

To Study variations in Blood Pressure (BP) Recording by Mercurial Sphygmomanometer & by LED (Non-Mercurial) BP Machine in Individuals in Sitting Position in Same Arm - A Cross Sectional Study in Guwahati City

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Abstract: *Background:* Arterial blood pressure (BP) is an important component of our body parameter & its maintenance to near normal levels is important for maintenance of internal milieu of our body. Mercurial BP instruments are in the process of being phased out due to environmental hazards posed by the liquid metal. *Methods:* After obtaining ethical clearance from institutional ethical committee a total of 100 individuals between 20-60 yrs of age of either gender were taken in the ambit of the study. The BP of the individuals were measured in the same arm in sitting position by Mercury Sphygmomanometer & by LED BP recording machine at room temperature after relaxing the subjects and readings were recorded accordingly in a profoma made beforehand. Prior to BP being taken the individuals were asked to sign the written consent & a brief history & physical examination was done. The BP readings with both Mercurial sphygmomanometer & LED instrument were tabulated & variation of readings & their statistical significance was found out. For statistical analysis the value of the BP recordings were presented as Mean \pm standard deviation. Statistical correlation between the recordings of BP by both methods were done and P-value < 0.05 was considered as significant. *Results:* BP readings recorded with both the instruments were found to be similar (readings of Mercurial & LED BP instrument) as result showed non significant 'p' value 0.1001 (systolic) & 0.1180 (diastolic) ($p > 0.05$). The mean of the arterial pressure as recorded by mercurial & LED were similar. *Conclusions:* It was therefore concluded from the study, that recording of BP by Mercurial & LED instruments yielded almost similar readings. So, by phasing out mercurial BP instruments, LED instruments are a good option for measuring arterial BP & can be used.

Keywords: LED BP Instrument, Mercurial Sphygmomanometer, Hypertension

1. Introduction

Blood pressure (BP) is an important component of our body parameter & its maintenance to near normal level is important for maintenance of internal milieu of our body particularly cardiovascular system & CNS. Blood pressure is determined predominantly by cardiac output & calibre of the arteriolar vessels often expressed by the term "Total peripheral resistance". The enigma of hypertension lies in proper measurement of BP taking into consideration the physiological variations as well as relative contributions of Kidneys, Adrenal glands, nervous system, sodium intake to the sustained elevation of Blood pressure. The interplay of these factors mainly socio-environmental setup of the individual concerned alongwith personal habits have a great impact in determining the ambient blood pressure. The aim of this study was to find out other non mercurial means of measuring the arterial BP accurately as conventional mercurial sphygmomanometers are being phased out owing to environmental hazard posed by the liquid metal. There have been many discussions in world body organizations also about the use of non mercurial BP measuring instruments being put into use on a regular basis in place of the conventional mercurial sphygmomanometers with hospital/ health care waste disposal regulatory authorities

keeping a strict vigil on disposal of mercurial waste from BP instruments and its threat to the health of the individuals.

2. Methods

The study was conducted in the Department of Physiology, Gauhati Medical College, Guwahati, Assam, India for a duration of 2 months. After obtaining permission from the heads of both institutions and ethical committee, individuals were approached to collect data. A total of one hundred (100) healthy individuals between 20-60 years of either sex were selected by simplified random sampling from Guwahati city. Study was performed after obtaining full consent from them. Individuals having mental instability were excluded from the study. Mercury Sphygmomanometer & LED BP instrument were used to record BP of the selected individuals in sitting position in same arm after doing initial round of physical examination and brief history. They were relaxed for a period of 5 mins initially as well as between measurement by the different instruments, Room temperature was maintained optimally at 24 degree Celsius. All the subjects were tested upon between 9 a.m. to 12 noon in order to rule out any alterations imposed by diurnal variations in BP. The subject was allowed to sit comfortably in a chair with arm rest and breathe normally. The cuff of the BP instruments were tied as per standard procedures. BP

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was subsequently measured using both type of instruments (Mercurial as well as LED BP Instrument). The primary objective of the study was to find out any significant variation between recordings of BP by Mercurial sphygmomanometer & LED BP measuring instrument. The recordings were subsequently noted and Systolic BP obtained by both the instruments were compared by paired “t” test as well as the diastolic BP compared of both the readings. The Pearson coefficient was plotted as a graph which revealed a linear relationship with slight positive correlation. A p-value of <0.05 was to be taken considered as significant which was calculated as per analysis of variance (ANOVA) using Statistical Package for Social Sciences (SPSS) version 20 was employed for comparing the parameters.

3. Result

BP readings of 100 individuals recorded with both the BP measuring instruments (Mercurial & LED) were found to be non significant in terms of variations of readings as result showed non-significant ‘p’ value 0.1001 (systolic) & 0.1180 (diastolic) (p>0.05). The mean of the arterial pressure as recorded by mercurial & LED BP measuring instrument were almost similar.

Table 1: Showing Systolic and Diastolic BP in Mean ± SD and the corresponding p value

p value	Systolic BP in mm Hg in Mean±SD		Diastolic BP in mm Hg in Mean±SD	
	LED	Mercury	LED	Mercury
>0.05			>0.05	

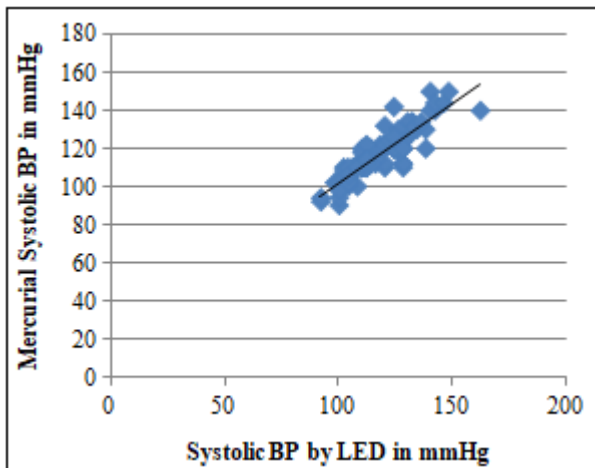
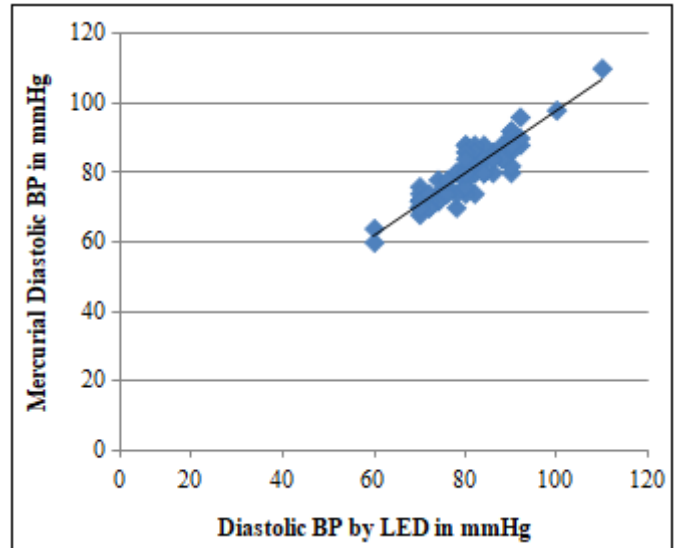


Figure 1: Scatter Diagram showing positive correlation between the Mercurial and LED systolic BP with ‘r’ value of 0.89312



Systolic BP		
t-Test: Paired Two Sample for Means		
	128	110
Mean	117.5757576	116.8080808
Variance	184.1038961	166.7689136
Observations	99	99
Pearson Correlation	0.901126531	
Hypothesized Mean Difference	0	
df	98	
t Stat	1.2896676	
P(T<=t) one-tail	0.100100693	
t Critical one-tail	1.660551218	
P(T<=t) two-tail	0.200201385	
t Critical two-tail	1.984467404	

p>0.05

Diastolic BP		
t-Test: Paired Two Sample for Means		
	74	72
Mean	79.87878788	79.49494949
Variance	68.88311688	65.00762729
Observations	99	99
Pearson Correlation	0.923762431	
Hypothesized Mean Difference	0	
df	98	
t Stat	1.19235765	
P(T<=t) one-tail	0.118000103	
t Critical one-tail	1.660551218	
P(T<=t) two-tail	0.236000206	
t Critical two-tail	1.984467404	

p>0.05

4. Discussion

The arterial blood pressure measured by the conventional mercurial Sphygmomanometer and by LED blood pressure measuring instrument almost showed almost similar readings in the same arm in sitting posture after 5 mins minimum rest. As we all know by now that mercury being considered an environmental pollutant or hazard, the mercurial sphygmomanometers are being phased out in a rapid manner and replaced by digital instruments for measuring arterial blood pressure. The LED (non mercurial) sphygmomanometers are being brought into service and as per this study there is no difference in the readings of both

systolic & diastolic blood pressure with 100 persons arterial blood pressure being measured by both and it yielded non significant result with p value greater than 0.05 which was taken as the reference standard considering 95% confounding factor.

5. Conclusion

The arterial blood pressure measured by mercurial sphygmomanometer & by LED non mercurial blood pressure measuring device showed the same reading of both systolic & diastolic blood pressure in the same arm in sitting position in the same arm after minimum 5 minutes of rest this confirmed that in place of mercurial sphygmomanometers LED blood pressure measuring devices can be used easily as it required no calibration with the mercurial sphygmomanometers unlike aneroid (dial type) BP measuring device and cost effective too with no question of any harmful effect/ hazard on the health of the person.

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