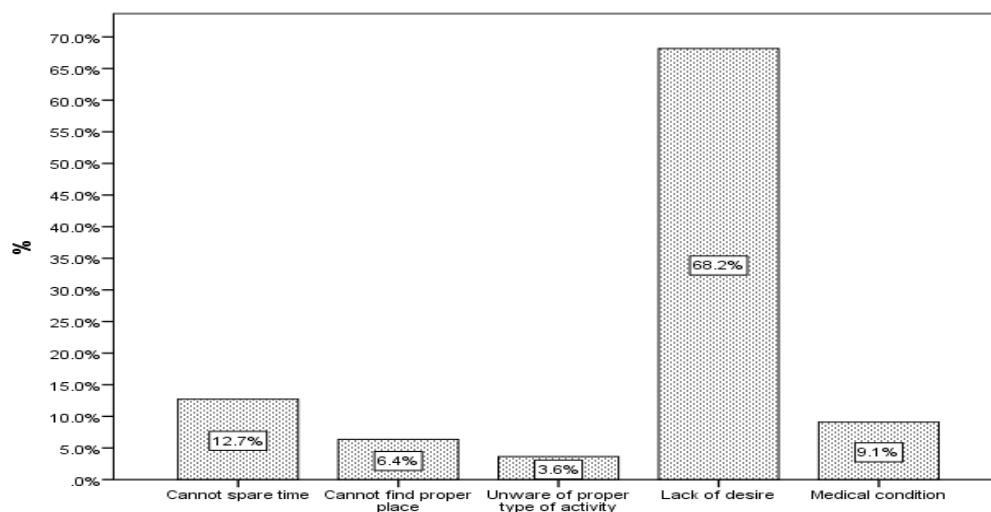


Figure 2; Reasons % for not practicing physical activity among 110 hypertensive patients

A hundred and sixty-four patients of the study sample were conducive to work (the research did not mention the type of work that the patient does). They stated, through the questionnaire, that they were practicing limited amounts of activity in the workplace and during the rest of the day. Forty-five of them 27.4% practiced a simple activity during a period not exceeding ten minutes, Whereas 119 patients 72.6% practiced moderate activity for a period exceeding ten minutes. The results as shown in Table 2 indicated that simple activity may have simple

benefits in controlling blood pressure disorder as about 64% of patients who performed simple activities had uncontrolled blood pressure. While it can be observed that only about, 29% of, patients who engaged in moderate activities continue to suffer from uncontrolled blood pressure.

Table (2). The frequency and percentages of Practicing Physical activity among 229 patients

Categories	All n:229 n (%)	Controlled Hypertension (n:150 n(%))	Uncontrolled Hypertension (n:79 n (%))	p-value
Practicing physical activity				
No	110 (48.0)	31 (28.2)	79 (71.8)	0.001b
Yes	119 (52.0)	119 (100)	0 (0.0)	
Frequency of exercise Frequency of exercise				
1-2 days per week	9 (7.6)	9 (100)	(00.0)	0.001a
3-4 days per week	96 (80.7)	96 (100)	(00.0)	
≥5 days per week	14 (11.8)	14 (100)	(00.0)	
Activity during work				
Sitting /simple activity <10 minutes	45 (27.4)	16 (35.6)	29 (64.4)	0.001b
Moderate activity >10 minutes	119 (72.6)	85 (71.4)	34 (28.6)	
Vigorous activity >10 minutes	0 (0.0)	0 (0.0)	0 (0.0)	
Activity if not employed				
Mostly relaxing at home /simple activity at home	12 (18.5)	5 (41.7)	7 (58.3)	>0.001b
Moderate activity at home/ outside	21 (32.3)	12 (57.1)	9 (42.9)	
Vigorous activity at home / outside	32 (49.2)	32 (100)	0 (0.0)	
Activity during leisure time				
Relax or simple activity <10 minutes	105 (45.9)	32 (30.5)	73 (69.5)	>0.001a
Moderate activity >10 minutes	119 (52.0)	113 (95)	6 (5.0)	
Vigorous activity >10 minutes	5 (2.2)	5 (100)	0 (0.0)	

p-values were calculated by (a): chi-square test, and (b): Fisher's exact test.

Sixty-five patients of the study sample were not affiliated with any job but did physical activities at different doses at home or outside. About half of them 49.2% were active and had controlled blood pressure. While some of the rest 18.5% and 32.3% who did not do vigorous activity still suffered from lack of controlling high BP. The majority of the 12 patients who did simple physical activities without effort (58%) had uncontrolled blood pressure. Whereas 21 patients exerted more effort and practiced physical activities inside or outside homes, only 43% of them continued their blood pressure uncontrolled.

Regardless of the patient's affiliation with a job or not, the nature of activity during leisure time was different from the rest of the weekdays as shown in Table 2. Where we note 57 patients preferred to perform simple activities during the days of the week (if they employed or not) while 105 patients practice those activities during leisure time. While 140 patients engaged in moderate activities during normal days, the number decreased to 119 patients on holidays, and only five patients remain practicing vigorous activity even on holidays.

The results show that there is an association between the physical activity and the controlling of hypertension. Table 2 shows that patients that engage in moderate or vigorous activity for more than 10 minutes (if the patient is employed, not employed or during leisure time) helps in reducing the BP to the recommendation level.

Preference of sedentary life and stay away from physical activity negatively affects the patient's condition and may influence on controlling the patient's blood pressure, which places them at risk of rising blood pressure over the recommendation level. This is clear from the results of current study and many other scientific studies [27, 28, 29, 30]. European and American evidence of high blood pressure recommended exercising regularly, such as walking, swimming and jogging daily for periods of 30- 45 minutes. Halm J and Amoako E. [31] indicated to the direct positive effects that physical activity has on controlling blood pressure. They found that the aerobic exercise lowers systolic blood pressure by about 3-4 mmHg for patients suffering from raising blood pressure.

CONCLUSION

The results suggested that patient with essential hypertension can improve their health and control their BP by exercising regularly, eating a healthy diet, avoiding sedentary life along with bad habits, and using medication according to the doctor's instructions. It also emphasized the necessity of increasing awareness of non-pharmacological interventions as a complementary method to drug therapy among patients. It would be useful for general practitioners to confirm their adherence to the non-pharmacology treatment plan follow up the patients regularly.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

REFERENCES

1. Giuseppe Mancia, Robert Fagard, Krzysztof Narkiewicz, Josep Redon, Alberto Zanchetti, Michael Böhm, et.al. 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. *European Heart Journal (ESC)*. 21 July 2013; 34(28):2159–2219.
2. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et.al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. *Hypertension*. JAMA. 2003; 289(19):2560-72.
3. Vamvakis A, Gkaliagkousi E, Triantafyllou A, Gavriilaki E and Douma S. Beneficial effects of nonpharmacological interventions in the management of essential hypertension. *Journal of the Royal Society of Medicine Cardiovascular Disease*. 2017; 6: 1–6.
4. Carretero O, Oparil S. Essential Hypertension Part I: Definition and Etiology. *American Heart Association (Circulation)*. 2000;101:329-335.
5. Whelton SP, Chin A, He J, Effect of Aerobic Exercise on Blood Pressure: A Meta-Analysis of Randomized, Controlled Trials, *Annals of Internal Medicine*. 2002; 136:493-503.
6. He J, Whelton PK. Elevated systolic blood pressure and risk of cardiovascular and renal disease: overview of evidence from observational epidemiologic studies and randomized controlled trials, *Am Heart J*. 1999; 138:211-9.
7. Veronique A. Cornelissen, Neil A. Smart, Exercise Training for Blood Pressure: A Systematic Review and Meta-analysis. *Journal of the American Heart Association*. December 2013; 1-9.

8. Sacks F M, Svetkey L P , Vollmer W M , Appel L J , Bray G A, Harsha D et al. DASH-Sodium Collaborative Research Group: Effects on blood pressure of reduced dietary sodium and the Dietary Approach to Stop Hypertension (DASH) diet. *N Eng J Med*. 2001; 344(1):3-10.
9. Mosca L, Benjamin EJ, Berra K, Bezanson JL, Dolor RJ, Lloyd-Jones DM, et.al. American Heart Association. Effectiveness based guidelines for the prevention of cardiovascular disease in women update: a guideline from the American Heart Association. *J Am Coll Cardiol*. 2011; 57:1404–1423.
10. Schellack N and Naicker P. Hypertension: a review of antihypertensive medication, past and present. *Afr Pharm J*, 2015; 82(2):17-25.
11. Jackson RE and Bellamy MC. Antihypertensive drugs. *BJA Education*. 2015;15 (6): 280–285.
12. Delacroix S, Chokka RC, Worthley SG. Hypertension: Pathophysiology and Treatment. *J Neurol Neurophysiol* 2014; 5: 6.
13. Alsairafi M, Alshamali K, Al-rashed Anwar, Effect of Physical Activity on Controlling Blood Pressure among Hypertensive Patients from Mishref Area of Kuwait. *European Journal of General Medicine*. 2010;7(4):377-384.
14. Gunnar H. Anderson Jr. Effect of Age on Hypertension: Analysis of Over 4,800 Referred Hypertensive Patients. *Saudi J Kidney Dis Transplant*.1999;10(3):286-297.
15. Altajori N, Elshrek YM. Review Article: Risk Factors for Non-communicable Diseases in Libya. *The Egyptian Journal of Hospital Medicine*. Jan. 2017; 66:202-214.
16. Manzoli L, Villari P, Pirone M, Boccia A. Marital status and mortality in the elderly: A systematic review and meta-analysis. *Social Science & Medicine*. 2007; 64:77–94.
17. Waite LJ, Lehrer EL. The benefits from marriage and religion in the United States: A comparative analysis. *Population Development Review*. 2003; 29:255–276.
18. Kiecolt-Glaser JK, Newton TL. Marriage and health: His and hers. *Psychological Bulletin*. 2001;127:472–503.
19. Virdis A, Giannarelli C, Neves MF, Taddei S, Ghiadoni L. Cigarette smoking and hypertension. *Curr Pharm Des*. 2010; 5(23):2518-25.
20. Berlin I, Cournot A, Renout P, Duchier J, Safar M. Peripheral haemodynamic effects of smoking in habitual smokers. A methodological study. *Eur J Clin Pharmacol*. 1990;38(1):57–60.
21. Ambrose JA, Barua RS. The pathophysiology of cigarette smoking and cardiovascular disease: an update. *J Am Coll Cardiol*. 2004;43(10):1731–7.
22. Oza R, Garcellano M. Non-pharmacologic Management of Hypertension: What Works?. *Am Fam Physician*. 2015;91(11):772-776.
23. Fung TT, Rimm EB, Spiegelman D, Rifai N, Tofler G H, Willett W C et al. Association between dietary patterns and plasma biomarkers of obesity and cardiovascular disease risk. *Am J Clin Nutr*. 2001;73: 61–67.
24. Gillies HC, Derman EW, Noakes TD. Effects of Amlodipine on Exercise Performance and Cardiovascular and Skeletal Muscle Function in Physically Active Hypertensive Patients. *Clinical Drug Investigation*. 1996;12:135–145.
25. Kindermann W. Calcium Antagonists and Exercise Performance. *Sports Medicine*. 1987;4 (3):177–193.
26. Elley CR, Kerse N, Arroll B, Robinson E. Effectiveness of counseling patients on physical activity in general practice: cluster randomized controlled trial. *BMJ*. 2003;326:793-8.
27. Halm J, Amoako E. Physical activity recommendation for hypertension management: does health care provider advice make a difference? *Ethn Dis*. 2008;18(3):278-82.
28. Fagard RH, Cornelissen VA. Effect of exercise on blood pressure control in hypertensive patients. *Eur J Cardiovasc Prev Rehabil*. 2007;14:12-7.
29. Padilla J, Wallace JP, ParkS. Accumulation of physical activity reduces blood pressure in pre- and hypertension. *Med Sci Sports Exerc*. 2005;37(8):1264-75.
30. Hagberg JM, Park JJ, Brown MD. The role of exercise training in the treatment of hypertension. An update. *Sports Med*. 2000;30:193-206.
31. Halm J, Amoako E. Physical activity recommendation for hypertension management: does health care provider advice make a difference?. *Ethn Dis*. 2008;18(3):278-82.