SPHYGMOMANOMETERS IN CLINICAL USE: ARE THEY RELIABLE?

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ABSTRACT

Introduction: Hypertension affects approximately 1 billion individual worldwide. It is responsible for 7.1 million premature deaths and 4.5% of disease burden. Higher the BP, the greater is the chance of heart attack, heart failure, stroke, and kidney disease. The management of Hypertension depends on stage of Hypertension which is determined by measurement of systolic and diastolic blood Pressure. Accurate assignment of blood pressure status is crucial from a public health standpoint.

Overestimating or underestimating blood pressure by even 5 mm Hg can mislabel over 20 million persons as having high normal blood pressure rather than hypertension; conversely, another 20 to 30 million could be misclassified as hypertensive exposing these persons to the expense and adverse effects of treatment.

Different type of Blood pressure instruments (sphygmomanometer) like mercury and aneroid type are generally used in our country.

What ever the type for accurate measurement of blood Pressure properly calibrated and validated instrument should be used.

Objective: To determine the frequency of errors in Blood pressure instruments (sphygmomanometer) in use in different health care facilities

Material and Method: Inclusion: All working BP apparatus used in different health facilities

Exclusion: Damaged or out of order instruments

Method: Blood pressure instruments (sphygmomanometer) in use in different health care facilities were randomly tested on-site with ERKA Made In Germany Model No 83646 BAD Tötz Name of the facility where BP apparatus is used, designation of the user, the type of BP instrument, make of the instrument and error if any was recorded. Any difference of more than 5 mm mercury was taken as an error as recommended.

Results: 501 BP apparatuses were tested. All of them were in use. Out of these 252 (50.3%) were being used in teaching hospitals. 48.5% were mercury manometers most of the instrument were purchased six months earlier. Error was present in 30.1% of instruments in use. It was observed in 45.73% of aneroid type of BP apparatus and 13.58% of mercury type of BP apparatus. Difference range from 0 to 70 mm mean 4.73 SD 8.313. Error was more in aneroid type of BP apparatus (p= .001) Error was significantly more in older instrument (p=.001) Non of the instruments was calibrated.

Conclusion: It is recommended that Blood pressure instruments should be regularly calibrated.

Key Words: Blood pressure instruments, calibration.

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INTRODUCTION

Hypertension affects approximately 1 billion individual worldwide. As the population ages, the prevalence of hypertension will increase even further unless broad and effective preventive measures are implemented. Recent data from the Framingham Heart Study suggest that individuals who are normotensive at age 55 have a 90 percent lifetime risk for developing hypertension.[1]

Hypertension is respon sible for 7.1million premature deaths and 4.5% of disease burden

The higher the BP, the greater is the chance of heart attack, heart failure, stroke, and kidney disease. At 40–70 years of age, each increment of 20 mmHg in systolic BP (SBP) or 10 mmHg in diastolic BP (DBP) doubles the risk of CVD across the entire BP range from 115/75 to 185/115 mmHg.[2]

It was in 1896 when Riva Rocca measured BP in arm using mercury manometer.

The Aneroid sphygmomanometer has been used for the indirect measurement of blood pressure since the studies of Hill and Bernard and has been widely used in clinical practice because of its convenience and portability. Compared with standard mercury sphygmomanometry, however, the aneroid device has more working parts and requires more maintenance, particularly when it is subjected to heavy use.[3]

The management of Hypertension depends on stage of Hypertension that is determined by measurement of systolic and diastolic BP. Accurate assignment of blood pressure status is crucial from a public health standpoint. The risk associated with increasing blood pressure is graded and continuous and begins at 115/75 mm Hg.

Overestimating or underestimating blood pressure by even 5 mm Hg can mislabel over 20 million persons as having high normal blood pressure rather than hypertension; conversely, another 20 to 30 million could be misclassified as hypertensive exposing these persons to the expense and adverse effects of treatment.[4]

Another study consistent 5 mmHg error in systolic pressure has shown to result in systolic hypertension being under diagnosed by 30% or over diagnosed by 43%.[5]

For accurate measurement of BP properly calibrated and validated instrument should be used.[6]

OBJECTIVE

To determine the frequency of errors in Blood pressure instruments (sphygmomanometer) in use in different health care facilities.

MATERIAL AND METHOD

Inclusion
All working BP apparatus used in different health facilities.

Exclusion
Damaged or out of order instruments

Method
Blood pressure instruments (sphygmomanometer) in use in different health care facilities were randomly tested on-site with ERKA Made In Germany Model No 83646 BAD Tötz

Name of the facility where BP apparatus is used, designation of the user, the type of BP instrument, make of the instrument and error if any was recorded. Any difference of more than 5 mm mercury was taken as an error as recommended

DATA MANAGEMENT

The data was entered in SPSS 16. The variables were analyzed using frequency result were assessed as percentages and correlations were determined using t-test p value less than 0.05 was taken as significant

RESULTS

501 BP apparatuses were tested. All of them were in use. Out of these 252 (50.3%) were being used in teaching hospitals. Fig 1
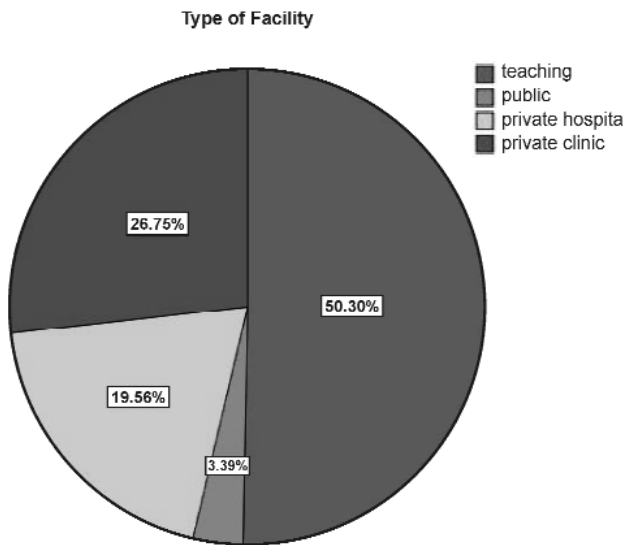
Instrument were in use of physician, Cardiologists, Gynecologists, Surgeons, General Practitioners house officers, residential medical officers and paramedical staff.

Only 23% percent of the instruments were being used by the specialists. Table 1

Among the 501 instrument tested 243 were mercury. Table 2

Most of the instruments were in use for more than six months.Table 3

Fig-1 : Type of health facility

Type of Facility

- teaching
- public
- private hospita
- private clinic

26.75%
50.30%
19.56%
3.39%

Table-1 : Status of personals using the instrument

	Frequency	Percent
Physician	52	10.4
Cardiologists	25	5.0
Gynecologists	13	2.6
Surgeons	16	3.2
Other (para med)	102	20.4
General Practitioners	116	23.2
RMO/H.O	173	34.5

Table-2 : Types of BP apparatus. Frequency and significance of error

	Frequency/ (Percentage)	NORMAL	ERROR	P value
Mercury	243 (48.5%)	210 (86.41%)	33 (13.59%)	P= .001
Aneroid	258 (51.5%)	140 (54.26%)	118 (45.73%)	

Table-3 : Time since purchase: frequency and significance of error

	Frequency	Percent	Error present %	P value
Less then 1 month	26	5.2	.038%	P=.001
1-6 months	122	24.4	15%	
Greater than 6 months	352	70.3	37.28%	

Error was observed in 30.1% of the instruments tested. It seen in 45.73% of aneroid type of BP apparatus and 13.58% of mercury type of BP apparatus difference range from 0 to 70 mm mean 4.73 SD 8.313 . Error was more in aneroid type of BP apparatus (p= .001) .

Error was significantly more in older instrument (p=.001).[Table 3]

DISCUSSION

Study by Ali suggest that 17% of mercury and aneroid sphygmomanometers were inaccurate Results of this study are consistent with other published research. Bailey *et al*[8] found 35% of aneroid manometers to be inadequately calibrated. Burke *et al* [9] found 30% of aneroid devices with error compared with 2% of mercury devices. Mion *et al*[10] found 58% aneroid and 21% of mercury manometers.[7]

In our study error was observed in 30.1% aneroid instruments this is a larger number observed compared to other studies error was present in 45.73% of aneroid type of BP apparatus this is in consistence with other studies where 31%* and 53% error was observed in aneroid type of manometer in mercury type of BP apparatus where studies show it to be 6%.[11-12]

In our study none of the instrument was calibrated.

RECOMMENDATIONS

To minimize the risk of erroneous blood pressure recording, aneroid devices should be regularly checked for accuracy encourage the general use of mercury manometers as the instrument of choice until other instruments are better validated;[13,14,15]

As the instruments are not calibrated error was more in older instrument.

It is recommended that to minimize the risk of erroneous blood pressure recording, aneroid devices should be regularly checked for accuracy.

the general use of mercury manometers as the instrument of choice should be encouraged until other instruments are better validated.

Recommended calibration and check intervals for mercury, aneroid by Australian heart.

Mercury sphygmomanometers that object should be

checked at 6 month interval and Aneroid sphygmomanometers used room should be checked monthly.

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