

Knowledge regarding the accurate measurement of blood pressure among intern medical officers practising at three teaching hospitals in Sri Lanka: A cross-sectional analysis

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Abstract

Introduction: Hypertension is a major risk factor for cardiovascular and renal diseases. Accurate measurement of blood pressure as per existing guidelines is of paramount importance in the management of hypertension.

Objective: To describe knowledge of current guidelines regarding the accurate measurement of blood pressure by an auscultatory method with a manual sphygmomanometer among Intern Medical Officers practising at the National Hospital of Sri Lanka, Teaching Hospital, Kandy and Teaching Hospital, Jaffna.

Methods: A cross-sectional survey was carried out among newly qualified doctors, practicing at the National Hospital of Sri Lanka, Teaching Hospital, Kandy and Teaching Hospital, Jaffna. A self-administered questionnaire was used to collect data. Data were analyzed using SPSS 28.

Results: Of 79 newly qualified doctors who participated, the majority (64.6%) were males, and mean age was 28.24 (range of 24-32) years. A significant proportion (45.6%) answered less than 8 (8=median) questions correctly, out of 15 questions intended to assess knowledge regarding accurate blood pressure measurement.

Conclusions: Knowledge regarding accurate measurement of blood pressure among newly qualified doctors was suboptimal. Junior doctors should be motivated to improve their knowledge and skills of blood pressure measurement through regular in-service training.

Key words: blood pressure measurement, Sri Lanka, newly qualified doctors, hypertension


Introduction

Elevated blood pressure (BP) is an independent, consistent, and important risk factor for cardiovascular and renal disease and is a major public health concern.¹ Accurate measurement of BP is important in the diagnosis and management of hypertension. BP measurement also plays a vital role in epidemiological research and is critical for the effective practice of clinical medicine.

The most widely practiced method of measuring BP within the Sri Lankan health care system is the manual auscultatory method using a stethoscope and a sphygmomanometer. With this method, the training and skills of the practitioner are the most influential factors in determining accurate blood pressure readings.² Geoffrey Rose classified observer error into three categories: systematic error that leads to both intra-observer and inter-observer error, terminal digit preference which results in the observer rounding off the pressure reading to a digit of his or her choosing, most often to zero and observer prejudice or bias, whereby the observer simply adjusts the pressure to meet his or her preconceived notion of what the pressure should be.³ Inaccurate measurement leads to an overestimation of blood pressure and mislabeling of patients as hypertensive, resulting in unnecessary treatment and side effects of medications.^{4,5} In some instances, underestimation of blood pressure may result in poor control of BP overall.

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The error in BP measurement is greater when the cuff is too small relative to the patient's arm circumference, as noted in several studies.^{6,7,8} Although blood pressure should be read to the nearest 2 mmHg, previous research has noted a tendency of rounding off figures, leading to an excess in the recording of zero or five as the last digit in auscultatory BP determinations.^{9,10} It has also been reported that multiple BP determinations provide better predictive power than a single reading. It is recommended to take a minimum of two readings after an interval of one minute and to record the average of the readings.¹¹

There are published national and international guidelines for the accurate measurement of blood pressure.¹²⁻¹⁵ A study conducted among 150 medical students in the United States of America, in which an eleven-element skill set for measuring BP was assessed, showed that only one student was proficient in all eleven skills.¹⁶ There is a scarcity of studies in this area in Sri Lanka. Therefore, this study was designed to describe knowledge of current guidelines for accurate measurement of BP by auscultatory method with a manual sphygmomanometer among Intern Medical Officers (IMOs) practicing at three major university teaching hospitals in the country.

Methods

This cross-sectional survey was conducted among IMOs currently practicing at the National Hospital of Sri Lanka in Colombo, Teaching Hospital, Kandy and Teaching Hospital, Jaffna.

IMOs who had graduated within the preceding 12 months (1st November 2020 to 31st December 2021) were included. A convenient sampling technique was used on all doctors who met the inclusion criteria.

A pretested self-administered questionnaire was shared through the Google platform. The questionnaire consisted of two parts, basic socio-demographic variables, and questions regarding BP measurement. Fifteen factors considered important when measuring BP were used to assess knowledge of the participants. These factors were adopted from national and international guidelines for BP measurement.^{12,13} All fifteen questions provided four possible answers with only one answer being correct and participants were asked to select the answer they felt was correct.

Ethical clearance was obtained from the Ethical Review Committee of the Faculty of Medicine, General Sir John Kotelawala Defense University.

All relevant data were extracted manually from completed questionnaires, entered on an Excel spreadsheet, and transferred and analyzed on the SPSS-28 version. Descriptive statistics were calculated. Chi-square test was used to determine differences between the groups. A p-value less than 0.05 was considered statistically significant.

Results

The total number of newly qualified doctors who agreed to take part in the survey within one year of qualification was 79. Seventy-eight participants were graduates of Sri Lankan universities and one had graduated from a university overseas. As shown in Table 1, the mean age of the participants was 28.24 (range 24-32) years, and 64.6% were male. The majority (57.0%) were practicing at the National Hospital of Sri Lanka, followed by Teaching Hospital, Jaffna (27.8%), and Teaching Hospital, Kandy (15.2%).

Answers given to the questionnaire comprising 15 factors that should be assessed when measuring BP are summarized in Table 2. Only 27 (34.2%) participants correctly answered the question regarding the number of readings to be taken when measuring BP. Only 34 (43%) correctly answered regarding the accuracy of a BP reading (i.e. BP should be read to the nearest 2 mmHg). Most participants (84.8%) were unaware that diastolic pressure increases when sitting with an unsupported back.

The mean score for correctly answered questions was 7.81 ± 2.3 and the median was 8, with a minimum score of 2 and a maximum of 14. A median score (8) was used to classify the participants' knowledge regarding the accurate measurement of BP into two categories – poor knowledge (<8) and good knowledge (≥ 8). Of 79 newly qualified doctors, 43 (54.43%) correctly answered more than 8 questions regarding accurate blood pressure measurement. Bivariate analysis between knowledge score and selected socio-demographic variables [(age ($p=0.09$), sex ($p=0.19$), current workplace ($p=0.25$), graduated university ($p=0.96$), and duration since graduation ($p=0.31$)] failed to show a significant association.

Table 1. Demographic characteristics of newly qualified doctors enrolled in the study

<i>Variable</i>	<i>Statistics</i>
Age (years)	Mean 28.24 (Range 24-32)
Duration since graduation (months)	Mean \pm SD-8.20 \pm 2.77
Gender	Male Female
	51 (64.6%) 28 (35.4%)
Current workplace	
	National Hospital of Sri Lanka Teaching Hospital, Jaffna Teaching Hospital, Kandy
	45 (57.0%) 22 (27.8%) 12 (15.2%)
University	
University of Jaffna	19 (24.1%)
University of Colombo	14 (17.7%)
University of Peradeniya	5 (6.3%)
University of Kelaniya	9 (11.4%)
Eastern University	1 (1.3%)
University of Sri Jayewardenepura	10 (12.7%)
Rajarata University	5 (6.3%)
University of Ruhuna	6 (7.6%)
General Sir John Kotelawala Defense University	9 (11.4%)
Overseas University	1 (1.3%)

Table 2. Results of assessment of knowledge on blood pressure measurement

<i>Question: Correct answer</i>	<i>Correct response: Number (%)</i>
1. Resting the patient prior to BP measurement: Rest the patient at least 5 minutes prior to the measurement	36 (45.6%)
2. Position of patient's legs whilst measuring BP: Both legs should be uncrossed and upstretched	63 (79.7%)
3. Position of patient's feet during BP measurement: Both feet should be on the floor	48 (60.8.9%)
4. Arm support during BP measurement: The arm should be fully supported	41 (51.9%)
5. Position of the forearm for BP measurement: The forearm should be at the level of the heart	53 (67.2%)
6. Cuff size: Cuff size should encircle 75 per cent or more of the patient's arm circumference	63 (79.7%)

(Continued)

7. Placing of cuff: The cuff should be placed over the bare arm	65 (82.3%)
8. Patient talking while measuring BP: No talking when BP is being measured	47 (59.5%)
9. The arm for BP measurement for the first time: BP should be measured in both arms	49 (62%)
10. Number of readings to be taken: Two readings and an average should be taken	27 (34.2%)
11. Accuracy of BP reading: BP should be read to the nearest 2 mmHg	34 (43%)
12. Clinically important BP reading in consecutive time intervals: The higher BP reading	13 (16.5%)
13. Correct arm to use for future BP measurements: Arm with the higher BP reading	30 (30.8%)
14. Effect of unsupported back on blood pressure measurement: Increases diastolic pressure	12 (15.2%)
15. Effect of crossing the legs on blood pressure measurements: Increases systolic pressure	31 (39.2%)

Discussion

The overall level of awareness of the participants regarding factors that affect BP measurements using the auscultatory method with a manual sphygmomanometer was relatively low with none of the questions receiving a 100% correct answer. The majority (54.4%) answered more than 8 questions correctly, which was considered 'good knowledge'. These results are similar to a study conducted among medical and nursing students in Spain, where 51.8% had good knowledge.¹⁶ However, a study conducted in Nigeria among the clinical staff of a tertiary hospital revealed that only 26.5% had good knowledge regarding BP measurement guidelines.¹⁷ Several studies from various parts of the world have previously reported poor knowledge of BP measurement guidelines.^{18,19,20} There was no significant association of knowledge level with socio-demographic variables such as age, sex, current workplace, graduated university, and duration since graduation, possibly due to the small sample size. A previous study reported poor knowledge of BP measurement (87.4% versus 52.4%, $P < 0.001$) among females compared to males.¹⁷

Reflecting the conclusions of studies from other countries,^{16,17,21,22,23} the results of this study too clearly indicate that there is an unmet need for newly qualified medical practitioners to appreciate and consistently implement the factors that may affect BP measurements using the auscultatory method while utilizing a manual sphygmomanometer.

Limitations

The main limitation of this study is the small sample size which limits the generalization of the findings. The other limitation is the study method, since the most accurate assessment of knowledge of BP measurement is direct observation of participants measuring BP of patients, rather than using a questionnaire. The collection of more data in the questionnaire (whether the correct technique was taught at any stage in the medical school curriculum, correlation of marks with final MBBS results of participants, etc.) would also have improved the results of this study.

Conclusion

The results of this survey indicate that newly qualified medical practitioners are not fully proficient in all the aspects of knowledge and skills needed to determine BP accurately, even though this is an important clinical skill taught in medical schools. It is therefore essential that current methods of teaching and testing the correct method of BP measurements using the auscultatory method with a manual sphygmomanometer be evaluated with well-designed studies addressing the limitations of this study. Wall charts in areas where BP measurements are taken depicting and constantly reminding the correct procedure, leaflets for patients explaining the correct procedure when measuring BP, and in-service training of doctors will help to improve the accuracy of BP measurement by doctors and optimize the diagnosis and management of hypertension.

Author declarations

Ethical approval and consent to participate

Ethical approval for this study was obtained from the Ethics Review Committee of the Faculty of Medicine, General Sir John Kotelawala Defense University. Informed consent was obtained from all the participants prior to recruitment to the study.

Competing interests

The authors declare that they have no competing interests.

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