Tropical Journal of Pharmaceutical Research September 2022; 21 (9): 2009-2016
ISSN: 1596-5996 (print); 1596-9827 (electronic)

Available online at http://www.tjpr.org
http://dx.doi.org/10.4314/tjpr.v21i9.27

Original Research Article

Effect of combined use of home blood pressure monitoring and nifedipine on blood pressure compliance and quality of life of patients with essential hypertension

Yingchao Wang*, Yunru Wang, Hua Du
Cardiovascular Medicine II, Jiaozuo Coal Industry (Group) Co. Ltd, Central Hospital, No. 1 Jiankang Street Jiefang District, Jiaozuo City, Henan Province, China

For correspondence:* ***Email:* *w289232231@163.com*

Sent for review: 18 April 2022 *Revised accepted: 31 August 2022*

Abstract

Purpose: *To investigate the effect of combination of home blood pressure monitoring (HBPM) and nifedipine on blood pressure compliance and quality of life in patients with essential hypertension.*
Methods: *One hundred and twenty essential hypertension patients admitted to Jiaozuo Coal Industry (Group) Co. Ltd Central Hospital from February 2020 to February 2021 were retrospectively studied. They were equally divided into study group (SG) and control group (COG) according to the order of admission. All patients were treated with nifedipine. Blood pressure was regularly measured in COG patients in the consulting room, while for SG patients, blood pressure was measured at home. Treatment compliance, blood pressure-related indices and quality of life of the two groups were determined.*
Results: *Treatment compliance values of patients in SG at 6 weeks (T2) and 12 weeks (T3) were significantly better than the corresponding values for patients in COG ($p < 0.05$). The related indices of blood pressure at T2 and T3 were significantly better in SG than in COG ($p < 0.05$), with higher blood pressure compliance at T2 and T3 in SG (60 and 70 %, respectively) than in COG ($p < 0.05$). The quality-of-life scores at T3 in SG were significantly higher than those in COG ($p < 0.05$).*
Conclusion: *The combined use of HBPM and nifedipine improves treatment compliance, enhances the levels of related indices of blood pressure, increases blood pressure compliance, and quality of life of patients with essential hypertension. Therefore, the combined therapy merits further investigation on a larger scale.*

Keywords: *Home blood pressure monitoring, Nifedipine, Essential hypertension, Quality of life*

Tropical Journal of Pharmaceutical Research is indexed by Science Citation Index (SciSearch), Scopus, Web of Science, Chemical Abstracts, Embase, Index Copernicus, EBSCO, African Index Medicus, JournalSeek, Journal Citation Reports/Science Edition, Directory of Open Access Journals (DOAJ), African Journal Online, Bioline International, Open-J-Gate and Pharmacy Abstracts

INTRODUCTION

In 2019, *Cardiovascular Health and Diseases in China* reported that there were 330 million Chinese patients with cardiovascular diseases, 245 million of whom had essential hypertension [1]. Thus, the disease constitutes a serious danger to the health and lives of Chinese people. At present, a strategy of drug intervention is used in patients with essential hypertension, in line with the clinical principles of “stable drug efficacy and good tolerance” [2].

The *2018 Chinese Guidelines for the Management of Hypertension* indicates that the extents of treatment and control of hypertension in China in 2012 were 40 and 10 % respectively, while the total control from 2012 to 2015 was only 16.8 % [3,4]. This indicates that although there are many types of drugs for treatment of hypertension in China, the blood pressure compliance has not been significantly improved. The *2010 Chinese Guidelines for the Management of Hypertension* proposes that effective management is key to prevention of serious cardiovascular and cerebrovascular complications [5,6].

Previous studies have shown that home blood pressure monitoring (HBPM) enhances the accuracy of measurement [7]. Moreover, some studies have shown that HBPM is associated with some advantages such as increasing patients' awareness of the disease, as well as improving their treatment compliance [8]. Presently, not much is known about the therapeutic effectiveness of HBPM. Therefore, the present study was carried out to determine the effect of combined use of home blood pressure monitoring (HBPM) and nifedipine on blood pressure compliance and quality of life of patients with essential hypertension.

METHODS

General profile of patients

Data for 120 essential hypertension patients admitted to Jiaozuo Coal Industry (Group) Co. Ltd Central Hospital from February 2020 to February 2021 were retrospectively analyzed. The subjects were equally divided into study group (SG, n = 60) and control group (COG, n = 60) according to the order of admission. The study was approved by the ethics committee of Jiaozuo Coal Industry (Group) Co. Ltd Central Hospital (approval no. 20191260), and it was carried out in accordance with the Declaration of Helsinki as revised in 2013 [9]. Signed written informed consents were obtained from the patients and/or their guardians.

Inclusion criteria

Patients in the following categories were enrolled in this study: those who met the World Health Organization (WHO) diagnostic criteria for essential hypertension [10], patients for whom secondary hypertension was excluded by physical examination and laboratory tests, those under the age of 80 years, with basic reading and writing skills, patients who took hypotensive drugs for more than 6 months, with blood pressure between levels 1 and 2 (below clinical blood pressure standards), and patients who used upper arm semi-automatic electronic sphygmomanometer [11] at home with measurement error within ± 0.67 kPa, when compared with the consulting room mercury sphygmomanometer.

Exclusion criteria

The excluded patients were those who had psychiatric problems or inability to communicate with others, patients with severe diseases such as parkinsonism, atrial fibrillation, diabetes mellitus, malignancies, stroke and acute heart failure, as well as hepatic and renal dysfunctions. Moreover, the excluded patients included those who were unable to actively cooperate during the treatment and fill out the questionnaire, and those who withdrew midway from the study.

Withdrawal criteria

The medical records of patients in the following categories were not used for data analysis: those with severe complications and special physiological changes, patients who were adjudged by the doctors to be unsuitable for continued participation in the study, and patients who requested to be withdrawn from the study due to their unwillingness to continue with the clinical trial.

Treatments

All patients were given 20 mg of nifedipine (Hunan Warrant Pharmaceutical Co. Ltd; NMPA approval no. H20084558) once daily. One course of treatment lasted for one month. The patients were treated for a total of 3 courses.

Blood pressure measurement

The blood pressure of each patient in COG was measured regularly in the consulting room. Before the measurement, the patients were allowed to rest and sit for 10 min to eliminate the influence of exercise factors on blood pressure. The patients were instructed to avoid smoking and caffeine intake before blood pressure testing. Cuffs of appropriate sizes were prepared, and the blood pressure of each patient was measured using a standard mercury sphygmomanometer (Jiangsu Yuyue Medical Equipment & Supply Co. Ltd.; NMPA Certified no. 20152070945). During the measurement, the patients were asked to adopt a sitting position with legs naturally on the floor. The lower border of the cuff was 2 cm from the antecubital midline, and the tube was placed on the brachial artery

pulse, prior to tightening of the cuffs. Blood pressure in the left upper arm was measured conventionally 3 times, with an interval of 5 min. Patients were kept sitting during this process, and the average of the 3 values was taken as clinical blood pressure. After the measurement, the patients were instructed to come to the consulting room for measurement once every 2 weeks for a total of 12 weeks.

The blood pressure measurement for patients in SG was done at home. Before the measurement, each patient was asked to sit for 10 min, with the cuff at the same level as the heart. The patient sat with back against the seat, and remained still, with legs relaxed. In addition, the patients were instructed not to exercise or consume caffeine before blood pressure testing to avoid the effect of external factors on blood pressure. Measurement was performed 3 times, and the average of the 3 values was recorded. Then, the patients were asked to operate the upper arm semi-automatic electronic sphygmomanometer on site after studying the procedures. Using an assessment scale for the electronic sphygmomanometer, the researchers evaluated whether the patient's operation was appropriate, and corrected any mistakes.

The blood pressure was measured daily at each period (9:00 - 10:00 am after breakfast, and 7.00 – 9.00 pm after dinner), and the average value of the 6 measurements was recorded. One physician and one nurse were designated to perform routine management of patients in SG and follow up door-to-door once a week in order to assess their performance of HBPM. At the same time, the patients were also required to come to the consulting room for blood pressure measurement once every 2 weeks for 12 weeks. The HBPM was still required on the day of the clinical measurement.

Evaluation of parameters

Treatment compliance

This was based on the therapeutic adherence scale for hypertensive patients (TASHP) which was developed for patients with essential hypertension in urban China [12]. Based on the Likert 5-point scoring method, the scale was used to assess medication compliance behavior, adverse medication behavior, daily life management behavior, and smoking and drinking management behavior. The scores ranged from 25 to 125 points for a total of 25 items. The higher the score, the higher the treatment compliance. The data were compared before treatment (T_1), 6 weeks after treatment (T_2), and 12 weeks after treatment (T_3).

Blood pressure-related indices

Before treatment (T_1), at 6 weeks (T_2) and 12 weeks after treatment (T_3), fasting venous blood (5 mL) was collected in the morning and allowed to stand for 30 min. Then, the serum was separated by centrifugation at 3000 rpm. Triglycerides, total cholesterol, and fasting blood glucose (FBG) were measured using an Automatic Biochemical Analyzer (Cobase 411 with matching reagent, NMPA Certified no. 2011 3402843).

The clinical blood pressure values of the patients at T_1, T_2 and T_3 were taken as the standards for calculating the average value. Blood pressure < 140/90 mmHg was set as the qualified standard against which the blood pressure compliance of patients was evaluated.

Quality of life

Quality of life was assessed based on the life scale for hypertensive patients [13]. The scale was used to score physiological symptoms, somatic symptoms, sexual dysfunction, sleep conditions, vitality, anxiety, repression, obsessive-compulsive disorder, interpersonal sensitivity, working state, hostility, ability of daily living, and cognitive ability. Each item was scored 0 - 4 points. The higher the total score, the more severe the symptoms of patients. The data were compared before treatment (T_1) and at 12 weeks after treatment (T_3).

Statistical analysis

In this study, the data were processed using SPSS 20.0, while graphs were prepared with GraphPad Prism7 (GraphPad Software, San Diego, USA). Enumeration data and measurement data are expressed as numbers and percentages (n (%)) and mean ± standard deviation (SD), respectively, and they were compared between the two groups using χ^2 and *t*-test, respectively. Differences were considered statistically significant at $p < 0.05$.

RESULTS

General profiles of patients

There were no statistically significant differences in general data between the two groups of patients ($p > 0.05$). These data are shown in Table 1.

Table 1: Comparison of general data between the groups of patients

Group	SG (n = 60)	COG (n = 60)	χ^2/t	*P*-value
Gender			0.135	0.714
Male	34	32		
Female	26	28		
Age (years)				
Range	55-76	56-74		
Average age	65.98±2.10	65.85±2.23	0.329	0.743
Mean body mass (kg)	57.52±2.65	58.00±2.41	1.038	0.301
BMI (kg/m^2)	23.54±2.10	23.22±2.21	0.813	0.418
Living habits				
Salt intake (g/day)	12.32±1.22	12.54±1.25	0.976	0.331
Oil intake (g/day)	35.68±2.14	35.46±2.15	0.562	0.575
Smoking	18	19	0.039	0.843
Drinking	22	24	0.141	0.707
Exercise	8	7	0.076	0.783
Level of education				
Middle school and below	21	20	0.037	0.847
Senior school or junior college	25	26	0.034	0.853
University and above	14	14	0.000	1.000
Method of medical payment				
Free medical care	5	6	0.100	0.752
Medical insurance	40	38	0.147	0.702
Self-pay	15	16	0.044	0.835
Marital status			0.223	0.637
Unmarried (divorced, widowed)	50	48		
Married	10	12		
Monthly income (Yuan)			0.044	0.835
≥3000	15	16		
<3000	45	44		
Family history of hypertension	42	40	0.154	0.695

Table 2: Comparison of levels of blood pressure-related indices (n = 60)

Group	SG	COG	*t*	*P*-value
T_1				
Systolic blood pressure (mmHg)	169.98±15.65	169.65±15.41	0.116	0.908
Diastolic blood pressure (mmHg)	110.26±8.54	110.48±8.14	0.144	0.885
Triglycerides (mmol/L)	2.32±0.42	2.35±0.39	0.405	0.686
Total cholesterol (mmol/L)	6.01±1.00	6.06±1.05	0.267	0.790
Fasting blood glucose (mmol/L)	3.14±0.35	3.16±0.41	0.287	0.774
Compliance rate of blood pressure (%)	0 (0/0)	0 (0/0)	-	-
T_2				
Systolic blood pressure (mmHg)	145.68±12.98	156.41±14.20	4.320	<0.001
Diastolic blood pressure (mmHg)	92.68±7.98	98.99±8.40	4.219	<0.001
Triglycerides (mmol/L)	2.10±0.36	2.26±0.45	2.151	0.034
Total cholesterol (mmol/L)	5.59±1.10	5.98±1.04	1.996	0.048
Fasting blood glucose (mmol/L)	2.99±0.21	3.10±0.26	2.549	0.012
Compliance rate of blood pressure (%)	60 (36/60)	40 (24/60)	4.800	0.028
T_3				
Systolic blood pressure (mmHg)	139.65±14.51	146.25±13.98	2.537	0.013
Diastolic blood pressure (mmHg)	82.54±8.54	87.24±8.14	3.086	0.003
Triglycerides (mmol/L)	2.04±0.41	2.24±0.35	2.874	0.005
Total cholesterol (mmol/L)	5.46±1.23	5.89±1.05	2.060	0.042
Fasting blood glucose (mmol/L)	2.90±0.20	3.02±0.19	3.369	0.001
Compliance rate of blood pressure (%)	70 (42/60)	50 (30/60)	5.000	0.025

Treatment compliance

Treatment compliance values at T_2 and T_3 were significantly better in SG than in COG ($p < 0.05$; Figure 1).

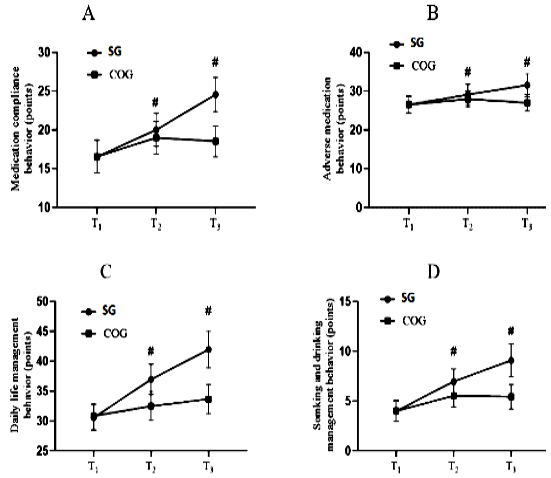

Figure 1: Comparison of treatment compliance between the two groups. Data are expressed as mean ± SD. (A) Medication compliance, (B) adverse medication behavior, (C) management of daily life, (D) management of smoking and drinking behavior. $^{\#}P < 0.05$

Blood pressure-related indices

The blood pressure-related indices of SG at T_2 and T_3 were better than those of COG ($p < 0.05$). The blood pressure compliance values at T_2 and T_3 for SG reached 60 and 70 % respectively, and were significantly higher than the corresponding values for COG ($p < 0.05$). These results are presented in Table 2.

Quality-of-life scores

Scores on quality of life at T_3 were significantly better in SG than in COG ($p < 0.05$; Table 3).

DISCUSSION

Essential hypertension, the most common chronic cardiovascular and cerebrovascular disease seen in clinics, often occurs in middle-aged and elderly people. It triggers damage to organs such as the heart, brain and kidney, and it causes serious cardiovascular and cerebrovascular complications in patients. Therefore, the clinical treatment of essential hypertension is basically aimed at controlling blood pressure so as to reduce disability and mortality in patients.

Table 3: Comparison of scores on quality of life at T_3 (n = 60)

Group	SG	COG	*T*	*P*-value
T_1				
Physiological symptoms	51.68±3.54	51.26±3.41	0.662	0.509
Somatic symptoms	17.98±1.23	17.87±1.20	0.496	0.621
Sexual dysfunction	5.99±1.01	5.98±1.10	0.052	0.959
Sleep condition	6.78±1.24	6.80±1.25	0.088	0.930
Vitality	6.00±1.23	6.05±1.24	0.222	0.825
Anxiety	7.86±1.20	7.89±1.26	0.134	0.894
Repression	11.97±2.34	11.99±2.36	0.047	0.963
Obsessive/compulsive disorder	9.54±0.98	9.68±0.95	0.795	0.429
Interpersonal sensitivity	18.98±2.54	18.96±2.68	0.042	0.967
Working state	4.99±0.65	4.96±0.57	0.269	0.789
Hostility	9.24±1.23	9.22±1.26	0.088	0.930
Daily living ability	93.68±4.21	93.87±4.21	0.247	0.805
Cognitive ability	43.51±5.10	43.58±5.55	0.072	0.943
T_3				
Physiological symptoms	65.98±5.54	58.64±5.21	7.476	<0.001
Somatic symptoms	22.54±1.98	19.00±1.21	11.817	<0.001
Sexual dysfunction	7.95±1.05	7.35±0.98	3.236	0.002
Sleep condition	10.10±1.65	8.95±1.20	4.366	<0.001
Vitality	8.74±1.05	8.11±1.00	3.365	0.001
Anxiety	10.00±1.58	8.74±1.68	4.232	<0.001
Repression	12.95±2.65	10.96±2.20	4.475	<0.001
Obsessive/compulsive disorder	10.12±1.35	9.54±1.20	2.487	0.014
Interpersonal sensitivity	25.10±2.21	24.00±2.04	2.833	0.005
Working state	8.01±1.01	7.21±1.00	4.360	<0.001
Hostility	11.65±1.24	9.54±1.23	9.358	<0.001
Daily living ability	100.68±2.65	95.14±2.65	11.451	<0.001
Cognitive ability	56.98±6.54	50.12±5.98	5.996	<0.001

Due to the high incidence of hypertension in China in recent decades, several anti-hypertension drugs are used in China, with diuretics, beta-blockers, calcium channel blockers, angiotensin-converting enzyme inhibitors, and angiotensin II receptor inhibitors being the most common. Nifedipine, a calcium channel blocker, is often used for middle-aged and elderly patients, especially those who are accustomed to high sodium diets and alcoholism. Long-term treatment with nifedipine is also effective on atherosclerosis [14]. However, a survey by WHO indicates that patients with chronic diseases often present low treatment compliance. This was confirmed in the *2018 Chinese Guidelines for the Management of Hypertension*. From 2012 to 2015, the treatment rate of patients with essential hypertension in China was only 40 %, and the blood pressure compliance was below 20 % [15]. These findings indicate that the use of anti-hypertensive drugs did not produce optimum effects.

The rate of treatment of hypertension increased in all countries worldwide between the 1980s and 1990s, but this rate has decreased in the past two decades. Even in the developed countries like the United States of America and Germany with better anti-hypertensive treatments, blood pressure compliance is not satisfactory: the medication compliance of patients is only 80 %, while the blood pressure compliance in low-and middle-income countries is less than 30 % [16]. This disparity demonstrates a huge gap between developing countries and developed nations. In China, the clinical treatment of essential hypertension focuses on improving the effectiveness of management of the patients. It has been reported that HBPM improves self-management ability of patients which is closely related to treatment compliance. Low treatment compliance of patients with essential hypertension is closely connected with their lifestyles, exercise and eating habits. A study has shown that treatment compliance is also closely associated with the income of patients. In this case, long-term medication resulted in anxiety, thereby seriously affecting effectiveness [17]. Therefore, improvement of the treatment compliance of patients is key to enhancing blood pressure compliance. The results obtained in this study indicate that HBPM fully improved patients' enthusiasm, participation and self-care. This explains why the treatment compliance values in SG at T_2 and T_3 were significantly better than the corresponding values in COG.

Moreover, HBPM has the advantages of delivering more accurate results and preventing white coat syndrome. It is worth noting that this study also involved door-to-door follow-up by physicians and nurses, and the patients were subjected to external constraints. Due to their enthusiasm for self-test blood pressure, as well as efficient supervision by the research group, the patients paid more attention to their behavior and avoided bad living habits as much as possible. Therefore, the scores on quality of life at T_3 in SG were significantly better than the corresponding scores in COG due to changes in the lifestyle of the patients. As a result of these changes, the levels of blood pressure-related indices at T_2 and T_3 in SG were significantly better than those in COG, and the blood pressure compliance values at T_2 and T_3 in SG reached 60 and 70 % respectively, which were significantly higher than those in COG, indicating a better treatment effect in SG. In a previous study, it was demonstrated that HBPM enhanced blood pressure compliance in patients [18]. Although regular door-to-door follow-up was not performed in that study, it could not be concluded that the experimental results were unrelated to intervention of the research group. Therefore, the actual effects of HBPM need to be further investigated by prolonging the study time and reducing the intervention.

Limitations of the study

In this study, patients were inevitably subjected to external supervision due to the follow-up survey. Therefore, it is likely that their treatment compliance may be better than that of ordinary patients, thereby affecting their scores in the various scales to some extent. However, the data of the two groups can still be compared. There is need for further investigation of the practical effects of HBPM in studies by prolonging the study time and reducing the intervention of the research group.

CONCLUSION

The combined use of HBPM and nifedipine improve the treatment compliance, enhanced levels of related indices of blood pressure, and increase blood pressure compliance and quality of life of patients with essential hypertension. Therefore, the combined therapy merits further investigation in a larger scale while factoring in the the practical effects of HBPM, prolonging the study time and reducing the intervention of the research group.

DECLARATIONS

Acknowledgements

None provided.

Funding

None provided.

Ethical approval

None provided.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article, and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Yingchao Wang and Yunru Wang conceived and designed the study, and drafted the manuscript. Yingchao Wang, Yunru Wang and Hua Du collected, analyzed and interpreted the experimental data. Yingchao Wang and Hua Du revised the manuscript for important intellectual contents. All authors read and approved the final manuscript.

REFERENCES

1. *Biçer S, Ünsal A, Taşcı S, Demir G, Ceyhan YŞ. The effect of acupressure on blood pressure level and pulse rate in individuals with essential hypertension: A randomized controlled trial. Holist Nurs Pract 2021; 35(1): 40-48.*
2. *Arslan G, Ceyhan Ö, Mollaoğlu M. The influence of foot and back massage on blood pressure and sleep quality in females with essential hypertension: a randomized controlled study. J Hum Hypertens 2021; 35(7): 627-637.*
3. *Ruszkowski P, Masajtis-Zagajewska A, Nowicki M. Effects of combined statin and ACE inhibitor therapy on endothelial function and blood pressure in essential hypertension - a randomised double-blind, placebo-controlled crossover study. J Renin Angiotensin Aldosterone Syst 2019; 20(3): 1470320319868890.*
4. *Villar R, Sánchez RA, Boggia J, Peñaherrera E, Lopez J, Barroso WS, Barbosa E, Cobos L, Hernández Hernández R, Octavio JA, et al. Recommendations for home blood pressure monitoring in Latin American countries: A Latin American Society of Hypertension position paper. J Clin Hypertens (Greenwich) 2020; 22(4): 544-554.*
5. *Khan MY, Pandit S, Abdulkutty J, Navasundi G, Hazra PK, Phadke U, Mane A, Mehta S, Shah S. Effectiveness of telmisartan on blood pressure control in hypertensive patients in India: A real-world retrospective study from electronic medical records. Cardiol Ther 2021; 10(1): 255-269.*
6. *Soliman RH, Pollock DM. Circadian control of sodium and blood pressure regulation. Am J Hypertens 2021; 24: hpab100.*
7. *El Mokadem M, Boshra H, Abd El Hady Y, Kasla A, Gouda A. Correlation between blood pressure variability and subclinical target organ damage in patients with essential hypertension. J Hum Hypertens 2020; 34(9): 641-647.*
8. *Yang YM, Shi RH, Xu CX, Li L. BRD4 expression in patients with essential hypertension and its effect on blood pressure in spontaneously hypertensive rats. J Am Soc Hypertens 2018; 12(12): e107-e117.*
9. *World Medical Association. World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. JAMA 2013; 310(20): 2191-2194.*
10. *Viazzi F, Greco E, Ceriello A, Fioretto P, Giorda C, Guida P, Russo G, De Cosmo S, Pontremoli R. AMD-Annals Study Group. Apparent treatment resistant hypertension, blood pressure control and the progression of chronic kidney disease in patients with type 2 diabetes. Kidney Blood Press Res 2018; 43(2): 422-438.*
11. *Ramirez AJ, Sanchez MJ, Sanchez RA. Diabetic patients with essential hypertension treated with amlodipine: blood pressure and arterial stiffness effects of canagliflozin or perindopril. J Hypertens 2019; 37(3): 636-642.*
12. *Andraos J, Munjy L, Kelly MS. Home blood pressure monitoring to improve hypertension control: a narrative review of international guideline recommendations. Blood Press 2021; 30(4): 220-229.*
13. *Khoram S, Loripoor M, Pirhadi M, Beigi M. The effect of walking on pregnancy blood pressure disorders in women susceptible to pregnancy hypertension: A randomized clinical trial. J Educ Health Promot 2019; 8: 95.*
14. *Khan MY, Pandit S, Jayagopal PB, Oomman A, Chockalingam KC, Ramakrishnan A, Mane A, Mehta S,*

Shah S. Effectiveness of olmesartan on blood pressure control in hypertensive patients in India: A real world, retrospective, observational study from electronic medical records. J Assoc Physicians India 2020; 68(8): 66-72.

15. *Kario K, Nomura A, Kato A, Harada N, Tanigawa T, So R, Suzuki S, Hida E, Satake K. Digital therapeutics for essential hypertension using a smartphone application: A randomized, open-label, multicenter pilot study. J Clin Hypertens (Greenwich) 2021; 23(5): 923-934.*
16. *Legarth C, Grimm D, Wehland M, Bauer J, Krüger M. The impact of vitamin D in the treatment of essential hypertension. Int J Mol Sci 2018; 19(2): 455.*
17. *Ohno S, Metoki H, Oku M, Iwama N, Shiozaki A, Nakashima A, Saito S. Prediction of hypertensive disorders of pregnancy based on home blood pressure monitoring. Pregnancy hypertension: An Int J Women's Cardiovasc Health 2021, 25(S1). DOI: 10.1016/j.preghy.2021.07.015*
18. *Attar A, Sadeghi AA, Amirmoezi F, Aghasadeghi K. Low dose spironolactone monotherapy in the management of stage 1 essential hypertension: A pilot randomized, double-blind, placebo-controlled trial. Acta Cardiol Sin 2018; 34(1): 59-65.*