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BACKGROUND Mobile health technologies are revolutionizing cardiovascular medicine. However, a low-cost, user-friendly smartphone-based electrocardiograph that enables the acquisition of multiple lead Electrocardiograms (ECG), with reliability comparable to standard electrocardiograph, is still lacking. The D-Heart Electrocardiograph has been developed for iOS and Android, enabling the acquisition of the ECG through 5 electrodes (4 peripheral and 1 precordial (V5)) connected to a portable hardware that streams via Bluetooth the trace to the smartphone. Because of the potential impact of this technology as a screening strategy in low-income countries, we performed the present study in a regional hospital in Africa.

PURPOSE To determine the accuracy of D-Heart Electrocardiograph in the stratification of ECG morphological abnormalities compared to a standard 12 lead ECG, assumed as the gold standard.

METHODS Consecutive patients referred for routine medical evaluation to the Regional Hospital of Ziguinchor (Senegal) were enrolled. D-Heart recordings were obtained followed by 12 lead ECGs. The severity of ECG abnormalities was defined by a semi-quantitative score based on the sum of 9 criteria (Del Cre, Int J Cardiol. 2013): abnormal cardiac rhythm, QRS duration≥100 ms, Romhilt–Estes (R-E) score≥5, fascicular block and/or bundle-branch block, ST-T abnormalities, ST-T segment elevation≥0.2 mV, prolonged QTc interval, pathological Q waves and absence of normal Q wave. Four ECG groups were identified: normal (0 criteria); mildly abnormal (1–3 criteria); moderately abnormal (4–6 criteria); markedly abnormal (7–9 criteria). ECGs were analyzed blindly by two independent observers. Discordant adjudications were resolved by a third observer.

RESULTS We evaluated 117 patients (69 males, mean age 39±11 years) of African origin with a mean blood pressure of 119/78 mmHg. Eight (7%) patients had a diagnosis of hypertension, whereas 5 (4%) had history of coronary artery disease.

Adjudication according to 12-lead ECG and D-Heart – respectively- was as follows: normal ECG: 69 (59%) vs 72 (61%); mildly abnormal ECG: 45 (38%) vs 42 (36%); moderately abnormal ECG: 3 (3%) vs 3 (3%). Cohen’s kappa () test showed a concordance of 0.949 (p=0.029) between the two techniques. Thus, while the 12-lead ECG was expectedly more sensitive for mild abnormalities, there was 100% concordance for the moderately abnormal tracings. Of note, concordance was also high with regard to the R-E score (=0.868; p=0.038). Comparison of PR and QRS intervals (Bland-Altman method, non-parametric approach) showed excellent accuracy for D-Heart measurements (95% limit of agreement -20 to + 20 ms for PR and -10 to + 10 ms for QRS).

CONCLUSION D-Heart ECGs proved accurate, allowing a stratification of ECG abnormalities comparable to the standard 12-lead ECG. This new technique opens promising perspectives for low-cost community cardiovascular screening programs in low-income settings.