Original Research Article

Effect of hypertension duration on relationship between blood pressure and signs and symptoms in hypertensive patients: a cross sectional survey

Syeda Nosheen Zehra1, Adnan Anwar2, Shahid Kamran3, Hafsa Jawaid4, Syeda Maheen5, Madiha Ariff6*

1Department of Medicine, Liaqat National Hospital and Medical College, Karachi, Sindh, Pakistan
2Department of Physiology, 3Department of Forensic Medicine, Altibri Medical College, Karachi, Sindh, Pakistan
4Medical Student, Dow University of Health Sciences, Karachi, Sindh, Pakistan
5Department of Medicine, JPMC, Karachi, Sindh, Pakistan
6Medical Officer, DUHS, Karachi, Sindh, Pakistan

Received: 9 April 2019
Accepted: 4 May 2019

*Correspondence:
Dr. Madiha Ariff,
E-mail: madiha.ariff@live.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Hypertension is defined as a systolic blood pressure of 140 mmHg or more, or a diastolic blood pressure of 90 mmHg or more or taking anti-hypertensive medication. The clinical presentation of high blood pressure may depend upon several factors such as age, gender, severity and duration of hypertension. There is a paucity of data exploring the role hypertension duration may play in shaping the relationship between blood pressure and signs and symptoms of hypertension. To evaluate the effect of hypertension duration on relationship between blood pressure and signs and symptoms in hypertensive patients.

Methods: A cross-sectional study was carried out among 250 patients, aged 18 or above, with self-reported history of hypertension and on anti-hypertensive medication. Data were collected by means of a structured questionnaire whereas the blood pressure level was measured with the help of sphygmomanometer using stethoscope. Inferential analysis was performed by applying chi-square test whereas the significance level was set at 0.05.

Results: The study results revealed that among patients with ≥5 years duration of hypertension headache history (P=0.021), edema (P=0.034), increased urinary frequency (P=0.031), sleep apnoea (P=0.016), palpitation (P=0.005) and confusion (P=0.021) were significantly associated with systolic whereas only increased urinary frequency (P=0.009) was significantly associated with diastolic blood pressure. Moreover, among patients with <5 years duration of hypertension vision problems (P=0.03), sleep apnoea (P=0.015) and palpitation (P=0.035) were significantly associated with systolic whereas sleep apnoea (P=0.048) and palpitation (P=0.028) were significantly associated with diastolic blood pressure.

Conclusions: The study results showed that patients with higher blood pressure were more likely to have the signs and symptoms of hypertension. Also, patients with longer duration of hypertension had greater number of signs and symptoms associated with systolic hypertension.

Keywords: Blood pressure, Cross-sectional survey, Hypertension duration, Hypertensive patients, Signs and symptoms
INTRODUCTION

Hypertension is defined as a systolic blood pressure (SBP) of 140 mmHg or more, or a diastolic blood pressure (DBP) of 90 mm Hg or more or taking anti-hypertensive medication.\(^1\) Global hypertension prevalence is currently 26% which is expected to rise to 29% by the year 2025.\(^2\) World Health Organization reported that 25.2% of the Pakistani population suffered from raised blood pressure in 2014.\(^3\) A systematic review in 2009 concluded that prevalence, awareness, treatment and control of hypertension in developing countries are coming closer to those in developed countries.\(^4\) It is known to increases the risk of various medical conditions such as heart attack, stroke, kidney failure and blindness.\(^5\) The high prevalence of hypertension and poor hypertension control are cited as significant determinants of the rising epidemic of cardiovascular diseases in developing countries.\(^6\) A meta-analysis in 2002 reported blood pressure to be strongly related to vascular mortality down to at least 115/75 mmHg.\(^7\)

There are two types of hypertension namely essential and secondary. Essential hypertension can be defined as a rise in blood pressure of unknown cause that increases risk for cerebral, cardiac, and renal events.\(^8\) Secondary hypertension is defined as increased systemic blood pressure due to an identifiable cause. Only 5-10% of patients suffering from arterial hypertension have a secondary form, whereas the vast majority has essential hypertension.\(^9\)

On the recommendations of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, blood pressure for adults aged 18 years or older has been classified into four categories as normal, prehypertension, stage 1 hypertension and stage 2 hypertension: Normal-systolic <120 mm Hg, diastolic <80 mm Hg; Prehypertension-systolic 120-139 mm Hg, diastolic 80-89 mm Hg. Stage 1 Hypertension-systolic 140-159 mm Hg, diastolic 90-99 mm Hg and Stage 2 Hypertension-systolic 160 mm Hg or greater, diastolic 100 mm Hg or greater.\(^10\)

The clinical presentation of high blood pressure may depend upon several factors such as age, gender, severity and duration of hypertension. A through literature search did not reveal any pertinent data exploring the role hypertension duration may play in shaping the relationship between blood pressure and signs and symptoms of hypertension. This study, therefore, was planned to evaluate the effect of hypertension duration on relationship between blood pressure and signs and symptoms in hypertensive patients.

METHODS

A cross-sectional study was carried out among patients with self-reported history of hypertension and on anti-hypertensive medication. The duration of the study was 6 months, from July 2018 to December 2018. Patients were divided into two groups according to the duration of hypertension i.e. those with hypertension duration of 5 years or above and those with hypertension duration of less than 5 years.

Patients with history of diabetes, cardiac events, neurological disorders, cluster headache, gastrointestinal disease, visual problems, epistaxis before diagnosed with hypertension and morbid obesity were excluded from the study.

After taking informed consent, each participant’s information was collected by means of a structured questionnaire designed specifically for the study whereas the blood pressure level was measured with the help of sphygmomanometer using stethoscope.

The data were entered, coded and analysed on SPSS version 20. Inferential analysis was performed by applying chi-square test whereas the significance level was set at 0.05.

RESULTS

The total data collected were of 372 patients but after excluding missing data for various study variables the final data analysed were of 250 patients. The study results revealed that among patients with ≥5 years duration of hypertension headache history (P=0.021), edema (P=0.034), increased urinary frequency (P=0.031), sleep apnea (P=0.016), palpitation (P=0.005) and confusion (P=0.021) were significantly associated with systolic blood pressure where patients who had stage 1/stage 2 systolic hypertension were more likely to have these symptoms than those who were normotensive/pre hypertensive (77.0% vs. 53.3%, 75.4% vs 53.3%, 63.9% vs. 40.0%, 45.9% vs 20.0%, 50.8% vs 20.0% and 77.0% vs. 53.3% respectively) (Table 1).

The study results further revealed that among patients with ≥5 years duration of hypertension only increased urinary frequency (P=0.009) was significantly associated with diastolic blood pressure where patients who had stage 1/stage 2 diastolic hypertension were more likely to have this symptom than those who were normotensive/pre hypertensive (69.6% vs 42.2%) (Table 2).

Moreover, the study results showed that among patients with <5 years duration of hypertension vision problems (P=0.03), sleep apnoea (P=0.015) and palpitation (P=0.035) were significantly associated with systolic blood pressure where patients who had stage 1/stage 2 systolic hypertension were more likely to have these symptoms than those who were normotensive/pre hypertensive (57.3% vs. 39.3%, 32.0% vs. 14.3% and 39.8% vs. 23.2% respectively) (Table 3).
### Table 1: Relationship between systolic blood pressure and signs and symptoms of hypertension with ≥5-year duration.

| Variables (n=91) | Systolic Blood Pressure | P    |
|------------------|-------------------------|------|
|                  | Stage 1/Stage 2 Hypertensive | Normotensive/Pre-hypertensive |      |
|                  | Frequency (%) | Frequency (%) |      |
| Headache history | Yes | 47 (77.0) | 16 (53.3) | 0.021 |
|                  | No  | 14 (23.0) | 14 (46.7) |      |
| Vertigo          | Yes | 46 (75.4) | 16 (53.3) | 0.034 |
|                  | No  | 15 (24.6) | 14 (46.7) |      |
| Edema            | Yes | 33 (54.1) | 11 (36.7) | 0.118 |
|                  | No  | 28 (45.9) | 19 (63.3) |      |
| Chest pain       | Yes | 38 (62.3) | 13 (43.3) | 0.087 |
|                  | No  | 23 (37.7) | 17 (56.7) |      |
| Vision problems  | Yes | 36 (59.0) | 16 (53.3) | 0.607 |
|                  | No  | 25 (41.0) | 14 (46.7) |      |
| Dyspnoea         | Yes | 37 (60.7) | 15 (50.0) | 0.334 |
|                  | No  | 24 (39.3) | 15 (50.0) |      |
| Epistaxis        | Yes | 2 (3.3)   | Nil        | >0.999*|
|                  | No  | 59 (96.7) | 30 (100)   |      |
| Increased urinary frequency | Yes | 39 (63.9) | 12 (40.0) | 0.031 |
|                  | No  | 22 (36.1) | 18 (60.0)  |      |
| Nausea           | Yes | 18 (29.5) | 6 (20.0)   | 0.333 |
|                  | No  | 43 (70.5) | 24 (80.0)  |      |
| Sleep apnea      | Yes | 28 (45.9) | 6 (20.0)   | 0.016 |
|                  | No  | 33 (54.1) | 24 (80.0)  |      |
| Palpitation      | Yes | 31 (50.8) | 6 (20.0)   | 0.005 |
|                  | No  | 30 (49.2) | 24 (80.0)  |      |
| Fatigue          | Yes | 49 (80.3) | 20 (66.7)  | 0.152 |
|                  | No  | 12 (19.7) | 10 (33.3)  |      |
| Confusion        | Yes | 47 (77.0) | 16 (53.3)  | 0.021 |
|                  | No  | 14 (23.0) | 14 (46.7)  |      |

### Table 2: Relationship between diastolic blood pressure and signs and symptoms of hypertension with ≥5 year duration.

| Variables (n=91) | Diastolic Blood Pressure | P    |
|------------------|-------------------------|------|
|                  | Stage 1/Stage 2 Hypertensive | Normotensive/Pre-hypertensive |      |
|                  | Frequency (%) | Frequency (%) |      |
| Headache history | Yes | 35 (76.1) | 28 (62.2) | 0.152 |
|                  | No  | 11 (23.9) | 17 (37.8) |      |
| Vertigo          | Yes | 33 (71.7) | 29 (64.4) | 0.455 |
|                  | No  | 13 (28.3) | 16 (35.6) |      |
| Edema            | Yes | 22 (47.8) | 22 (48.9) | 0.919 |
|                  | No  | 24 (52.2) | 23 (51.1) |      |
| Chest Pain       | Yes | 29 (63.0) | 22 (48.9) | 0.174 |
|                  | No  | 17 (37.0) | 23 (51.1) |      |
| Vision problems  | Yes | 28 (60.9) | 24 (53.3) | 0.468 |
|                  | No  | 18 (39.1) | 21 (46.7) |      |
| Dyspnoea         | Yes | 29 (63.0) | 23 (51.1) | 0.25  |
|                  | No  | 17 (37.0) | 22 (48.9) |      |
| Epistaxis        | Yes | 1 (2.2)   | 1 (2.2)    | >0.999*|
|                  | No  | 45 (97.8) | 44 (97.8)  |      |
| Increased urinary frequency | Yes | 32 (69.6) | 19 (42.2) | 0.009 |
|                  | No  | 14 (30.4) | 26 (57.8)  |      |
The study results further showed that among patients with <5 years duration of hypertension sleep apnea (P=0.048) and palpitation (P=0.028) were significantly associated with diastolic blood pressure where patients who had stage 1/stage 2 diastolic hypertension were more likely to have these symptoms than those who were normotensive/pre hypertensive (33.3% vs. 19.5% and 43.1% vs. 26.4% respectively) (Table 4).

Table 3: Relationship between systolic blood pressure and signs and symptoms of hypertension with <5 year duration.

| Variables (n=159) | Systolic blood pressure |  |  |  |
|------------------|-------------------------|---|---|---|
|                  | Stage 1/Stage 2 Hypertensive | Normotensive/Pre hypertensive | p  |
|                  | Frequency (%)           | Frequency (%)              |
| Headache history |                         |                           |    |
| Yes              | 81(78.6)                | 42(75.0)                  | 0.6 |
| No               | 22(21.4)                | 14(25.0)                  |    |
| Vertigo          |                         |                           |    |
| Yes              | 55(53.4)                | 26(46.4)                  | 0.401 |
| No               | 48(46.6)                | 30(53.6)                  |    |
| Edema            |                         |                           |    |
| Yes              | 28(38.9)                | 35(40.2)                  | 0.863 |
| No               | 44(61.1)                | 52(59.8)                  |    |
| Chest pain       |                         |                           |    |
| Yes              | 39(37.9)                | 21(37.5)                  | 0.964 |
| No               | 64(62.1)                | 35(62.5)                  |    |
| Vision problems  |                         |                           |    |
| Yes              | 59(57.3)                | 22(39.3)                  | 0.03 |
| No               | 44(42.7)                | 34(60.7)                  |    |
| Dyspnoea         |                         |                           |    |
| Yes              | 55(53.4)                | 26(46.4)                  | 0.401 |
| No               | 48(46.6)                | 30(53.6)                  |    |
| Epistaxis        |                         |                           |    |
| Yes              | 5(4.9)                  | 1(1.8)                    | 0.666* |
| No               | 98(95.1)                | 55(95.2)                  |    |
| Increased urinary frequency | | | |
| Yes              | 38(36.9)                | 19(33.9)                  | 0.71 |
| No               | 65(63.1)                | 37(66.1)                  |    |
| Nausea           |                         |                           |    |
| Yes              | 28(27.2)                | 10(17.9)                  | 0.188 |
| No               | 75(72.8)                | 46(82.1)                  |    |
| Sleep apnea      |                         |                           |    |
| Yes              | 33(32.0)                | 8(14.3)                   | 0.015 |
| No               | 70(68.0)                | 48(85.7)                  |    |
| Palpitation      |                         |                           |    |
| Yes              | 41(39.8)                | 13(23.2)                  | 0.035 |
| No               | 62(60.2)                | 43(76.8)                  |    |
| Fatigue          |                         |                           |    |
| Yes              | 72(69.9)                | 37(66.1)                  | 0.619 |
| No               | 31(30.1)                | 19(33.9)                  |    |
| Confusion        |                         |                           |    |
| Yes              | 64(62.1)                | 29(51.8)                  | 0.206 |
| No               | 39(37.9)                | 27(48.2)                  |    |

*Fisher's Exact Test.

*Fisher's Exact Test.
Table 4: Relationship between diastolic blood pressure and signs and symptoms of hypertension with <5 year duration.

| Variables (n=159) | Stage 1/Stage 2 Hypertensive | Normotensive/Pre-hypertensive | P |
|-------------------|------------------------------|-------------------------------|---|
|                   | Frequency (%)                | Frequency (%)                |   |
| Headache history  | Yes                          | 55 (76.4)                    | 68 (78.2) | 0.79 |
|                   | No                           | 17 (23.6)                    | 19 (21.8) |   |
| Vertigo           | Yes                          | 36 (50.0)                    | 45 (51.7) | 0.829 |
|                   | No                           | 36 (50.0)                    | 42 (48.3) |   |
| Edema             | Yes                          | 28 (38.9)                    | 35 (40.2) | 0.863 |
|                   | No                           | 44 (61.1)                    | 52 (59.8) |   |
| Chest pain        | Yes                          | 23 (31.9)                    | 37 (42.5) | 0.171 |
|                   | No                           | 49 (68.1)                    | 50 (57.5) |   |
| Vision problems   | Yes                          | 42 (58.3)                    | 39 (44.8) | 0.09 |
|                   | No                           | 30 (41.7)                    | 48 (55.2) |   |
| Dyspnoea          | Yes                          | 38 (52.8)                    | 43 (49.4) | 0.674 |
|                   | No                           | 34 (47.2)                    | 44 (50.6) |   |
| Epistaxis         | Yes                          | 4 (5.6)                      | 2 (2.3)   | 0.411* |
|                   | No                           | 68 (94.4)                    | 85 (97.7) |   |
| Increased urinary frequency | Yes | 26 (36.1) | 31 (35.6) | 0.95 |
|                   | No                           | 46 (63.9)                    | 56 (64.4) |   |
| Nausea            | Yes                          | 20 (27.8)                    | 18 (20.7) | 0.297 |
|                   | No                           | 52 (72.2)                    | 69 (79.3) |   |
| Sleep apnoea      | Yes                          | 24 (33.3)                    | 17 (19.5) | 0.048 |
|                   | No                           | 48 (66.7)                    | 70 (80.5) |   |
| Palpitation       | Yes                          | 31 (43.1)                    | 23 (26.4) | 0.028 |
|                   | No                           | 41 (56.9)                    | 64 (73.6) |   |
| Fatigue           | Yes                          | 52 (72.2)                    | 57 (65.5) | 0.365 |
|                   | No                           | 20 (27.8)                    | 30 (34.5) |   |
| Confusion         | Yes                          | 41 (56.9)                    | 52 (59.8) | 0.719 |
|                   | No                           | 31 (43.1)                    | 35 (40.2) |   |

*Fisher's Exact Test.

DISCUSSION

The study results revealed that among patients with ≥5 years duration of hypertension headache history, edema, increased urinary frequency, sleep apnea, palpitation and confusion were significantly associated with systolic blood pressure whereas only increased urinary frequency was significantly associated with diastolic blood pressure where patients who had stage 1/stage 2 hypertension were more likely to have these symptoms than those who were normotensive/pre-hypertensive.

The study results further revealed that among patients with <5 years duration of hypertension vision problems, sleep apnea and palpitation were significantly associated with systolic blood pressure whereas sleep apnea and palpitation were significantly associated with diastolic blood pressure where patients who had stage 1/stage 2 hypertension were more likely to have these symptoms than those who were normotensive/pre-hypertensive. Duration of hypertension is known to exert a negative influence on several hypertension related manifestations.

It has been reported to be an independent predictor of anxiety symptoms in hypertensive patients. It has been found to negatively influence the survival in hypertensive patients. It has also been shown to be a predictor in surgical cure of reno-vascular hypertension. It has further been reported that both short term and long-term durations of elevated blood pressure are probably crucial in the pathogenesis concerning carotid arteries. Furthermore, literature reports it to negatively affect the long-term beneficial effects of percutaneous transluminal renal angioplasty and surgery in cases of renal artery stenosis as well.

Apart from the above mentioned consequences, international literature evaluating the role of duration of hypertension in affecting the relationship between blood pressure levels and the clinical manifestations of hypertension is limited at best, and a thorough literature search by the author did not show any local study conducted so far in the given contest. As it is known that blood pressure control while on anti-hypertensive medication can vary considerably, it is not unreasonable.
to suspect that such uncontrolled blood pressure level can continue to cause vascular damage as the illness progresses and may result in an increase in the severity and count of clinical manifestations in any given hypertensive patient.16

Interestingly, the study results showed confusion to be significantly associated with systolic hypertension, but not with diastolic hypertension, only in patients with hypertension duration of 5 years or longer. On the contrary, the duration of hypertension had not been shown earlier to affect the impairment of cognitive functions in hypertensive patients.17 This difference in the findings can be attributed to different methodological approach, sample size and population characteristics of both the studies.

Moreover, apart from palpitation for which relevant literature was not available for contrast, the only other symptom associated with systolic blood pressure irrespective of hypertension duration was sleep apnea, a finding well in line with published literature.18-24 On the other hand, none of the symptoms studied was found to be significantly associated with diastolic blood pressure both in patients with ≥5 years and in patients with<5 years duration of hypertension.

Unfortunately, with regard to the rest of the study findings, a meaningful comparison, as intended, could not be made due to a dearth of pertinent published literature. Nevertheless, the association of a greater number of hypertension signs and symptoms with systolic hypertension in patients with longer duration of hypertension as found in the study is intriguing enough and warrants further exploration as an absence of evidence can never be taken as an absence of association.

Having a moderate sample size and using convenient sampling technique because of financial and time constraints were the prime limitations of the study. Moreover, it is also acknowledged that the study results may have suffered from limitation of recall, an inherent weakness of a cross-sectional study design.

CONCLUSION

Patients with higher blood pressure were more likely to have the signs and symptoms of hypertension. Also, patients with longer duration of hypertension had greater number of signs and symptoms associated with systolic hypertension.

Recommendations

In light of the study findings, it is recommended that the role of hypertension duration in the context of clinical presentation of hypertension should be evaluated further as it might have significant implications for management of hypertension by aiding in identifying the high-risk target groups.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, et al. Heart disease and stroke statistics—2012 update: a report from the American Heart Association. Circul. 2012;125(22):e1002.
2. Kearney MP, Whelton M, Reynolds K, Muntner P, Whelton KP, Heet J. Global burden of hypertension: analysis of worldwide data. Lancet. 2005;365(9455): 217-23.
3. Noncommunicable Diseases Country Profile 2014. World Health Organization, 2014. Available at: http://www.who.int/nmh/publications/ncd-profiles-2014/en/. Accessed November 2018.
4. Pereira M, Lunet N, Azevedo A, Barros H. Differences in prevalence, awareness, treatment and control of hypertension between developing and developed countries. J Hypertens. 2009;27(5):963-75.
5. World Health Day. WHO, 2013. Available at: http://www.emro.who.int/world-health-days/2013/overview.html. Accessed 5 January 2018.
6. Ibrahim MM, Damasceno A. Hypertension in developing countries. Lancet. 2012;380(9841):611-9.
7. Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. Lancet. 2002;360(9349):1903-13.
8. Messerli FH, Williams B, Ritz E. Essential hypertension. Lancet. 2007;370(9587):591-603.
9. Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Bohm M, et al. 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. 2013;34(28):2159-219.
10. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, et al. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertent. 2003;42(6):1206-52.
11. Wei TM, Wang I. Anxiety symptoms in patients with hypertension: a community-based study. Int J Psychiatry Med. 2006;36(3):315-22.
12. D’Alonzo GE, Barst RJ, Ayres SM, Bergofsky EH, Brundage BH, Dette KM, et al. Survival in patients with primary pulmonary hypertension. Results from a national prospective registry. Ann Internal Med. 1991;115(5):343-9.
13. Hughes JS, Dove HG, Gifford Jr RW, Feinstein AR. Duration of blood pressure elevation in accurately predicting surgical cure of renovascular hypertension. Am Heart J. 1981;101(4):408-13.

14. Su TC, Lee YT, Chou S, Hwang WT, Chen CF, Wang JD. Twenty-four-hour ambulatory blood pressure and duration of hypertension as major determinants for intima-media thickness and atherosclerosis of carotid arteries. Atheroscl. 2006;184(1):151-6.

15. Alhadad A, Mattiasson I, Ivancev K, Gottsäter A, Lindblad B. Revascularisation of renal artery stenosis caused by fibromuscular dysplasia: effects on blood pressure during 7-year follow-up are influenced by duration of hypertension and branch artery stenosis. J Human Hypertens. 2005;19(10):761-7.

16. Kearney PM, Whelton PK, Reynolds K, Whelton PK, He J. Worldwide prevalence of hypertension: a systematic review. J Hypertens. 2004;22(1):11-9.

17. Mazzucchi A, Mutti A, Poletti A, Ravanetti C, Novarini A, Parma M. Neuropsychological deficits in arterial hypertension. Acta Neurol Scand. 1986;73(6):619-27.

18. Nieto FJ, Young TB, Lind BK, Shahar E, Samet JM, Redline S, et al. Association of sleep-disordered breathing, sleep apnea, and hypertension in a large community-based study. JAMA. 2000;283(14):1829-36.

19. Carlson JT, Hedner JA, Ejnell H, Peterson LE. High prevalence of hypertension in sleep apnea patients independent of obesity. Am J Resp Critical Care Med. 1994;150(1):72-7.

20. Hla KM, Young TB, Bidwell T, Palta M, Skatrud JB, Dempsey J. Sleep apnea and hypertension: a population-based study. Ann Int Med. 1994;120(5):382-8.

21. Shepard JJ. Hypertension, cardiac arrhythmias, myocardial infarction, and stroke in relation to obstructive sleep apnea. Clin Chest Med. 1992;13(3):437-58.

22. Marin JM, Agustí A, Villar I, Forner M, Nieto D, Carrizo SJ, Jelic S, et al. Association between treated and untreated obstructive sleep apnea and risk of hypertension. JAMA. 2012;307(20):2169-76.

23. Wolk R, Shamsuzzaman AS, Somers VK. Obesity, sleep apnea, and hypertension. Hypertens. 2003;42(6):1067-74.

24. Williams AJ, Houston D, Finberg S, Lam CH, Kinney JL, Santiago S. Sleep apnea syndrome and essential hypertension. Am J Cardiol. 1985;55(8):1019-22.

Cite this article as: Zehra SN, Anwar A, Kamran S, Jawaid H, Maheen S, Arif M. Effect of hypertension duration on relationship between blood pressure and signs and symptoms in hypertensive patients: a cross-sectional survey. Int J Res Med Sci 2019;7:2588-94.