Wrist-Worn Blood Pressure Monitor and Arm Cuff Aneroid Sphygmomanometer: A Comparison

First independent Indian study on wrist blood pressure accuracy exposes a systematic measurement gap that affects millions of self-monitoring patients published in European Society of Hypertension.

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THE PROBLEM

Over 25% of India's population lives with hypertension. The majority remain undiagnosed until a cardiovascular event forces clinical attention. Self-monitoring devices have become the first line of awareness yet their accuracy in Indian populations had never been independently verified. This study from AIIMS Raebareli directly confronts that silence.

THE STUDY

Published in the Journal of Family Medicine and Primary Care (2025), 150 healthy volunteers underwent simultaneous blood pressure measurements under AHA-protocol conditions wrist monitor against aneroid sphygmomanometer, with both teams blinded to each other's readings. Across 1,800 data points:

→ Wrist monitor overestimated systolic pressure by +5.9 mmHg
→ Wrist monitor overestimated diastolic pressure by +4.5 mmHg
→ Diastolic overestimation (6.02%) consistently exceeded systolic (5.08%)
→ Bias showed no significant correlation with age or gender, it is device-level, not population-dependent
→ Mean arterial and pulse pressure readings were equally inflated

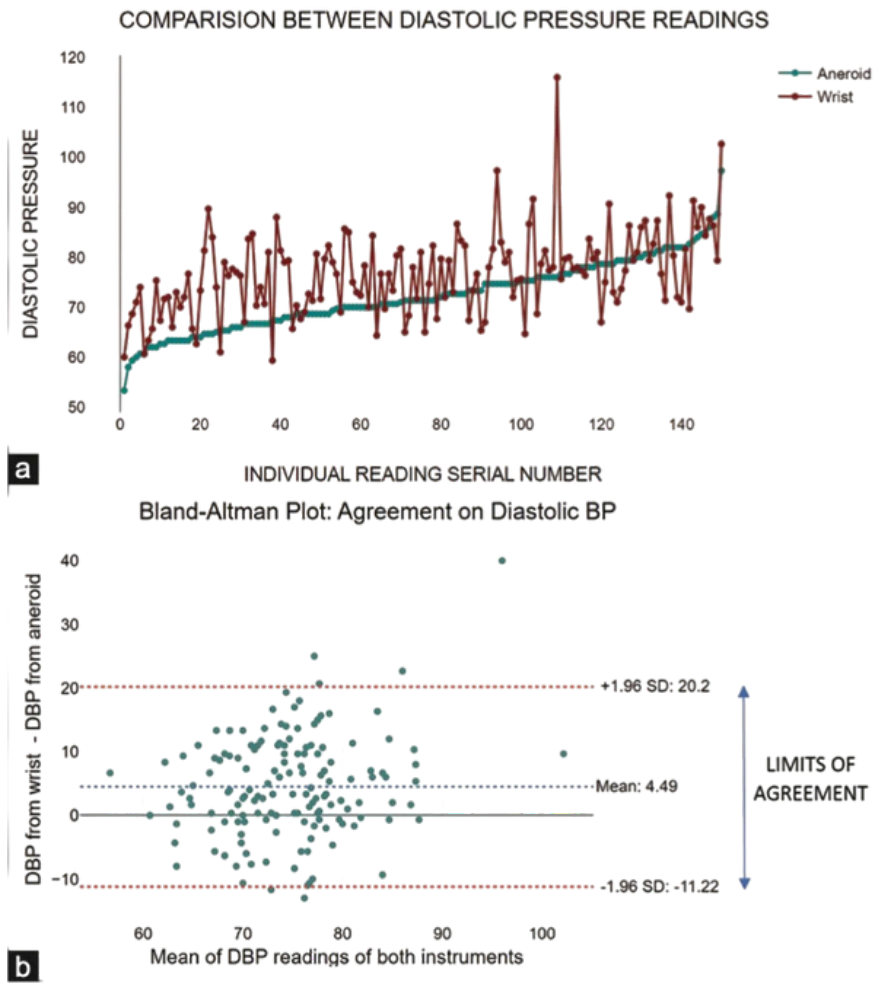

Figure 2: (a) Line graph showing comparison between diastolic pressure readings of the two instruments. (b) Bland–Altman plot showing the agreement on diastolic blood pressure between aneroid and wrist meter, 96% of the diastolic blood pressure readings were within 95% agreement

THE IMPORTANCE

Device error is the most fundamental and preventable source of blood pressure measurement inaccuracy. In a country where cardiovascular disease claims lives that early detection could protect, an uncalibrated reading carries real consequence. Patients who rely solely on wrist monitor values risk false reassurance or unnecessary clinical alarm and neither outcome serves public health.

HOW THE BIAS WAS CONFIRMED

The study employed Bland-Altman analysis the clinical benchmark for comparing two measurement instruments to plot agreement across all subjects. The mean difference remained consistently positive for both pressures. The wrist device did not fluctuate randomly around zero. It skewed high, directionally, across the board. That is the critical distinction between imprecision and systematic bias. Globally, the literature is divided Karampela found underestimation in critical care settings; Saito recorded mixed results against mercury standards. This study aligns with Schaefer and Azaki: both pressures inflated. What it uniquely contributes is the Indian population anchor previously absent from the published record entirely.

WHAT REMAINS UNANSWERED

This is a pilot study of 150 young, healthy college students in a controlled setting. The authors themselves flag it. What happens to this bias margin in older populations, in hypertensive patients already on medication, in those with arterial stiffness or obesity? The device gap documented here may narrow or widen considerably. The paper establishes the baseline. The clinical question it opens is larger than the one it closes.

THE EVIDENCE-BASED POSITION

Wrist monitors are not inaccurate instruments, they are systematically biased ones. Used with awareness of this margin, they remain viable for home surveillance, particularly in elderly, post-surgical, or non-ambulatory patients where arm cuffs are impractical. The clinical imperative is calibration awareness, not device abandonment. A single mmHg gap, repeated daily, is not a rounding error. It is a public health variable.

WHY YOU NEED TO CARE

The world is moving fast. Smartwatches flag irregular heart rhythms. AI health platforms analyse your blood pressure trends and generate dietary recommendations. Insurance models in several countries are beginning to incorporate wearable biometric data into risk profiling. Fitness applications are being trained on user-submitted readings to predict cardiovascular events before they occur. Every one of those systems is only as reliable as the data feeding it. If the input is consistently skewed by 5 to 6 mmHg, the output is not intelligent monitoring. It is confident error at scale. An AI trained on systematically overestimated readings does not learn blood pressure. It learns a distorted version of it. The question this paper raises is not whether wrist monitors work. It is whether the digital health ecosystem being built around them has accounted for what they actually measure.

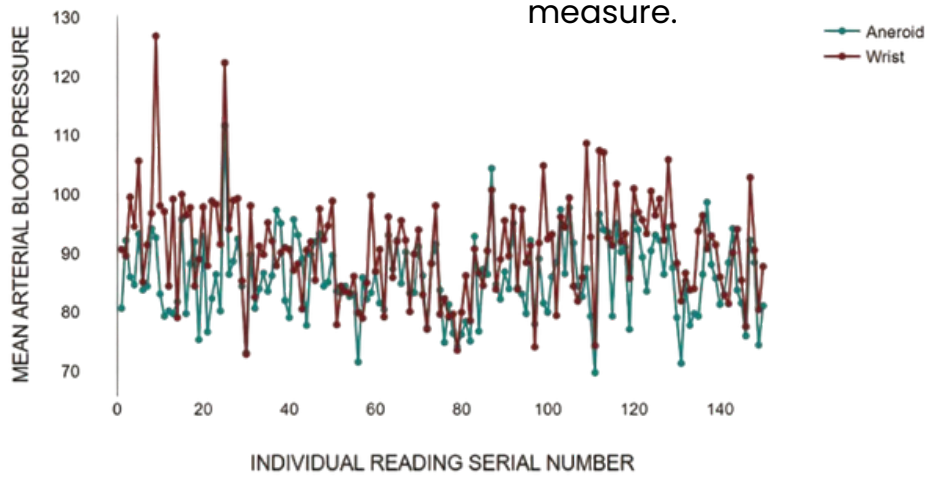

Figure 3: Line graph showing comparison between mean arterial pressure readings of the two instruments

Based on the study "A Comparison of Utility of a Wrist-Worn Blood Pressure Monitor with Arm Cuff Aneroid Sphygmomanometer," published in the European Society of Hypertension. For further details, refer to the original paper.