Research Article

Descriptive Cross-Sectional Study on Knowledge, Awareness, and Adherence to Medication among Hypertensive Patients at a Tertiary Care Centre in Colombo District, Sri Lanka

S. Pirasath 1*, A. G. H. Sugathapala, 1 and K. Wanigasuriya 2

1 Colombo South Teaching Hospital, Kalubowila, Sri Lanka
2 Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

Correspondence should be addressed to S. Pirasath; selladurairpasath@gmail.com

Received 13 December 2019; Revised 10 June 2020; Accepted 23 June 2020; Published 3 August 2020

Objective. This study was aimed to assess the patient’s knowledge and awareness about hypertension and adherence to antihypertensive medication among hypertensive patients.

Methods. The descriptive cross-sectional study was conducted in three medical clinics of Colombo South Teaching hospital, Kalubowila, Sri Lanka, from April 2019 to September 2019. Total of 384 hypertensive patients were recruited by systematic randomized controlled sampling and interviewed with validated questionnaires to assess their knowledge about hypertension and adherence to antihypertensive medication. Data were analyzed using SPSS (version 21) analytical package, and the chi-squared test was performed.

Results. The total sample consisted of 384 hypertensive patients with a mean age of 59.32 (±12.34SD). This included 180 (46.9%) males and 204 (53.1%) females. The male: female ratio was approximately 9:10. Most of patients were with primary and ordinary educational status (65.9%), normal body mass index (54.9%), mild elevation of LDL cholesterol (76.3%), and coexistent ischemic heart disease (39.6%). The knowledge about hypertension among majority of patients was reasonable. However, they were unaware about normal values of blood pressure (69%, 95% of CI 1.92–2.09) and diagnostic values of hypertension (90.1%, 95% of CI 2.26–2.40). Moreover, they were unaware of their blood pressure values at time of diagnosis (75.3%, 95% of CI 2.09–2.25), at recent clinic visit (71.3%, 95% of CI 2.0–2.17), and target level (81.8%, 95% of CI 2.25–2.41). Most patients had adequate knowledge about the risk factors and complications of hypertension and were aware of their target organ damage (70.3%). Most patients believed that medication alone is not sufficient to control blood pressure (41.7%, 95% of CI 1.40–1.51) and adequate control of their blood pressure reduces complications (68.2%, 95% of CI 1.37–1.51). Most of the patients (71.8%) had reasonable good drug compliance. The forgetfulness was commonly attributed for nonadherence (69%, 95% of CI 1.26–1.36).

Conclusions. The knowledge about hypertension among majority of patients was reasonable. But, they were unaware about their disease status and their diagnosis, target, and recent blood pressure values. Most of patients had adequate knowledge about the risk factors and complications of hypertension. However, they were unaware about their target organ damage due to hypertension. The drug compliance was reasonable among them. The forgetfulness was common reason for nonadherence. Therefore, healthcare professionals should implement individualized educational programmes to increase the awareness of disease status, appropriate blood pressure levels, and adherence of treatment to improve the outcome of patients.

1. Introduction

Hypertension is a common noncommunicable disease and one of the major risk factors for stroke, coronary artery diseases, and chronic kidney disease [1]. Hypertension is a significant global burden among noncommunicable diseases which is a public health problem strongly related to the urbanization and socioeconomic changes favoring sedentary life style [2]. Effective health services are needed to control hypertension in the world because it has a major economic impact ranging from medical costs to human capital loss and decrease in productivity [3].
Prompt recognition of the importance of systolic blood pressure is mandatory for medical professionals as one of the major public health and medical challenges in the prevention and treatment of hypertension [4]. Screening for elevated systolic blood pressure (SBP) has been identified as an important medical challenge in the prevention and treatment of hypertension. The lack of knowledge and awareness on hypertension and its complications among public is a major barrier to diagnose hypertension. Patient education is a key component in the programs and interventions designed to control hypertension, so it is therefore important to assess the patients’ knowledge and awareness of hypertension. Efforts to control hypertension have included improving public knowledge and awareness on the risks and complications of hypertension. The good knowledge, awareness, and attitudes of hypertension among hypertensive population will lead to good control and reduce the complications of hypertension. This study was aimed to assess the patients’ knowledge and awareness of hypertension among hypertensive patients attending medical clinics in Colombo South Teaching hospital, Kalubowila, centre of western Sri Lanka.

2. Methods

2.1. Study Design, Period, and Participants. A cross-sectional study was conducted among hypertensive patients attending medical clinics, Colombo South Teaching Hospital, Kalubowila, from 1st April, 2019, to 30th September, 2019.

2.2. Sample Size and Sampling Technique. There were no previous studies carried out to evaluate the knowledge, awareness of hypertension, and adherence to medication among hypertensive patients attending medical clinics, Colombo South Teaching hospital, Kalubowila, Colombo. Therefore, sample size was calculated by a single population proportion formula considering 5% of absolute precision required on either side of the proportion, 0.5 of anticipated population proportion, and critical value (1.96) with specified confidence interval of 95%. With the addition of 5% nonresponse rate, the yield sample size was 384. The number of potentially eligible participants and who refused were 9649 and 24, respectively. The participants were selected by simple random sampling technique.

Sample size calculation is as follows:

\[ N = \frac{Z^2 p (1 - p)}{d^2} \]  (1)

where \( N \) is the minimal sample size, \( Z \) is the critical value (1.96) of specified confidence interval which is 95%, \( p \) is the anticipated population proportion (0.5), \( d \) is the absolute precision required on either side of the proportion (5%), and \( N = 384 \).

Therefore, the calculated minimum sample size according to the above equation is as follows.

A nonresponse rate of 5% is assumed. Thus, the final sample = 384.

The patients above 18 years who are mentally competent, previously diagnosed as hypertensive by consultant physicians, and attending to medical clinics for 3 months or more at Colombo South Teaching Hospital, Kalubowila, were included and those who were pregnant and those who were unable to give consent was excluded in this study.

2.3. Data Collection and Study Instruments. The pretested validated questionnaire was used to collect the data of knowledge, awareness of hypertension, and adherence to medication among the hypertensive patients. The variables which were studied in this research were sociodemographic variables, knowledge and awareness of hypertension, adherence to medications, and reasons for nonadherence.

2.3.1. Numerical Variables. The blood pressure measurements were measured by medical officers on day of interview, using a mercury sphygmomanometer, in a comfortable resting position, sitting with forearm supported and the palm upward. The target blood pressure of <130/80 mm Hg for patients with diabetes and chronic kidney disease and <140/90 mm Hg for patients with nondiabetic and non-chronic kidney disease (7) was considered as target levels. The weight and height were measured using a standard electronic weight scale and standard height scale, and BMI was calculated based on weight and height using standard equation (BMI = weight (kg)/height (m^2)). The cholesterol values were recorded from their clinic records.

2.3.2. Study Instruments

(1). Interviewer-Administered Pretested Questionnaires. The Hypertension Fact Questionnaire was designed as a tool, using the existing literature, practicing physicians, and cardiologists to assess the knowledge and awareness among the hypertensive patients. It was a pretested validated questionnaire. It was a self-prepared pretested questionnaire based on preexisting facts related to hypertension without copying originality and was obtained content expert validation of facts from two medical professors, two consultant physicians, one cardiologists, two senior registrars, and one highly qualified English, Sinhala, and Tamil teachers. It was pretested during the pilot study with patients. The questionnaire was initially designed in English and then translated to Sinhala and Tamil languages. The questionnaire consists of twenty-one and twelve questions with different appropriate responses to assess the patients’ knowledge and awareness on hypertension, respectively. The knowledge and awareness of hypertension among participants were calculated depending on the number of questions with the correct responses of each participant. Their medication adherence and the reasons for nonadherence were studied using the modified version based on the Morisky Medication Adherence Scale.

2.4. Data Analysis and Processing. The collected data were entered in Microsoft Excel sheet and were analyzed using SPSS (version 18) analytical package. The results were presented as counts, percentages, table of frequencies, and
mean ± SD for continuous variables. The significance was declared at \( P \) value less than 0.05 and presented using narrative texts and tables.

2.5. Ethical Issues

2.5.1. Ethical Approval. Ethical clearance was obtained from the ethical review committees, Colombo South Teaching Hospital, Kalubowila, and Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka, and was approved by the Board of Study, Postgraduate Institute of Medicine, University of Colombo. Informed written consent was obtained from all participants.

3. Results

3.1. Sociodemographic Pattern and Risk Factors of Respondents. The total sample consisted of 384 hypertensive patients with a mean age of 59.32 (±12.34SD). This included 180 (46.9%) males and 204 (53.1%) females. The male: female ratio was approximately 9:10. The majority of patients were Sinhalese in ethnicity (84.1%). Most of patients were with primary or ordinary level educational status (65.9%), normal body mass index (54.9%), mild elevation of LDL cholesterol (76.3%), and coexistent ischemic heart disease (39.6%) (Table 1).

3.2. Knowledge about Hypertension among Respondents. The mean response values of overall questions related to knowledge about hypertension among majority of patients was reasonable (72.3%). However, 31% (95% CI 1.92-2.09) patients were aware about the normal values of blood pressure, and only 9.9% (95% CI 2.26-2.40) patients were aware about the cutoff values of hypertension. 69% (95% CI 1.64-1.88) patients had thought that the blood pressure increased with age. 41.7% (95% CI 1.67-1.81) patients believed that medication alone is not sufficient to control blood pressure. Most patients were aware that uncontrolled blood pressure could lead to heart failure (71.9%, 95% CI 1.42-1.58), heart attack (88.3%, 95% CI 1.15-1.27), and stroke (77.1%, 95% CI 1.33-1.49), whilst fewer patients were aware of renal (55.2%, 95% CI 1.69-1.88) and ophthalmological (57%, 95% CI 1.61-1.79) complications. Most of patients had adequate knowledge about the risk factors for developing of hypertension (Table 2).

3.3. Awareness about Hypertension among Respondents. The patients were interviewed about awareness of hypertension with pretested validated questionnaires and results were shown in Table 3. 81.5% (95% CI 1.18-1.28) patients were unaware about their hypertensive diagnosis. However, 24.7% (95% CI 2.09-2.25) patients could recall their blood pressure values at the time of diagnosis and 18.2% (95% CI 2.25-2.41) patients were aware of their target values of blood pressure. 29.7% (95% CI 2.0-2.17) patients could recall the blood pressure values of last visit. 41.9% patients misbelieve that their blood pressure was normal or low on last visit. Most patients knew that hypertension is a serious medical issue. 97.6% (95% CI 1.40-1.51) patients were aware of taking their medication important to control their blood pressure. 68.2% (95% CI 1.37-1.51) patients believed that adequate control of their blood pressure reduces complications. 70.3% (95% CI 1.31-1.43) patients had awareness of their target organ damage due to hypertension (Table 3).

3.4. Medication Adherence of Hypertension among Respondents. All participants were interviewed about adherence to their medications and reasons for nonadherence. The questionnaire contains six questions, which had yes, no, and cannot remember type responses and one multiple choice question. The results are shown in Table 4. The reasons for nonadherence were asked among patients through eight universal reasons, and the responses are shown in Table 5. Most of the patients had reasonable good drug compliance. The forgetfulness (69%, 95% of CI 1.26-1.36) was the common reason for nonadherence of their medication. The impact of side effects and misbeliefs on compliance was minimal. The cost and availability of drugs at state hospital were not a problem among them.

The patient’s knowledge of risk factors and complications related to hypertension did not differ significantly with age, sex, and educational status (\( P > 0.05 \)). However, their awareness of diagnosis, diagnostic values, cutoff values, and target values of hypertension differed significantly with the educational status (\( P < 0.05 \)).

4. Discussion

The previous studies and our study have showed the similar findings indicating that although patients had good knowledge of hypertension, control of blood pressure remained suboptimal [5–7]. Moreover, in our study, most patients were unaware about the normal values of blood pressure (69%) and the cutoff values of hypertension (90.9%). Most of patients (81.5%) were aware about their hypertensive diagnosis. Furthermore, a large study by the Australian Heart Foundation in 1978 among hypertensive population showed that decreased level of knowledge and awareness with long term follow-up was 49% in 1978, 34% in 1993, and remained at 34% in 1998 [8]. Therefore, we think about patient’s practices and attitude towards hypertension which had a significant positive impact on BP control rather than knowledge.

The results were highlighted in a previous study in Northern Sri Lanka which showed that 40.5% of patients were unaware of hypertensive status even though 69.5% had adequate knowledge about hypertension [9]. Another study among 424 hypertensive patients in Eastern Sri Lanka also showed that 92% of people had inadequate knowledge on the disease, its complications, and management strategies of hypertension with a overall knowledge score of <50% [10] which is in contrast to our findings. Another study among 525 hypertensive patients in 3 different healthcare systems over a 1-year period showed a significant association between BP control and knowledge about normal BP [11]. However, our study showed that knowledge about the risk
Table 1: The selected sociodemographic characteristics and risk factors among hypertensive patients.

| Selected variables      | Numbers | Percentage | 95% confidence interval |
|-------------------------|---------|------------|-------------------------|
| Sex                     | Male    | 180        | 46.9                    | 1.48–1.58               |
|                         | Female  | 204        | 53.1                    |                        |
| Age (years)             |         |            |                         |                        |
| 20–29                   | 8       | 2.1        |                         |                        |
| 30–39                   | 15      | 3.9        |                         |                        |
| 40–49                   | 50      | 13.0       |                         |                        |
| 50–59                   | 114     | 29.7       |                         | 4.40–4.66              |
| 60–69                   | 105     | 27.3       |                         |                        |
| 70–79                   | 75      | 19.5       |                         |                        |
| 80–89                   | 16      | 4.2        |                         |                        |
| >90                     | 1       | 0.3        |                         |                        |
| Ethnicity               |         |            |                         |                        |
| Sinhala                 | 323     | 84.1       |                         |                        |
| Tamil                   | 34      | 8.9        |                         | 1.18–1.29              |
| Muslim                  | 25      | 6.5        |                         |                        |
| Others                  | 2       | 0.5        |                         |                        |
| Educational level       |         |            |                         |                        |
| No schooling            | 19      | 4.9        |                         |                        |
| Primary level           | 103     | 26.8       |                         |                        |
| Ordinary level          | 150     | 39.1       |                         |                        |
| Advanced level          | 90      | 23.4       |                         | 2.90–3.10              |
| Undergraduate level     | 14      | 3.6        |                         |                        |
| Postgraduate level      | 8       | 2.1        |                         |                        |
| Occupation              |         |            |                         |                        |
| Housewife               | 151     | 39.3       |                         |                        |
| Unemployed              | 46      | 12.0       |                         |                        |
| Self-employed           | 91      | 23.7       |                         |                        |
| Graduate student        | 4       | 1.0        |                         |                        |
| Business                | 30      | 7.8        |                         | 2.70–3.14              |
| Officers                | 21      | 5.5        |                         |                        |
| Professionals           | 16      | 4.2        |                         |                        |
| Retired officers        | 23      | 6.0        |                         |                        |
| Others                  | 2       | 0.5        |                         |                        |
| Monthly income (Sri Lanka rupees) |     |            |                         |                        |
| Rs < 14,999             | 94      | 24.5       |                         |                        |
| Rs 15,000–29,999        | 108     | 28.1       |                         |                        |
| Rs 30,000–44,999        | 82      | 21.4       |                         |                        |
| Rs 45,000–59,999        | 45      | 11.7       |                         |                        |
| Rs 60,000–74,999        | 22      | 5.7        |                         | 2.63–2.99              |
| Rs 75,000–89,999        | 12      | 3.1        |                         |                        |
| Rs > 90,000             | 7       | 1.8        |                         |                        |
| No income               | 14      | 3.6        |                         |                        |
| Smoking status          |         |            |                         |                        |
| Never smoked            | 278     | 72.4       |                         |                        |
| Ex smoker               | 63      | 16.4       |                         |                        |
| Current smoker          | 17      | 4.4        |                         | 1.41–1.63              |
| 1–3 days/week           | 11      | 2.9        |                         |                        |
| 4–6 days/week           | 6       | 1.6        |                         |                        |
| Everyday                | 9       | 2.3        |                         |                        |
| Alcoholic status        |         |            |                         |                        |
| Never took alcohol      | 275     | 71.6       |                         |                        |
| Ex alcoholic            | 86      | 22.4       |                         |                        |
| Current alcoholic       | 8       | 2.1        |                         | 1.32–1.48              |
| 1–3 days/week           | 9       | 2.3        |                         |                        |
| 4–6 days/week           | 5       | 1.3        |                         |                        |
| Everyday                | 1       | 0.3        |                         |                        |
| Body Mass Index (Kg/m²) |         |            |                         |                        |
| Underweight             | 10      | 2.6        |                         |                        |
| Normal                  | 211     | 54.9       |                         | 2.40–2.53              |
| Overweight              | 137     | 35.7       |                         |                        |
| Obese                   | 26      | 6.8        |                         |                        |
| Serum LDL cholesterol (mg/dL) |       |            |                         |                        |
| <100                    | 147     | 38.3       |                         |                        |
| 100–149                 | 146     | 38.0       |                         |                        |
| 150–199                 | 64      | 16.7       |                         | 1.89–2.12              |
| >200                    | 1       | 0.3        |                         |                        |
| Not available           | 26      | 6.8        |                         |                        |
factors for development of hypertension was adequate. Furthermore, patients were aware more about cardiac and neurological complications than renal and ophthalmological consequences in our study.

Recent research reports showed that hypertension knowledge is related to systolic blood pressure (SBP) control, and systolic blood pressure is a strong independent risk factor for cardiovascular mortality and morbidity [11]. However, critical elements of BP knowledge have not been adequately assessed or there is lack of data on whether patients understand the importance of their BP level, especially with regard to the systolic component of BP [12]. Recently, lack of knowledge of target systolic BP levels was shown to be an independent predictor of poor BP control. Therefore, assessment of awareness is importance in controlling their SBP. Most importantly, few patients could recall their blood pressure values at the time of diagnosis (24.7%) and were aware of their target values of blood pressure (18.2%) and could recall the blood pressure values of last visit (29.7%). Moreover, misbelief about blood pressure as either normal or low on the last visit was noted among them (41.9%).

Patients who were unaware of their

| Table 1: Continued. | Selected variables | Numbers | Percentage | 95% confidence interval |
|---------------------|--------------------|---------|------------|------------------------|
| Comorbidities       | IHD                | 152     | 39.6       |                        |
|                     | Stroke             | 7       | 1.8        |                        |
|                     | CKD                | 23      | 6.0        |                        |
|                     | IHD and CKD        | 24      | 6.3        | 3.97–4.55              |
|                     | IHD and stroke     | 5       | 1.3        |                        |
|                     | IHD, CKD, and stroke| 4      | 1.0        |                        |
|                     | None               | 169     | 44.1       |                        |

| Table 2: The patient’s knowledge on hypertension. | Questions | Response | Number | Percentage | 95% CI |
|--------------------------------------------------|-----------|----------|--------|------------|--------|
| Knowing normal values of BP                       | Correctly known | 119     | 31.0   | 1.92–2.09  |
|                                                  | Wrongly known  | 41      | 10.7   |            |
|                                                  | Not known      | 224     | 58.3   |            |
| Knowing the cutoff values of HT                   | Correctly known | 38      | 9.9    |            |
|                                                  | Wrongly known  | 54      | 14.1   | 2.26–2.40  |
|                                                  | Not known      | 292     | 76.0   |            |
|                                                  | Increased      | 265     | 69     |            |
|                                                  | Decreased      | 22      | 5.7    | 1.64–1.88  |
| BP correlation with age                           | No effect      | 22      | 5.7    |            |
|                                                  | Not known      | 75      | 19.5   |            |
|                                                  | Common among male | 104    | 27.1   |            |
|                                                  | Common among female | 75    | 19.5   |            |
| BP correlation with sex                           | Equal among both sex | 73    | 19.0   | 2.49–2.73  |
|                                                  | Not known      | 132     | 34.4   |            |
|                                                  | Sufficient     | 162     | 42.2   |            |
| Control of BP with medication alone               | Insufficient   | 160     | 41.7   | 1.67–1.81  |
|                                                  | Not known      | 62      | 16.1   |            |
| Knowledge about complications of HT                | Yes            | 163 (42.4%) | 82 (21.4%) | 139 (36.2%) | 1.85–2.03 |
|                                                  | No             | 84 (21.9%)  | 37 (9.6%)  | 1.15–1.27  |
|                                                  | Not known      | 139 (36.2%) | 104 (27.1%) | 1.61–1.79  |
| Knowledge about risk factors of HT                 | Increased      | 279 (71.9%) | 13 (3.2%)  | 12 (3.1%)  | 84 (21.9%) | 1.33–1.54 |
|                                                  | Decreased      | 319 (83.1%) | 1 (0.3%)   | 14 (3.6%)  | 50 (13.0%) | 1.36–1.57 |
|                                                  | No effect      | 189 (49.2%) | 4 (1.6%)   | 71 (18.5%) | 118 (30.7) | 2.17–2.44 |
|                                                  | Not known      | 304 (79.2%) | 3 (0.8%)   | 20 (5.2%)  | 57 (14.8%) | 1.45–1.67 |
|                                                  | Excess salt consumption | 308 (80.2%) | 5 (1.3%)   | 18 (4.7%)  | 53 (13.8%) | 1.41–1.63 |
|                                                  | Lack of physical activity | 302 (78.6%) | 14 (3.6%)  | 17 (4.4%)  | 51 (13.3%) | 1.43–1.65 |
|                                                  | Overweight     | 308 (80.2%) | 2 (0.5%)   | 18 (4.7%)  | 56 (14.6%) | 1.60–1.85 |
|                                                  | Family history | 278 (72.4%) | 3 (0.8%)   | 34 (8.9%)  | 69 (18.0%) | 1.47–1.70 |
|                                                  | Aging          | 303 (78.9%) | 4 (1.0%)   | 12 (3.1%)  | 65 (16.9%) | 1.65–1.70 |
blood pressure thought that physicians did not emphasize the significance of blood pressure levels at clinic. These results strongly suggest that education of patients by health professionals at clinic visits was related to the importance of elevated blood pressure and cardiovascular risk. A recent study from Canada found a positive impact of BP tracker and patient education on hypertension knowledge at clinic visits [13]. Therefore, the access to patients’ clinic blood pressure data and perception of factors should be measured and evaluated at clinic visits. It is important to assess the extent of awareness of control of blood pressure levels among patients at clinics. That will be helpful to be part of

### Table 3: The patient’s awareness on hypertension.

| Questions                                | Response       | Numbers | Percentage | 95% CI  |
|------------------------------------------|----------------|---------|------------|---------|
| Knowing about diagnosis of HT            | Well known     | 313     | 81.5       |         |
|                                          | Unsure         | 53      | 13.8       | 1.18–1.28|
|                                          | Not known      | 18      | 4.7        |         |
|                                          | Correctly known| 95      | 24.7       |         |
| Knowing the values of BP at diagnosis    | Wrongly known  | 130     | 33.9       | 2.09–2.25|
|                                          | Not known      | 159     | 41.4       |         |
|                                          | Correctly known| 70      | 18.2       |         |
| Knowing target values of BP              | Wrongly known  | 117     | 30.5       | 2.25–2.41|
|                                          | Not known      | 197     | 51.3       |         |
|                                          | Correctly known| 114     | 29.7       |         |
| Knowing BP values of last clinic visit   | Wrongly known  | 127     | 33.1       | 2.0–2.17 |
|                                          | Not known      | 143     | 37.2       |         |
|                                          | Very serious   | 165     | 42.9       |         |
| Seriousness of high BP                   | Serious        | 183     | 47.7       | 1.61–1.74|
|                                          | Not serious    | 36      | 9.4        |         |
| Importance of medication to control BP   | Important      | 158     | 41.1       | 1.40–1.51|
|                                          | Not important  | 9       | 2.3        |         |
|                                          | Well known     | 262     | 68.2       |         |
| Good BP control reducing complications   | Unsure         | 73      | 19.0       | 1.37–1.51|
|                                          | Not known      | 49      | 12.8       |         |
|                                          | Well known     | 270     | 70.3       |         |
| HT leading to target organ damage        | Unsure         | 85      | 22.1       | 1.31–1.43|
|                                          | Not known      | 29      | 7.6        |         |

#### Target organ damage

| Question | Well known | Unsure | Not known | 95% CI |
|----------|------------|--------|-----------|--------|
| Kidney   | 216 (56.3%)| 71 (18.5%)| 97 (25.3%)| 1.60–1.78|
| Heart    | 327 (85.2%)| 30 (7.8%)| 30 (7.8%)| 1.16–1.27|
| Brain    | 255 (66.4%)| 76 (19.8%)| 76 (19.8%)| 1.40–1.55|
| Eye      | 215 (56.0%)| 86 (22.4%)| 83 (21.6%)| 1.57–1.74|

### Table 4: The patient’s medication adherence of hypertension.

| Questions                                | Yes Response No | Can’t remember | 95% CI |
|------------------------------------------|-----------------|----------------|--------|
| Taking drugs regularly till last month  | 238 (62%)       | 101 (26.3%)  | 45 (11.7%)| 1.45–1.59|
| Taking drugs regularly for last 2 weeks | 278 (72.4%)     | 75 (19.5%)   | 31 (8.1%)| 1.32–1.46|
| Taking drugs regularly yesterday         | 303 (78.9%)     | 68 (17.7%)   | 13 (3.4%)| 1.22–1.33|
| Stopping drugs due to side effects       | 55 (14.3%)      | 300 (78.1%)  | 29 (7.6%)| 1.90–2.0  |
| Taking drugs outside home stay           | 212 (55.2%)     | 106 (27.6%)  | 66 (17.2%)| 1.80–1.91|
| Stopping drugs due to normal BP level    | 85 (22.1%)      | 272 (70.8%)  | 27 (7.0%)| 1.56–1.72|

#### Missing data

| Forgetting to take drugs in the past | Numbers | Percentage | 95% CI |
|-------------------------------------|---------|------------|--------|
| Never                               | 178     | 46.4       | 1.77–1.96|
| Rarely                              | 99      | 25.8       |         |
| Sometimes                           | 88      | 22.9       |         |
| Frequently                          | 19      | 4.9        |         |

### Table 5: The reasons for nonadherence of medication among hypertensive patients.

| Reasons                        | Numbers | Percentage | 95% CI |
|--------------------------------|---------|------------|--------|
| Poor knowledge of HT           | 77      | 20.1       | 1.77–1.86|
| Poor knowledge of medication   | 68      | 17.7       | 1.79–1.86|
| Religious beliefs              | 34      | 8.9        | 1.88–1.94|
| Lack of belief on medication   | 56      | 14.6       | 1.82–1.89|
| Side effects of medication     | 61      | 15.9       | 1.80–1.88|
| Forgetfulness                  | 265     | 69.0       | 1.26–1.36|
| Out of supply of medication    | 51      | 13.3       | 1.83–1.90|
| Cost of medication             | 39      | 10.2       | 1.87–1.93|
Educational programs and interventions designed to improve the control of hypertension. Furthermore, another study showed an improvement in both BP control and drug adherence, whilst patients were educated to measure their own BP and chart it, along with their drug-taking schedule as well [14].

Prescriptions of the multiple drugs and poor compliance of the patients are major challenges in clinical practices that result in failure of treatment of hypertension. Hypertension is mostly a chronic asymptomatic condition. Therefore, patients may not feel any physical symptoms and may forget to take their medicine or feel that there is no need to take them until they know the need to take drugs regularly for a long time. Our study showed that most patients have known that hypertension is a serious medical issue and were aware of taking their medication important to control their blood pressure with reasonable drug compliance. Furthermore, our research showed various reasons for patients not taking antihypertensive drugs. Among them, forgetfulness was common reason for nonadherence of their medication. Some people thought taking drugs was unnecessary as they were not experiencing symptoms of hypertension. Some of them preferred traditional medicines and have not taken due to religious misbeliefs. An article which reviewed adherence to cardiovascular medications from among 76 studies showed same findings. The poor knowledge, negative perception about medication, side effects, and high medication cost were the most common predictors of poor drug adherence [15]. Socioeconomic factors of drug nonadherence, such as medication cost and lack of availability of drugs, were also essential factors for drug adherence which was also observed in our study. Furthermore, drug adherence could be improved by enhancing access to drugs by sustainable financing, affordable prices, and reliable supply systems [16].

Lifestyle interventions have the potential to reduce the need or number of medications in treatment of hypertension which includes reduced alcohol intake, reduced sodium chloride intake, increased physical activity, and control of overweight. In addition, several studies have showed globally that demographic factors increase the risk of uncontrolled hypertension among hypertensive patients [17, 18]. Our results showed that the majority of patients were overweight and had high cholesterol level and sedentary life style. Moreover, our study demonstrated significant associations of hypertension control status with demographic characteristics and lifestyle factors such as smoking and alcohol drinking. Even though most patients were aware of risk factors of hypertension in our study, practicing life style intervention was minimal among them. Regular physical activities reduce BP through decreased body weight or favorable changes in body fat distribution. These findings also point out that the importance of having health education concerning physical activity and maintenance of normal body weight for patients with high BP [19]. Furthermore, individualized evaluation of perception, attitudes, beliefs, and outcome expectations is crucial role to understand observed behavioral change.

According to Farquhar’s model of behavior change, our study results showed most patients had sufficient knowledge about hypertension, but only a few showed real motivations to change [20]. Moreover, few patients have interested in a behavioral change during conversation with them to control their hypertension in future. We also had opportunity to educate their hypertensive status in order to improve their awareness of hypertension at the end of the study. Moreover, physicians and healthcare professionals have identified mass media programs, printing materials, and video conferences as major sources to improve their knowledge and awareness of hypertension. Control of SBP and improved compliance should be achieved through an educational program that at least leads a concept of “knowing high BP” [21]. This recent research portrays the need to improve knowledge and awareness of hypertension in order to improve the medication adherence and optimum blood pressure control.

5. Conclusions and Recommendations

Our study revealed that the patients of a tertiary care hospital had sufficient general knowledge of hypertension but were unaware about their disease status and their diagnosis, target and recent blood pressure values, and about their target organ damage. Most of patients had adequate knowledge about the risk factors and complications of hypertension. Most of the patients had reasonable good drug compliance. The forgetfulness was commonly attributed for non-adherence. It is important to assess the extent of awareness of control of blood pressure levels among patients. That will be helpful to be part of educational programs and interventions designed to improve the control of hypertension. Therefore, healthcare professionals should implement individualized educational programmes to increase the awareness of disease status, appropriate blood pressure levels and adherence of treatment to improve outcome of patients. This study specifies potential areas where appropriate education of not only hypertension but also BP control could be an apt tool for the improvement of hypertension knowledge of patients.

5.1. Limitation of Study. We have not carried out a study to assess the knowledge, awareness, and medication adherence following the educational interventions. Therefore, further large-scale studies should be carried out to assess the participants’ perceptional level following interventions.

Abbreviations

BP: Blood pressure  
CI: Confidence interval  
CKD: Chronic kidney disease  
HT: Hypertension  
IHD: Ischemic heart disease  
LDL: Low-density cholesterol  
SBP: Systolic blood pressure  
SD: Standard deviation.
Data Availability
The data used to support the findings of this study are available from the corresponding author upon request.

Ethical Approval
Ethical approval was obtained from Ethical Review committee, Colombo South Teaching Hospital, Kalubowila, and Ethical Review committee, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

Consent
The study purpose, right to withdraw from the study without any repercussions, and confidentiality issues were explained, and informed consent was obtained from the participants. The confidentiality and anonymity were maintained throughout the study.

Conflicts of Interest
The authors declare that they have no conflicts of interest of this paper.

Authors’ Contributions
SP was the principal investigator who contributed to the conception and design of study, collected, entered, analyzed, and interpreted data, drafted the manuscript, and is the corresponding author of this paper. AGHS and KW were the supervisors who contributed to design of study and supervision, drafted the manuscript, and provided the consultations on the reasons contributing to management and on recommendations forwarded. All the authors read and approved the manuscript.

Acknowledgments
We would like to thank the Director, Colombo South Teaching Hospital, for granting permission to conduct our research at medical clinics. We would also like to thank the staff in charge of medical clinics for their genuine cooperation. Our gratitude also goes to data collectors for their hard work and patience in obtaining necessary information. Our special thanks also go to participants who generously shared their knowledge, attitude, and practices of their disease. The study was supported by the Ranji Wikramanayake Research grant by Ceylon College of Physicians in the year 2019.

References
[1] F. H. Messerli, B. Williams, and E. Ritz, “Essential hypertension,” The Lancet, vol. 370, no. 9587, pp. 591–603, 2007.
[2] P. M. Kearney, M. Whelton, K. Reynolds, P. Muntner, P. K. Whelton, and J. He, “Global burden of hypertension: analysis of worldwide data,” The Lancet, vol. 365, no. 9455, pp. 217–223, 2005.
[3] W. J. Elliott, “The economic impact of hypertension,” The Journal of Clinical Hypertension, vol. 5, no. 3, pp. 3–13, 2003.
[4] S. A. Olivera, R. S. Chen, B. D. McCarthy, C. C. Davis, and M. N. Hill, “Hypertension knowledge, awareness, and attitudes in a hypertensive population,” Journal of General Internal Medicine, vol. 20, no. 3, pp. 219–225, 2005.
[5] A. J. Viera, L. W. Cohen, C. M. Mitchell, and P. D. Sloane, “High blood pressure knowledge among primary care patients with known hypertension: a North Carolina family medicine research network (NC-FM-RN) study,” Journal of American Board of Family Medicine, vol. 21, no. 4, pp. 300–308, 2008.
[6] P. A. Sarafidis, S. Li, S.-C. Chen et al., “Hypertension awareness, treatment, and control in chronic kidney disease,” The American Journal of Medicine, vol. 121, no. 4, pp. 332–340, 2008.
[7] P. Muntner, A. Anderson, J. Charleston et al., “Hypertension awareness, treatment, and control in adults with CKD: results from the chronic renal insufficiency cohort (CRIC) study,” American Journal of Kidney Diseases, vol. 55, no. 3, pp. 441–451, 2010.
[8] A. Schmeiser-Rieder and U. Kunze, “Blood pressure awareness in Austria. A 20-year evaluation,” European Heart Journal, vol. 21, no. 5, pp. 414–420, 2000.
[9] S. Pirasath, T. Kumanan, and M. Guruparan, “A study on knowledge, awareness, and medication adherence in patients with hypertension from a tertiary care centre from northern Sri Lanka,” International Journal of Hypertension, vol. 2017, pp. 1–6, 2017.
[10] G. Kisokanth, I. Ilankoon, K. Arulanandem, C. Goonewardena, K. Sundaresan, and J. Joseph, “Assessment of knowledge on hypertension, its consequences and management practices among hypertensive patients - a descriptive study,” Journal of the Postgraduate Institute of Medicine, vol. 30, no. 3, pp. 1–11, 2016.
[11] E. L. Knight, R. L. Bohn, P. S. Wang, R. J. Glynn, H. Mogun, and J. Avorn, “Predictors of uncontrolled hypertension in ambulatory patients,” Hypertension, vol. 38, no. 4, pp. 809–814, 2001.
[12] J. L. Izzo, D. Levy, and H. R. Black, “Importance of systolic blood pressure in older Americans,” Hypertension, vol. 35, no. 5, pp. 1021–1024, 2000.
[13] A. D. K. Bowry, W. H. Shrank, J. L. Lee, M. Stedman, and N. K. Choudhry, “A systematic review of adherence to cardiovascular medications in resource-limited settings,” Journal of General Internal Medicine, vol. 26, no. 12, pp. 1479–1491, 2011.
[14] M. G. Dawes, J. Kaczorowski, G. Swanson, J. Karwalajtys, and T. Karwalajtys T, “The effect of a patient education booklet and BP ‘tracker’ on knowledge about hypertension. a randomized controlled trial,” Family Practice, vol. 27, no. 5, pp. 472–478, 2010.
[15] P. Pound, N. Britten, M. Morgan et al., “Resisting medicines: a synthesis of qualitative studies of medicine taking,” Social Science & Medicine, vol. 61, no. 1, pp. 133–155, 2005.
[16] E. I. Schafheutle, K. Hassell, P. R. Noyce, and M. C. Weiss, “Access to medicines: cost as an influence on the views and behaviour of patients,” Health and Social Care in the Community, vol. 10, no. 3, pp. 187–195, 2002.
[17] E. Degli Esposti, M. Di Martino, A. Sturani et al., “Risk factors for uncontrolled hypertension in Italy,” Journal of Human Hypertension, vol. 18, no. 3, pp. 207–213, 2004.
[18] G. Hu, H. Pekkarinen, O. HÄNninen, Z. Yu, Z. Guo, and H. Tian, “Commuting, leisure-time physical activity, and cardiovascular risk factors in China,” Medicine and Science in Sports and Exercise, vol. 34, no. 2, pp. 234–238, 2002.
[19] M. Thoenes, P. Bramlage, S. Zhong, S. Shang, M. Volpe, and D. Spirko, “Hypertension control and cardiometabolic risk: a
regional perspective,” *Cardiology Research Practice*, vol. 1, pp. 1–10, 2012.

[20] J. W. Farquhar, N. Maccoby, and P. D. Wood, “Education and communication studies,” in *Oxford Textbook of Public Health*, W. W. Holland, R. Detels, and G. Knox, Eds., pp. 207–221, Oxford University Press, Oxford, UK, 1985.

[21] F. Saleem, M. Hassali, A. Shafie, A. Awad, and S. Bashir, "Association between knowledge and drug adherence in patients with hypertension in Quetta, Pakistan,” *Tropical Journal of Pharmacology*, vol. 10, pp. 125–132, 2011.