



Original Research Article

Study of Factors Affecting Awareness and Knowledge of Healthcare Providers on Accurate Blood Pressure Measurement. Case Study: Healthcare Providers Working in Jahrom Healthcare Facilities

Article History:

Name of Author:

Safar Zarei

Affiliation: PhD of medical physiology,
Jahrom University of Medical Sciences,
Jahrom, Iran

Corresponding Author:

Safar Zarei

Received: 20-11-2025

Revised: 28-11-2025

Accepted: 10-12-2025

Published: 30-12-2025

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Noncommercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Abstract: *Aim and objectives:* The present study deals with determining how much the personnel employed in the medical centers of Jahrom County were aware of standard methods point during blood pressure measurement. *Methods:* The present study is of descriptive – cross-sectional nature performed on 302 cases working in Jahrom healthcare centers. The methodology applied in collecting data using standardized questionnaires devised by the researcher. The extracted data was analyzed by the software SPSS (version 16). *Results:* Observations showed that 10 to 20 percent of the cases had a good command of knowledge of influential factors on blood pressure measurement; moreover, there was a meaningful relation between holding higher degrees and accurate blood pressure measurement ($P < 0.05$). Nevertheless, beside the holders of lower degrees, also those holding higher educational degrees, had low command of knowledge thereof and also were not the majority of factors to be controlled. *Conclusions:* The findings extracted from the present study were an indicator of low command of knowledge among hospital personnel on determining factors affecting blood pressure measurement.

Keywords: blood pressure; environmental exposure, nursing; assessment awareness; clinical skill.

INTRODUCTION

Blood pressure (BP) measurement is always done to screen for hypertension which is a major modifiable risk factor for development of stroke, coronary heart disease, myocardial infarction, congestive heart failure, renal failure, and peripheral vascular disease (Muntner et al., 2019). Accurate BP measurement is the foundation of optimal diagnosis and treatment of hypertension. (Stergiou et al., 2018)

Therefore, accurate BP measurement is an important component to get correct diagnosis of hypertension (Lehane et al., 1980; Petrie et al., 1986; Roche et al., 1990). The gold standard for clinical BP measurement has always been readings taken by a trained health care provider, using the auscultatory method. The impact of untreated or poorly treated hypertension on the health of patients is a major contributor to the

overall burden of adult diseases in any population. Various studies abroad however indicated a deficit in the knowledge of guidelines and skills related to the measurement of BP (Mohammed, 2016). In a study of clinical nurses' knowledge about blood pressure measurement technique at a metropolitan teaching hospital, Queensland, Australia in 2002, the findings indicated that the knowledge was inadequate to perform blood pressure measurement in a standardized manner, and prevent introduced error (Armstrong, 2002).

González-López JJ et al. in 2009 reported that only 51.8% of all students knew how to measure blood pressure correctly (González-López et al., 2009). In a study of knowledge test of accurate blood pressure measurement skills in medical students at Palmer College of Chiropractic, Florida in 2013, it was found that the knowledge of blood pressure skills of a

sample of students were deficient (Crosley & Rose, 2013). High prevalence of Hypertension is continuously being reported all over the globe (Mills et al., 2016).

Objective of the study:

Different ways of blood pressure measurement with terrible mistakes and inadequate knowledge of the factors which affecting accurate blood pressure (Aung et al., 2017) encouraged us to perform this study. Our observations indicated that many of the healthcare experts were neither aware of the factors affecting blood pressure measurement nor pay due attention to them in Jahrom hospitals. In other words, we investigated the knowledge and awareness of the BP observers on accurate ways of blood pressure measurement in the context of pregnancy, aging, diabetes, arrhythmia, anxiety, and so on.

MATERIAL AND METHODS

Study design

This study followed a quantitative, descriptive design with an observational checklist and survey method. In the first phase, the subject's skills of blood pressure measurement in specific groups was determined by means of a questionnaire. In the second phase, researcher determined subject's practice by using an observation. Finally, the researcher investigated whether there was a correlation between subject's knowledge and their practice in the mentioned setting or not.

Study Setting

The present study was carried out in line with medical ethics stipulated by the Ministry of Health, Treatment and Medical Education in Jahrom county which is a city in Fars Province, Iran. At the 2016 census, its population was 141,634. This city is the largest city in south of Fars Province and the second one in whole province. with several universities, hospitals and medical centers, this city is one of the academic and medical hubs of southern Iran.

Study population:

To perform the study, initially, 400 cases of healthcare providers were selected but in advance of the study, some left or were removed from the study and finally 302 subjects including 134 nurse aides, 123 nurses, and 45 general physicians were remained in the study. Descriptive statistics are presented below in Figure 1:

Data collection procedure and instrument:

The data in this study were collected in 3 phases including research made questionnaire, interview and observation. The questionnaire aimed to cover basic and necessary information about the factors affecting the accurate blood pressure measurement as well as the important points to be taken into consideration.

The questionnaires were distributed among the respondents to fill in them. At the same time, informed consent was taken from eligible subjects. The questionnaire was detailed in staff knowledge and ; how to measure the blood pressure in people of different ages including children, the elderly and the pregnant; how to do the measurement in the context of stress and bustle, arrhythmia and obesity .The questionnaire comprised of two-categorized questions including some personal and some scientific questions. About scientific questions, firstly two-choices (yes/no) questions were asked and if the subject's responses were "yes", it means that subjects are aware of scientific principles based on self-declaration and if they answer the sub-questions correctly, it means that they have good knowledge of scientific and accurate measurement. Correct answers were specified in comparison with standard studies in fundamentals of nursing in **potter and Perry** text book (Potter & Perry, 1997). Followingly, the researcher directly observed the method of BP measurement used by the subjects while subjects were doing it as usual and without any direction. If the subjects did the measurement in accordance with standardized procedures, it indicated that the subjects either had enough theoretical knowledge about the procedure or were potent to do the measurement correctly. However, in some cases, while the subjects had enough information about the procedure, ignored certain rules essential to accurate measurement. Finally, a 10-minute interview was conducted to catch on their comments and interpretations on their failures to take BP measurement properly. They also were requested to give their recommendations to compensate the failures.

Reliability and validity:

The content validity of the questionnaire was determined through a panel of some experts. And the reliability was determined using 20 filled questionnaires in which 77% Cronbach's alpha was resulted and was considered as acceptable.

Ethical considerations

The present study was conducted pursuant to the medical ethics stipulated by the Ministry of Health, Treatment and Medical Education of the Islamic Republic of Iran and the consent form was taken from all subjects. Furthermore, the ethical committee of Jahrom medical university approved this study with the ethical code of (JUMS-85).

Statistical analysis

The data were analyzed through the application of SPSS statistical software version 16. To explain the extracted data, descriptive statistics and cross-tabulation tables were used. To compare the averages, Chi-Squared test was performed. Multi nominal logistic regression was performed in order to compare

the relationship between the data obtained from the questionnaire and the observation. The significance level was $P < 0.05$ and the results were reported in percent.

RESULTS:

Measurement in subpopulations

Pregnancy

The question of knowledge of the three groups under the study on precise diagnosis of Korotkoff sound phases and exploiting every phase to determine systolic and diastolic pressures in pregnancy was asked; in this regard, it was revealed that 4.4% of the physicians, 5.0% of nurses and 6.3% of nurse aides took phase 1 (k1) as the onset of systolic pressure and phase 4 as diastole. Phase 4 (k4 was taken) as the onset of diastolic pressure in pregnant women (Pickering et al., 2005, Feldman, 2001 #3816). So, they did not have knowledge about it and did not answer correctly. When we observed them, 70 % of physicians and 50 % of the nurses and all the nurse aids measurements were incorrect (Fisher exact test = 3.4, $p = 0.3$). this showed they didn't have practical knowledge. The reason was that they hadn't learned the issue after their graduation in some way or the other, for example by participating in workshops.

Babies

In infants, the flush and Doppler methods of blood pressure measurement are usually used. The flush method measures mean pressure; the Doppler method, systolic and diastolic pressures. Normal flush values from 1 to 12 months of age do not exceed 100 mm of mercury; Doppler systolic levels do not exceed 113 mm of mercury (Pickering et al., 2005, Van Montfrans, 2001 #3817). Our questionnaire revealed that only 6.5% of physicians, 5% of nurses and 2.6% of the nurse aids were well-informed about the procedure for infants and had theoretical knowledge. However, none of them minded the rule in their practice. Similar thing was performed for children between 1- 5-years old and it became clear that only 21.4 % of physician, 14.3% of nurses and 6.5% of nurse aids answered wrong and chose oscillometry instead of Doppler (Fisher exact test = 30.8 , $p = 0.001$).The reason was that they hadn't improved and updated their knowledge.

Elderly

In the present study, the questionnaire showed that only 17.5% of the general physicians, 12.3% of the nurses and 9.4% of nurse aides were aware of the need to measure blood pressure twice or thrice and report the average (Fisher exact test = 1.4, $p = 0.7$)(Pickering et al., 2005, Perloff, 1993 #4177). Regarding the old patients, it was observed that all subjects in the three groups used auditory and visual techniques, and were not familiar with other methods. They didn't check the blood pressure more than once another. (Fisher

exact test = 34.9, $p < 0.001$). (Table I) Lack of enough study and shortage of alternative equipment to be used to measure more exactly could justify such a problem. Moreover, 22% of the nurse aides checked the old patients' blood pressure in a standing position (instead of sitting) (Pickering et al., 2005)and were not familiar with the standard measures for patients' position and its important impact on doing the procedure. The observation proved that all the above-mentioned cases investigated by general physicians were measured just by auditory method (97.5%)

Arrhythmias

Regarding the question about patients suffering from cardiac arrhythmia, 80% of general physicians and 75.0% of the cases in the two other groups knew that the blood pressure should be checked twice or thrice and then use the average(Stewart et al., 1995). Only 12.5% of the physicians and 9.6% of the nurses and 9.4% of the nurse aids knew that type of arrhythmia should be reported. The findings of observation showed that none of the cases respected this rule (Fisher exact test = 17.6 , $p = 0.002$).

With respect to the question of standard dimensions of deflating bladders for adult patients, 15% of the general physicians, 7.9% of the nurses and 7.2% of the nurse aids knew the standard measures of deflating rate of the cuff. (The cuff had to be deflated slowly at 2-3 mmHg/sec)(Kay, 1998). None of subjects in three groups respected it when observed (Fisher exact test = 2 , $p = 0.3$). They stated that work load didn't permit them to study these points and do the measurement correctly.

Diabetes

In case of proper measurement with old or sick patients suffering from diabetes, less than 10% (7% physician and 5 % nurses and none of the nurse aids) of the personnel were aware and mindful of the point that measurement of blood pressure in diabetic patients had to be taken in sitting or supine position(Pickering et al., 2005; Potter & Perry, 1997) and answered correctly, however none of them respected the rule when we observed them. (Fisher exact test = 34.9, $p < 0.001$). Such incongruity could be due to lack of enough time and improvement of knowledge in personnel following their graduation from university.

Anxiety

Using questionnaire about BP measurement in anxious patient, it showed that 77.5% of the physicians, 68.4% of the nurses and 45.0% of the nurse aids were aware of the frequency of blood pressure measurement during anxiety, namely three times (Pickering et al., 2005; Potter & Perry, 1997). However, our observation indicated that only 32.5% of the physicians, 15.8% of the nurses and 8.7% of the

nurse aids took blood pressure three times and reported all times (Fisher exact test = 1.5, $p = 0.6$). The reason for this failure, as stated by the subjects, was the increasing number of visitors coming daily to these health facilities for medical care.

Obesity

In case of obese patients, based on questionnaire answers, 17.5% of physicians, 11.6% of nurses and 15% of nurse aids were aware of cuff size and other method of measuring blood pressure, such as Doppler or oscillometry (Pickering et al., 2005; Potter & Perry, 1997). In this case, we observed that 6.8% of general physicians, 5.8% of nurses and none of nurse aides used the suitable cuff in proportion with arm circumferences (Pearson chi square = 3.9, $p = 0.049$).

Table No. 1: The health-care personnel's awareness of accurate blood pressure measurement as well as its influential factors

DISCUSSION

The present study dealt with the scope of awareness in general physicians, nurses and nurse aides on correct blood pressure measurement. Results from the study showed that nearly 80% of the nurses presumed that they had enough theoretical and practical knowledge of blood pressure measurement before filling up the due questionnaire. However, only 30% of them acquired the score above 60 of totally 100 and this was while the measurement was a part of their daily involvements (Almeida Tda & Lamas, 2013).

Evaluating the knowledge of personnel involved in the correct measurement, is often vital importance, because the procedure is considered as a prevalent technique in precise diagnosis and control of hypertension, cardiovascular diseases, hypotension as well as stroke.

Results from the present study showed that the widespread differences in the scope of knowledge of the three different groups involved in the experiment, namely general physicians, nurses and nurse aides along with the observations done by the researchers, provided a meaningful relationship between having higher degrees of education and correct blood pressure measurement; in such a way that, the higher the academic degree, the greater the scope of knowledge of personnel on correct blood pressure measurements. Moreover, the present study showed some of prevalent negligence and indifference to recommended and important points among subjects of higher degrees while taking blood pressure measurement.

Pregnancy

Ideally, systolic and diastolic blood pressures would be measured through Korotkoff sounds in 5 different

phases. In normal patients, phase 1 would be considered as systolic pressure and phase 5 as the diastolic one, but in pregnant women, phase 4 would be considered as diastolic pressure (Pickering et al., 2005). Unlike this study, other researches indicated that almost half of the physicians considered phase 5 as diastolic in normal condition (Asai et al., 2000). Our study showed that neither of personnel had knowledge nor practice. Personnel confusion about different phases could be attributed to: low-quality of academic courses, forgetfulness due to long course of time following the graduation, hearing impairments, distractibility due unsuitable or overpopulated environment, as well as patients' speaking during the procedure (Semple et al., 2001). Table I

Children

In a number of children below 5 years old, the Korotkoff sounds were not audible. In order to measure the blood pressure in infants correctly, different methods were supposed to be used rather than the aural and visual methods. These methods included flush methods, measuring the alternations through direct observation, ultrasound method, performing plethysmography, impedance method (resistance), and Doppler ultrasound recording technique (Pickering et al., 2005). Moreover, proper cuff size for infants must be 40% of circumference of the arm. Therefore, taking into account the suitable size of the cuff had a direct effect on the correct blood pressure estimations. We observed that there was a positive relationship between knowledge and performance. However, any inadequacy in applying the mentioned methods could be attributed to insufficient equipment in the health-care center as well as lack of enough knowledge of personnel about the procedure. Table I

Old patients

Generally speaking, the patients' age is one of the most important factors in blood pressure measurement. Blood pressure in elderly people is measured using usual care methods and in other different ways including: digital, tonometry, oscillometry, tele-monitoring and mobile (smartphone) tele-monitoring methods. Among such methods, the mobile tele-monitoring method is the most preferred one (Ogedegbe & Pickering, 2010). Researchers believed that, for the sake of adequacy of blood pressure measurement in elderly people, blood pressure had to be taken twice in sitting position (Pickering et al., 2005). In our study, the personnel were only aware of auditory and visual methods and did not have enough knowledge about other procedures. We suggest that hospital managers take some steps toward the improvement of their personnel's knowledge and practice by using alternative workshops. Table I

Diabetes

While measuring blood pressure, physical health is a defining factor. In diabetic and pregnant patients and those with kidney diseases, normal blood pressure readings stays at lower levels(Pickering et al., 2005) . For example, in line with the standards introduced by the British Heart Foundation, blood pressure measurement in some diabetic cases must be taken in both sitting and supine positions (ChristineFeather, 2001). However, our study showed that only a few of the personnel in the three groups were aware of and respected it practically . This could be explained in terms of insufficient training at academic environment or forgetfulness due to long length of time following the graduation. Table I

Arrhythmia

In case of patients suffering from arrhythmia, it is necessary to measure the blood pressure at least 3 times and calculate the mean of the readings. Subjects of the study; personnel, neither aware of nor did it in practice. In such patients, reporting the type of arrhythmia is required. Contrary to the present study, a report showed that about half of personnel did 2 readings or more in patient with atrial fibrillation(Beevers et al., 2001; Stewart et al., 1995). It seems that personnel of Jahrom hospitals need more study to update their knowledge. Table I

Obesity

Only a limited number of subjects in the three groups paid attention to the choice of a suitable cuff which was appropriate for obese patient; wrong size would prompt wrong diagnosis of hypertension. The same with our results, Asai (2000) reported that about half of available cuffs are small and 14% of them are large(Asai et al., 2000). Furthermore, we noticed that there were only limited sizes of cuffs accessible at Jahrom healthcare centers and hospitals, measuring 27 by 34 cm and 16 by 30 cm rubber tubing. Table I

Anxiety

In case of patient's anxiety, the observer must do the measurement three times and report all readings(Campbell & McKay, 1999). Based on previous studies, it was proved that automatic methods of measurement had the advantage of reducing the observer errors or patients' anxiety. Anxiety could be interpreted in form of the fear of white clothing and the frequency of readings. However, there was a disadvantage with automatic method as related to the apparatus malfunction. considering epidemiologic studies, auditory methods are often replaced the automatic technique (Ogedegbe & Pickering, 2010). Table I

In Jahrom medical centers, there was a positive relationship between knowledge and performance but the number of automated monitors was quite limited. This could be interpreted as a reason for higher

number of incorrect reports of BP measurement at hospitals of this city. However, in advanced centers and clinics , more emphasis must be put on the automation of BP measurement equipments.

CONCLUSIONS:

The findings of the research depicted low command of knowledge or practice in hospital personnel namely, physicians, nurses and nurse aids at different levels in determining the factors influencing the blood pressure measurement in different group of patients including pregnant women, children, elderly individuals, patients with anxiety, the diabetic and patients with arrhythmia or others with general disorders.

Informed consent: All the subjects filled the consent form before the initiation of the study

Figure 1. The scheme of participants and the number of attendants up to the end of the study

Table No. I: healthcare personnel awareness of accurate blood pressure measurement and its influential factors

Table No. II: healthcare personnel awareness of specific issue about accurate blood pressure measurement

Table No. III: healthcare personnel awareness of accurate blood pressure measurement in subpopulations.

REFERENCES:

1. Almeida Tda, C., & Lamas, J. L. (2013, Apr). [Nurses of adult intensive care unit: evaluation about directand indirect blood pressure measurement]. *Rev Esc Enferm USP*, 47(2), 369-376.
<http://www.ncbi.nlm.nih.gov/pubmed/23743903> (Enfermeiros de Unidade de Terapia Intensiva adulto: avaliacao sobre medida direta e indireta da pressao arterial.)
2. Armstrong, R. S. (2002). Nurses' knowledge of error in blood pressure measurement technique. *International Journal of Nursing Practice*, 8(3), 118-126.
3. Asai, Y., Kawamoto, R., Nago, N., & Kajii, E. (2000, Apr). [Blood pressure measurement by primary care physicians: comparison with the standard method]. *Nihon Koshu Eisei Zasshi*, 47(4), 326-336.
4. Aung, K. C., Lwin, M. M., Yee, K. T., & Myint, W. W. (2017). Medical and nursing students' knowledge of accurate blood pressure measurement procedure in University Malaysia Sarawak. *Journal of Advanced Research in social and behavioral sciences*, 9, 29-36.

5. Beevers, G., Lip, G. Y., & O'Brien, E. (2001). Blood pressure measurement: Part II—Conventional sphygmomanometry: Technique of auscultatory blood pressure measurement. *BMJ*, 322(7293), 1043-1047.
6. Campbell, N. R., & McKay, D. W. (1999). Accurate blood pressure measurement Why does it matter? *Canadian Medical Association Journal*, 161(3), 277-278.
7. ChristineFeather. (2001). Blood presssure measurement. *nursing*, 97(4), 33.
8. Crosley, A. M., & Rose, J. R. L. (2013). Knowledge of accurate blood pressure measurement procedures in chiropractic students. *Journal of Chiropractic Education*, 27(2), 152-157.
9. González-López, J. J., Ramírez, J. G.-A., García, R. T., Esteban, S. A., del Barrio, J. A., & Rodríguez-Artalejo, F. (2009). Knowledge of correct blood pressure measurement procedures among medical and nursing students. *Revista Española de Cardiología (English Edition)*, 62(5), 568-571.
10. Kay, L. E. (1998). Accuracy of blood pressure measurement in the family practice center. *The Journal of the American Board of Family Practice*, 11(4), 252-258.
11. Lehane, A., O'Brien, E., & O'Malley, K. (1980). Reporting of blood pressure data in medical journals. *British Medical Journal*, 281(6255), 1603.
12. Mills, K. T., Bundy, J. D., Kelly, T. N., Reed, J. E., Kearney, P. M., Reynolds, K., Chen, J., & He, J. (2016). Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. *Circulation*, 134(6), 441-450.
13. Mohammed, Q. H. (2016). Knowledge and Practices of Nursing College Student's Regarding Blood Pressure Measurement in Hospitals at Kirkuk City. *kufa Journal for Nursing sciences*, 6(2), 177-184.
14. Muntner, P., Shimbo, D., Carey, R. M., Charleston, J. B., Gaillard, T., Misra, S., Myers, M. G., Ogedegbe, G., Schwartz, J. E., & Townsend, R. R. (2019). Measurement of blood pressure in humans: a scientific statement from the American Heart Association. *Hypertension*, 73(5), e35-e66.
15. Ogedegbe, G., & Pickering, T. (2010, Nov). Principles and techniques of blood pressure measurement. *Cardiol Clin*, 28(4), 571-586. <https://doi.org/10.1016/j.ccl.2010.07.006>
16. Petrie, J., O'Brien, E., Littler, W., & De Swiet, M. (1986). Recommendations on blood pressure measurement. *British medical journal (Clinical research ed.)*, 293(6547), 611.
17. Pickering, T. G., Hall, J. E., Appel, L. J., Falkner, B. E., Graves, J., Hill, M. N., Jones, D. W., Kurtz, T., Sheps, S. G., & Roccella, E. J. (2005). Recommendations for blood pressure measurement in humans and experimental animals part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Hypertension*, 45(1), 142-161. <https://doi.org/10.1161/01.CIR.0000154900.76284.F6>
18. Potter, P. A., & Perry, A. G. (1997). *Fundamental of nursing: Concepts, process, and practice..* St. Louis: Mosby-Year Book. Inc Company, 1393-1398.
19. Roche, V., O'malley, K., & O'brien, E. (1990). How'scientific'is blood pressure measurement in leading medical journals? *Journal of hypertension*, 8(12), 1167-1168.
20. Semple, M., Cook, R., Moseley, L., & Torrance, C. (2001). Social influence and the recording of blood pressure by student nurses: an experimental study. *Nurse Researcher*, 8(3), 60-71. <https://doi.org/10.7748/nr2001.04.8.3.60.c6158>
21. Stergiou, G., Palatini, P., Asmar, R., de la Sierra, A., Myers, M., Shennan, A., Wang, J., O'Brien, E., & Parati, G. (2018). Blood pressure measurement and hypertension diagnosis in the 2017 US guidelines: first things first. *Hypertension*, 71(6), 963-965.
22. Stewart, M. J., Gough, K., & Padfield, P. L. (1995). The accuracy of automated blood pressure measuring devices in patients with controlled atrial fibrillation. *Journal of hypertension*, 13(3), 297-300.