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Comparison between the efficiency of a mercury aneroid and a digital sphygmomanometer

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Abstract
Objective: To assess the reliability of the blood pressure by the three different apparatuses, Aneroid, mercury and digital sphygmomanometers on adult male populations.
Methodology: A total of sixty subjects, aged between fifteen and twenty-five, were chosen from various schools in the Kashmiri district of Shopian. Nonetheless, a mercury sphygmomanometer is used to measure blood pressure when the patient is at rest. Subsequently, an electronic device and a digital sphygmomanometer are used to monitor blood pressure.
Results: According to the results, there is a mean difference in the blood pressure measurement instruments: the digital blood pressure measuring device has a systolic blood pressure mean of 117.33, whereas the mercury's is 118.10. The mercury's diastolic blood pressure is 78.66, whereas the other instrument's diastolic blood pressure is 79.06, and the aneroid blood pressure mean is 117.76 and the diastolic at 78.43.
Conclusion: The sphygmomanometer is as accurate as it is, but the mercury sphygmomanometer performed better than both digital and analog instruments and ought to be utilized for appropriate and superior administration.

Keywords: Sphygmomanometer, blood, pressure, mercury, digital, aneroid

Introduction
The first individual to directly measure intra-arterial pressure in a horse was largely credited as Reverend Stephen Hales in 1733. The mercury sphygmomanometer served as the unwavering standard for blood pressure (BP) measurement. There has been a revolution in BP measurement over the past few years. The days of manually calibrating aneroid sphygmomanometers, which are prevalent in workplaces, are long gone. In their place are now a variety of semi- or fully automated (like oscillometric) blood pressure monitors that may be used both inside and outside of buildings. More downsides accompanied the increased alternatives for BP devices. Oscillometric instruments reduce human error to some extent, but many of the more modern types fall short of mercury sphygmomanometers in terms of precision. Automated office, home, and ambulatory BP measuring systems are oscillometric devices, and they have the potential to produce incorrect results, especially if they do not go through rigorous validation. The usage of home blood pressure measurements has grown in popularity. One of the most often measured clinical indicators is blood pressure, and blood pressure readings play a significant role in guiding treatment choices. Unfortunately, it is not always simple to evaluate the physiological significance of a patient's blood pressure. This essay examines the physiological and physical underpinnings of arterial pressure as well as its connection to tissue perfusion. A prior assessment of blood pressure addressed some of the difficulties. We have TWO ways to check blood pressure: self-monitoring at home, ambulatory monitoring, and clinic measurements, which are still recognized as the gold standard. Both the diagnosis of hypertension patients and the assessment of their treatment response will depend more and more on the latter. To ensure accurate blood pressure readings, the American Heart Association (AHA) modified its recommendations for blood pressure monitoring in 2005. Systolic blood pressure (SBP) of 140, diastolic blood pressure (DBP) of 90 mmHg, and/or current usage of an antihypertensive drug are all considered to be hypertension by the Joint National Committee

on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7). The number of Americans with hypertension is 65 million, or 32% of the population. Individuals with high blood pressure have a two times greater chance of getting congestive heart failure and a four times greater relative risk of having a stroke. The likelihood of prejudice and inaccuracy on the part of the doctor or other person measuring blood pressure is widely known. With the known variability of blood pressure, a few measures taken infrequently may unavoidably yield an incorrect estimate of the average blood pressure level. Many mercury sphygmomanometers are allegedly malfunctioning and poorly maintained, according to anecdotal complaints from hospitals and family clinics in the United Kingdom. However, several studies have shown that nurses and physicians are equally ignorant about the technical aspects of taking blood pressure. The mercury sphygmomanometer, the gold standard for blood pressure measurement, has been used in the National Health and Nutrition Examination Survey (NHANES) (BP).

Electronic sphygmomanometers: At the ITU, renal unit, accident & emergency, and operating rooms, 77 electronic machines of various makes were discovered. Very few of these devices have received validation by the procedure of the British Hypertension Society or the national standard for America. These devices underwent no additional testing. Before marketing, BP devices should be validated to compare their accuracy and precision to a reference standard. This reference standard is commonly auscultation using mercury or calibrated aneroid sphygmomanometer. 469 mercury sphygmomanometers in all were discovered and put to the test. Twenty-five of them were useless due to lacking essential parts. These weren't put to any more tests. The remaining 444 machines had 167 (38%) dirty columns, 95 (21%) of which were caused by mercury oxidation, making it impossible to see the mercury column's level and obscuring the calibration markings. It was impossible to discern the mercury meniscus level in 81 (18%) because the mercury column had either been moved or the markings on the columns were severely faded. The mercury column's angle was incorrect in 91 cases (20%). Mercury had seeped into TWO of them. Electronic sphygmomanometers: Seventy-seven electronic machines of various makes were found mainly in the ITU, Renal Unit, Accident & Emergency, and operating theatres. Very few of these machines have been validated according to the British Hypertension Society protocol.

Methodology

Objective: The purpose of the study is to determine the accuracy of BP (blood pressure) measured by digital, mercury sphygmomanometer and by hand in school-going male students.

Subjects and Data Collection: A total of 60 male students (subjects) are selected randomly under the age group of 15-20 years. Age in years, sex, BMI (body mass index) height is measured in centimeters by measuring the wall and weight is measured in kilograms by the digital weighing machine used as a standard protocol. An average of three recordings of blood pressure measurement by all three devices and by hand placing on the artery was used for analysis.

Blood Pressure Measurement: In the summer session, when it's normally warmer in Kashmir, the subjects were brought into a calm room. Between 11:00 and 12:00 a.m., the study was carried out. Tea and coffee consumption and smoking were prohibited starting half an hour before the beginning of the study, and the subjects were allowed to rest for about 5-10 min before the investigation began. All subjects were seated on a chair with support for their back. Their left arm was used for the study. Students were asked to take off any clothing that restricted blood flow to their upper arms by applying pressure to them. Every participant had their blood pressure tested twice using each device, and the average of the two readings was recorded in a data input form. Digital monitors and the mercury sphygmomanometer were used to take measurements every 30 to 60 seconds. As a result, venous congestion was avoided and blood pressure variability was reduced.

The mercury instrument was used to begin the measurements. The bladder and cuff were positioned in compliance with the guidelines. They used binaural stethoscopes to measure blood pressure simultaneously with the mercury device so that the first and second observers were unaware of each other's readings.

The subjects are of the same area and come in 3km square of both Shopian and Pulwama districts of Kashmir Division.

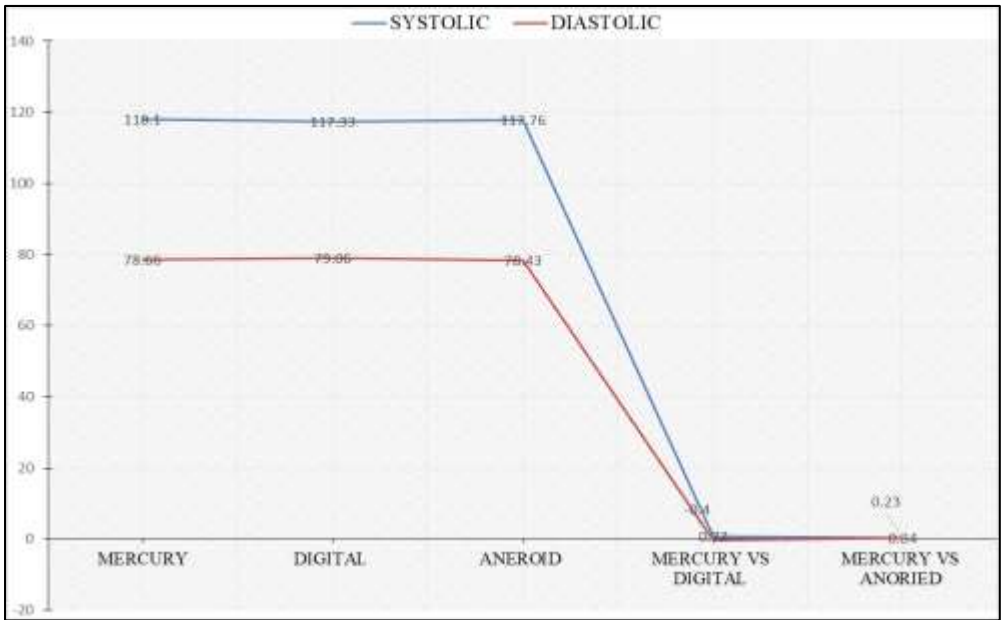
Materials

There are three types of Sphygmomanometers Digital which is of Dr. Morepen BP02 BP02, mercury is of simple Mercury device and Aneroid.

Results

Table 1: Compression of blood pressure measurement between Mercury, Digital and Aneroid sphygmomanometer

Blood Pressure	Mercury Mean (SD)	Digital Mean (SD)	Aneroid Mean (SD)	Mercury Vs Digital (SD)	Mercury Vs Aneroid (SD)
Systolic	118.10 (1.49)	117.33 (1.51)	117.76 (1.75)	0.77 (-0.02)	0.34 (-0.26)
Diastolic	78.66 (1.47)	79.06 (1.63)	78.43(1.65)	-0.4 (-0.16)	0.23 (-0.18)



Graph I: Compression of blood pressure measurement between Mercury, Digital and Aneroid sphygmomanometer

Description of the table

The data analysis software SPSS 20 is used. The total sample size is 15 and is determined by using a mercury sphygmomanometer and a digital sphygmomanometer twice. Mercury's device recorded a systolic blood pressure of 123.20, digitally measured systolic blood pressure is 119.06 and aneroid systolic is 117.76 and diastolic is 78.43. The diastolic blood pressure taken with a mercury instrument is 78.93 and that measured with digital equipment, which is 78.20.

Conclusion

It is concluded that there is little difference between digital and mercury sphygmomanometers. Mercury is so difficult to deduct as compared to digital but mercury is more accurate as compared to digital and aneroid sphygmomanometer apparatus.

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