

BLOOD PRESSURE MEASUREMENT KNOWLEDGE AMONG FINAL YEAR MEDICAL STUDENTS AN INTERVENTIONAL PRE-POST ANALYSIS

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ABSTRACT

Objective: The objective of the current study was to assess the education intervention impact on their knowledge regarding blood pressure measurement and diagnosis.

Method: An interventional study was conducted among medical students at Xi'an Jiaotong University, health science centre, Shaanxi, China. The study participant was final year's medical student who completed the compulsory internship. A self-developed and validated questionnaire was used in the current study. An educational intervention was conducted by one author (MK) who had good hands-on blood pressure measurement. The data was analyzed using SPSS v25.

Result: A total of 94 students were participated in the study. Overall knowledge regarding hypertension diagnosis was significantly improved in post intervention group. The participant knowledge was significant increased regarding preparation of patient before taking of blood pressure ($p > 0.001$) and impact of cuff size on blood pressure reading in ($p > 0.001$) post intervention compared to pre-intervention. In addition, participants significantly more knowledgeable regarding impact of nervousness and cold on false diagnosis of blood pressure ($p > 0.001$) and time of subsequent measurement of blood pressure in post intervention group ($p > 0.001$).

Conclusion: The medical education intervention regarding blood pressure measurement and diagnosis significantly improved the medical student knowledge.

Keywords: Medical education, intervention, blood pressure measurement, medical students

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Email: Dr.usmle2021@gmail.com**Statements and Declaration****Competing Interests:** The authors declare that they have no conflict of interest**Funding:** Non**Author contributions**

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Acknowledgements: The authors are thankful to the All Final Year Medical Student of Xi'an Jiaotong University School Of Medicine for their kind cooperation and Respond.**DOI:** <https://doi.org/10.5281/zenodo.10823312>**INTRODUCTION**

Arterial hypertension (AHT) is a complex chronic disease, often referred to as a "silent killer," and is a leading risk factor for mortality [1]. High blood pressure is the top among 30 risk factors for diseases leading to the highest levels of disability-adjusted life years [2]. According to the World Health Organization (WHO), hypertension affects 45% of the global population and is responsible for 12.8% of all deaths and 7.5 million premature deaths [3]. Additionally, there is a significant association between hypertension and mortality rates from COVID-19 [4]. These findings highlight the considerable global impact of hypertension.

The diagnosis and ongoing assessment of hypertensive patients involve the measurement of blood pressure, necessitating a precise measurement technique. Primary Care (PC) settings offer an optimal environment for the application of protocols and clinical practice guidelines (CPG) for the diagnosis and management of hypertension [5, 6]. However, the implementation of these protocols requires specific knowledge and training of medical and nursing professionals. Despite the importance of this, there is a scarcity of literature evaluating this procedure, and the methodology employed often lacks rigor [7, 8]. Additionally, there have been reports of non-adherence to monitoring recommendations and numerous errors in the execution of this technique. Furthermore, it is worth noting that there has been a decline in awareness and control among patients with hypertension in recent years, potentially attributed to inadequate therapeutic education provided by healthcare professionals [9].

Therefore, it is necessary to develop a series of strategies and actions to improve knowledge and skills in the initial diagnosis of hypertension employing tactics especially aimed at continuing education for medical students. Therefore, the current study was conducted to assess the education intervention impact on their knowledge regarding blood pressure measurement and diagnosis.

Method**Study design, participant and setting**

An interventional study was conducted among medical students at second affiliated Hospital of Xi'an Jiaotong University, China is a state-of-the-art

tertiary care hospital located in shaanxi, china. It was established in 1956 and has a capacity of over 2300 beds and offers a wide range of medical and surgical specialties including cardiology, neurology, gastroenterology, oncology, and orthopedics. The period was six month (March- 2023 – August -2023). The study participant was final years medical student who completed the compulsory internship.

Sample size

The sample size was calculated using Raosoft sample size calculator with a margin of error of 5% and a confidence level of 95%, and with an estimated population size of 114 final medical students at Xi'an Jiaotong University. An extra 5% of the calculated sample size was added to make allowances for attrition. This made total sample size of 94.

Study instrument and data collection

The initial draft of the questionnaire was prepared based on the previous published literature[5, 6, 8, 10-12]. The face-validation was conducted by the two experts (one from cardiology and one from internal medicine). The suggested changes were incorporated and pretested for content validation through pilot study. The Cronbach alpha coefficient was 0.73, showed a valid internal consistency.

The question composed of two parts; the first part was related demographics such as age and gender while the second part comprised of study question regarding hypertension diagnosis. For each item, a dichotomous response was collected (true, false). A correct response was awarding with 1-point and wrong answer was assigned 0-point.

The purpose of the study was explained to the medical student at the study site. The questionnaire was administered to consented students, who were consecutively sampled, at their respective units and retrieved immediately after completion. The medical students were reassessed with the same questionnaire one-month post intervention.

Intervention

An educational intervention was conducted by one author (MK) who had good hands-on blood pressure measurement. The intervention aimed to address knowledge on BP measurement and diagnosis observed among the medical students. The intervention comprised didactic lectures, case

studies, demonstrations, interactive, question and answer sessions on knowledge BP measurement related to diagnosis, using both manual and automatic BP monitoring devices. The training was last for one hour and was conducted at the seminar room at Second Affiliated Hospital of Xi'an Jiaotong University.

Study ethics

The study was approved by the ethical committee of the Second Affiliated Hospital of Xi'an Jiaotong University. Informed consent was obtained from each participant.

Statistical analysis

The data was analyzed using statistical package for social sciences (SPSS v25). The categorical variable was presented as a frequency and percentages. The chi-square test or fisher exact test (if applicable) was used to assess the effect of intervention on student knowledge regarding blood pressure measurement and diagnosis. The p-value was considered significant at 0.05 level.

Results

A total of 94 students were participated in the study. However, in post-intervention 2 participants were drop out. Most of the participants were fell in age range of 18-25 years and were male as shown in Table 1.

Table - 1. Demographics characteristics of the participants

		Pre-intervention	Post-intervention
		N (%)	N (%)
Age	18-25	54 (57.4)	52 (56.5)
	>25	40 (42.6)	40 (43.5)
Gender	Male	57 (60.6)	57 (62.0)
	Female	37 (39.4)	35 (38.0)

The participant knowledge was significant increased regarding preparation of patient before taking of blood pressure ($p > 0.001$) and impact of cuff size on blood pressure reading in ($p > 0.001$) post intervention compared to pre-intervention. In addition, participants significantly more knowledgeable regarding impact of nervousness and cold on false diagnosis of blood pressure ($p > 0.001$) and time of subsequent measurement of blood

pressure in post intervention group ($p > 0.001$). The detail can be seen in Table 2. Overall knowledge regarding hypertension diagnosis was significantly improved in post intervention group as shown in Figure 1.

Table - 2. Effect of the education intervention on participant's knowledge

Items (correct response)	Pre-intervention	Post-intervention	P-value
	N (%)	N (%)	
The patient should be in a quiet, noise-free environment and seated comfortably. They should sit upright with their upper arm resting on a table at heart level. (True).	60 (49.2)	62 (50.8)	0.60
The patient must sit quietly for 3–5 min before the blood pressure is taken (True).	40 (37.0)	68 (63.0)	<0.001
If the blood pressure cuff is too wide or too narrow it could cause a false high or false low blood pressure reading, respectively (True).	30 (25.9)	86 (74.1)	<0.001
Nervousness and cold are factors that can cause a false diagnosis of hypertension (True).	67 (44.1)	85 (55.9)	<0.001
Subsequent blood pressure measurements must be separated by 1–2 min (True).	48 (35.8)	86 (64.2)	<0.001
When using the manual auscultatory technique, you must palpate the brachial artery before positioning the blood pressure cuff and then place the stethoscope 2 cm away from the cuff (True).	28 (26.9)	76 (73.1)	<0.001
Grade 2 arterial hypertension is diagnosed when the systolic blood pressure is between 160 and 179 mmHg and the diastolic blood pressure is between 100 and 109 mmHg (True).	19 (18.3)	85 (81.7)	<0.001
For a patient with diabetes, blood pressure readings equal to or higher than 130/80 mmHg indicate hypertension (False).	21 (84.0)	4 (16.0)	<0.001
For blood pressure control, upper arm is defined when differences in systolic blood pressure measurements above 5 mmHg interarm are observed (False).	13 (72.2)	5 (27.8)	0.05
Repeated differences between both arms which are higher than 20/10 mmHg in systolic blood pressure/diastolic blood pressure, respectively, indicate vascular abnormalities (True).	31 (30.1)	72 (69.9)	<0.001
A blood pressure reading of 146/89 mmHg for a patient sitting, that changes to 130/81 mmHg when the patient stands up for 1–3 min indicates the existence of orthostatic hypotension (False).	41 (71.9)	16 (28.1)	<0.001
The presence of persistent values equal to or greater than 125/75 mmHg in a patient with kidney failure indicates arterial hypertension (False).	36 (81.8)	8 (18.2)	<0.001
Patients with atrial fibrillation are advised to check their blood pressure with a manual aneroid auscultatory device (True).	33 (34.0)	64 (66.0)	<0.001
From ambulatory blood pressure monitoring (ABPM) arterial hypertension is diagnosed when the average of the measurements over a 24 h period is equal to or greater than 135/85 mmHg (False).	29 (27.4)	77 (72.6)	<0.001
Patients using home blood pressure monitoring (HBPM) must take their blood pressure at least twice a day, once in the morning and once in the evening, over three consecutive days and keep a record of the readings (True).	42 (34.1)	81 (65.9)	<0.001
'Masked hypertension' is also called white coat hypertension (False).	56 (41.2)	80 (58.8)	<0.001

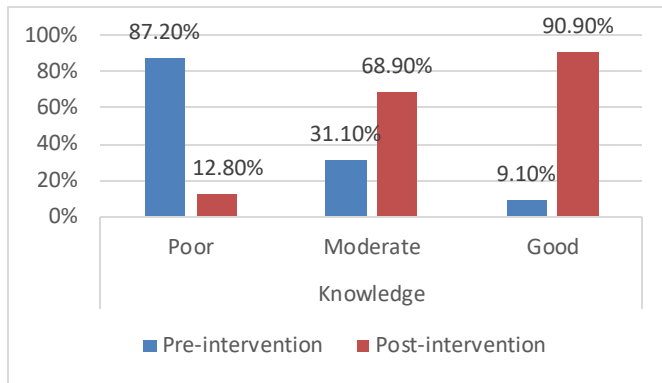


Fig 1. The effect of education intervention on overall knowledge ($p < 0.001$)

Discussion

Medical education regarding blood pressure measurement is of utmost importance for medical students as it is a fundamental skill that is crucial for diagnosing and managing various medical conditions. Blood pressure is a vital sign that provides important information about a person's cardiovascular health and overall well-being. Medical students need to be well-versed in the accurate measurement of blood pressure in order to identify and monitor conditions such as hypertension, hypotension, and other cardiovascular diseases [13]. Understanding the correct techniques for measuring blood pressure, including proper positioning, cuff size selection, and interpretation of the results, is essential for medical students to make accurate diagnoses and provide appropriate treatment for their patients [14, 15].

Furthermore, medical education on blood pressure measurement also plays a significant role in preventive care. By understanding the significance of blood pressure monitoring, medical students can educate their patients about the importance of regular blood pressure checks and the potential risks associated with high or low blood pressure. This knowledge can help in early detection and intervention, ultimately preventing the development of serious cardiovascular complications [14, 16]. Additionally, medical students who are well-trained in blood pressure measurement can contribute to the overall improvement of healthcare quality and patient outcomes [17]. Therefore, medical education regarding blood pressure measurement is crucial for equipping future healthcare professionals with the

necessary skills to effectively assess and manage cardiovascular health in their patients.

The current study highlighted several gaps in knowledge on blood pressure measurement among medical students that need to be addressed. Firstly, there is a lack of standardized training and assessment methods for blood pressure measurement, leading to inconsistencies in the techniques used by medical students as shown in the current study. This can result in inaccurate readings and misdiagnosis of conditions such as hypertension or hypotension [18]. Additionally, there is a need for greater emphasis on the importance of proper cuff sizing and positioning during blood pressure measurement as observed in the current study, as these factors can significantly impact the accuracy of the readings.

Conclusion

The current study highlighted that medical education intervention regarding blood pressure measurement and diagnosis had significantly improved the medical student knowledge. Therefore, medical education regarding blood pressure measurement and diagnosis should be incorporated as a continuing medical education to equip the future doctors with skills to effectively assess and manage cardiovascular health in their patients.

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