International Journal of Community Medicine and Public Health
Hassan KH et al. Int J Community Med Public Health. 2020 Nov;7(11):4307-4311
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20204406

Original Research Article

Different measures of blood pressure in primary health care in Saudi Arabia

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Received: 14 September 2020
Revised: 24 September 2020
Accepted: 29 September 2020

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ABSTRACT

Background: Objective of the study was to be able to know various measurement or devices for blood pressure (BP) used in primary care (PC).
Methods: Cross-sectional multicenter study, sample is consecutive cases, study done in kingdom of Saudi Arabia in health institution of Primary care that treat patients who already diagnosed with hypertension aged more than 18 years old, the method used in the study is observation of devices which measure blood pressure through two following BP measurements.
Results: Blood pressure was measured for 14,137 from 3,592 PC physicians, blood pressured measured by a mercury sphygmomanometer, in 69.8% of the patients, while it is measured by electronic device in 16.5% but measured by aneroid manometer in 11.8% while 1.9% measured by more of a measurement method. Electronic devices and aneroid manometers were the most used measurement of blood pressure in rural areas. Also, there were differences in the BP values between different methods of the measurement.
Conclusions: The best methods of blood pressure measurement between medical staff is mercury sphygmomanometers and aneroid devices in primary care and to avoid biases in the measurement we encourage to use electronic devices to measure BP.

Keywords: High blood pressure, Measurement devices, Primary care

INTRODUCTION

The diagnosis of hypertension (HT) can only be established by measuring blood pressure (BP) with devices known as sphygmomanometers. The BP figures that we obtain in the measurement process with the different measuring devices are those that can lead us to the diagnosis of HT, which, implicitly, gives us an idea of the importance of the correct BP measurement.

The first major contribution to the diagnosis of HT is due to the Italian physician Scipione Riva-Rocci.[1] who in 1896 designed a sphygmomanometer similar to the one we use today. In 1987, Hill and Barnard developed the aneroid manometer, in which they replaced the mercury column with a pressure gauge. In 1905, the Russian physician Nicolai-Sergievic Korotkoff described in his doctoral thesis different and perfectly audible tones when applying the stethoscope to the brachial artery. From that moment on, there was already a device and a system to measure BP.[2,5]

Until the end of the last century, and still today, the method generally used in consultations for the diagnosis of HT has been the measurement of BP with mercury sphygmomanometers or aneroid manometers, using the auscultatory technique. In most of the large epidemio logical studies, BP figures have been related to cardiovascular risk using mercury sphygmomanometers as measuring devices. However, it is necessary to take into account the presence of different biases (observer, equipment, etc.) and the fact that some patients cannot avoid the alert reaction when measuring their BP in the consultation.[3-7]

On the other hand, regulation 93/42/EEC of the Council of the European Union promotes the disappearance of instruments that contain mercury in the short term, so that in a short time mercury sphygmomanometer will have to be replaced in consultations. In some European countries, the use of mercury in hospitals is already prohibited; For example, in Sweden, mercury sphygmomanometers have not been used in primary care clinics for more than a decade.

As for the aneroid devices, their use has several drawbacks, since they are very sensitive to shocks, they are easily decalibrated (they require maintenance and semi-annual calibration) and, what is more important, they are not validated.

Its poor reproducibility and the lack of information about the variability of BP are some of the problems of the few BP measurements performed in the office with mercury or aneroid sphygmomanometers.

Since the 1980s, electronic devices have been used that avoid observer biases and that it is possible to offer the patient to take BP measurements at home, thereby also avoiding the alert reaction of the consultation. On the other hand, with electronic devices it is relatively easy to make repeated BP measurements in the office or at home, so we can obtain certain information on BP variability and, by averaging a minimum number of them, increases the reproducibility of the diagnostic method.[8]

The objective of this study was to find out which measuring devices are currently being used in daily clinical practice in primary care clinics.

METHODS

A cross-sectional, multicenter study has been carried out in hypertensive patients treated in the primary care setting of Saudi Arabia, as a joint research project between the hypertension working group of the Saudian Society of rural and general medicine and the medical department. Primary care physicians, who selected a maximum of 4 patients each by consecutive sampling, who had to meet the following inclusion criteria: patients of both sexes, over 18 years of age, diagnosed with HT and on drug treatment. Verbal consent was requested from the patients for the use of the study data.[7]

Two BP measurements were made in the patients, in a sitting position and after resting for 5 min, with an interval of 3 min between each intake and obtaining the arithmetic mean of the 2 readings. If a difference ≥5 mmHg was found between the 2 measurements, a third was carried out. The BP measurements were made with the usual measuring device that the doctor had in the consultation.

The following data were recorded on a data collection sheet: age and sex of the patients, type of consultation (rural, semi-urban or urban), office (health center, outpatient clinic, local office), BP values, pharmacolo gical treatment of the HT and type of device used.

Optimum BP control was considered when the arithmetic mean values of the 2 measurements made at the visit were <140/90 mmHg.

The statistical analysis was performed with the statistical packages SPSS (version 11.5) and SAS (version 8). The results are expressed as frequencies and percentages for the qualitative variables, and through the mean±standard deviation (SD), the median and the range. for quantitative variables, indicating the 95% confidence interval (CI) for the variables of interest. For the comparison of means, the Student's t-test was used for independent data; When quantitative data that did not follow a normal distribution were compared, the nonparametric mann-withney test was used, and the *2 test was used for the possible association between qualitative variables.[6,7]

RESULTS

Sample description

A total of 14,137 surveys were evaluated, of which 1,383 (9.8%) were rejected for violating the protocol or for

presenting inconsistent or incomplete data. The final sample obtained was 12,754 patients, with a mean age of 63.3 years (95% CI, 63.1-63.5) with 57.2% women. Of the 3,592 participating doctors, 15.3% worked in rural areas, 18.9% in semi-urban areas, and 65.8% in urban areas. 76.5% of the doctors worked in health centers, 9.9% in outpatient clinics, 13.1% in local clinics and 0.5% in 2 or more locations.[8-9]

Measurement conditions and blood pressure values

The most widely used measurement method was the mercury sphygmomanometer (69.8%), followed by electronic devices (16.5%) and the aneroid manometer (11.8%). In 1.9% of patients, BP was determined with more than one measurement method. The frequency with which each method was used was different depending on whether it was rural, semi-urban or urban ($p<0.001$).

The mean values for systolic BP (SBP) were 141.4±14.8 mmHg and for diastolic BP (DBP) 82.6±8.8 mmHg. The values of the first reading were 142.6±15.6 and 83.2±9.4 mmHg, respectively, and those of the second reading were 140.8±14.9 and 82.2±8.8 mmHg, with significant differences between both readings, both for SBP and DBP ($p<0.001$). 92.8% of the patients claimed to have taken the medication when they came for consultation.

The population groups that were generated according to the measurement method did not show statistically significant differences in terms of their biodemographic characteristics.

Regarding the measurements carried out, it should be noted that 33.7% of the researchers who used the electronic blood pressure monitor had used a third BP measurement; this percentage was significantly lower in the case of the investigators who used the mercury sphygmomanometer (17.1%) and the aneroid manometer (18.0%) ($p<0.001$).

The degree of control of hypertension in the patients was similar with the different measuring devices: 36.9% of the patients controlled when the mercury sphygmomanometer was used, 36.6% when an electronic device was used, and 39 % when an aneroid manometer was used ($p>0.05$).

Regarding the use of the digits 0 and 5 as completion of the BP values recorded by the physicians in the data collection sheet, differences were observed according to the measurement method, and these digits were used much more frequently when the method was not electronic.[9,10]

Prescription profile

Among the physicians who used one or the other measurement method, no differences were observed regarding the drugs used for the treatment of HT. About 60% of the patients received monotherapy and the most commonly used drugs were angiotensin converting enzyme inhibitors (ACEIs), angiotensin II AT1 receptor antagonists (ARA-II) and calcium antagonists; approximately 35% of patients used 2 drugs, in which case fixed combinations were used mainly (in 75% of patients with 2 drugs) and less frequently free combinations (in 25% of cases). Among the fixed associations, the most used were ACEI-diuretics and ARA II-diuretics; in the case of free associations, the most used were diuretics-calcium antagonists and ARA II-calcium antagonists. Only 5-6% of the patients received treatment with 3 or more drugs.

DISCUSSION

In this study, carried out in a large sample of hypertensive patients in primary health care, the types of BP measuring device used in daily clinical practice are analyzed. The results show that the majority of doctors use the mercury sphygmomanometer. On the other hand, it is striking that a percentage of doctors continue to use aneroid manometers in their consultations despite the fact that they frequently offer inaccurate measurements and, as Lones et al state, they are not adequate substitutes for mercury manometers. In this sense, it should be noted that, for some years now, the European hypertension society has not recommended the use of aneroid manometers for daily clinical practice.[9,10]

When comparing the measuring devices used by doctors according to the habitat, it has been observed that in urban and semi-urban settings, mercury sphygmomanometers are used more and electronic devices less. We do not have a clear explanation to justify the differences.

Regarding the measurement devices used, it is worth highlighting the differences observed between the different autonomous communities. This may have been influenced by the fact that the corresponding regional health services do not apply uniformly the provision of the different BP measuring devices in the consultations. In our country,

We have not found published data on the use of different measuring devices in primary care clinics in our country.

If we compare the different mean BP values of the patients obtained with the different measuring devices, especially in the case of the first measurement and the SBP, the observed differences suggest the presence of a probable observer and/or observer bias. measuring device. The fact that the characteristics of the patients are similar (in terms of age, sex, weight, etc.), among the population groups according to the measurement method, confirms the homogeneity of the sample and minimizes its influence as possible. confounding factors when comparing the mean values obtained. On the other hand, the fact that the researchers who used the electronic measuring device more frequently performed the third BP

measurement emphasizes the presence of an observer bias when using mercury sphygmomanometers or aneroid manometers.

Another data that confirms the presence of an observer bias is the use of the digits 0 and 5 with the different measuring devices; these were used more by physicians who used mercury sphygmomanometers and aneroid sphygmomanometers. The SMART study provides data similar to those observed in this study.[11]

If we add the possible inaccuracy of these measurement equipment to the presence of observer biases, we can consider the amount of errors that can be made in the BP measurement process, with the consequent failures in the diagnosis and evaluation of the hypertensive patients and in the subsequent decision making, possibly wrong. In a study carried out in Sao Paulo 21% of mercury sphygmomanometers and 50% of aneroid manometers were inaccurate. In another study carried out in our setting, a high percentage of mercury sphygmomano meters were not well calibrated.[12,13]

Both aspects, biases of the observer and of the measurement equipment, lead to an inaccurate measurement of BP, which is one of the possible causes of incorrect diagnoses and poor control of hypertensive patients. One of the strategic measures proposed to optimize BP control is to improve the usual methodology for BP measurement using validated electronic devices to avoid errors by the observer and the measuring equipment.[14] O'Rorke et al suggest that before considering a patient as poorly controlled, BP measure ments should be repeated with a technique as close as possible to the ideal, which of course is not the mercury sphygmomanometer or, of course, the aneroid manometer.[15,16]

The fact that the selection of physicians was not random could be a limitation of the study, although we believe that the sample size obtained allows this limitation to be minimized.

CONCLUSION

We can conclude by recommending the replacement of the mercury and aneroid devices with electronic devices, preferably automatic and oscillometric, to avoid biases of the observer and the measuring equipment and to get as close as possible to an exact BP measurement. Primary care managements should provide health centers with electronic BP measurement devices, since the use of this type of device will benefit not only patients, but also the environment, since mercury is a strong non-degradable pollutant. A line of research for the future will be to know if the use of electronic devices modifies the degree of control of patients and the therapeutic attitude of doctors.

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

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Cite this article as: Hassan KM, Rahali HE, Balamash HM, Alanazi RK, Almatroudi NS, Alsairra MN, et al. Different measures of blood pressure in primary health care in Saudi Arabia. Int J Community Med Public Health 2020;7:4307-11.