

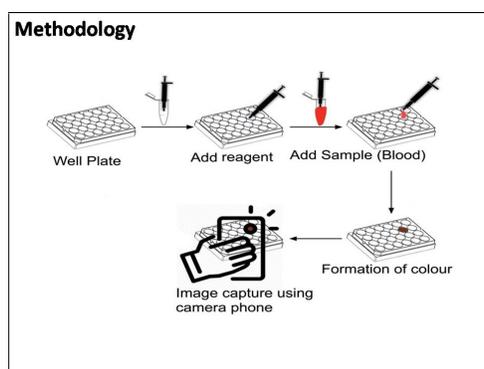
## New mobile app can help people measure Haemoglobin level in remote areas

Agharkar Research Institute, an autonomous institute of the Department of Science and Technology, Ministry of Science and Technology, Government of India has developed a mobile app-based system for haemoglobin measurement.

The product consists of a reagent, plastic containers, plates, pipette, proprietary software and a CD showing the demonstration.

This cost-effective high throughput method for haemoglobin estimation using an android smartphone app is particularly useful in the resource-limited setup as well as in remote rural areas.

The process consists of addition of reagent to the plate, followed by the addition of blood sample. The formation of colour is captured using a camera phone. On clicking the Hb calculator app icon, a splash screen is launched. Initially, an image of the container with a blank solution is captured and set as the calibration image. After this, an image of the container with sample solution is captured and analyzed. The app automatically calculates the Hb value (g/dL) for the respective sample, and the result is displayed on the screen.

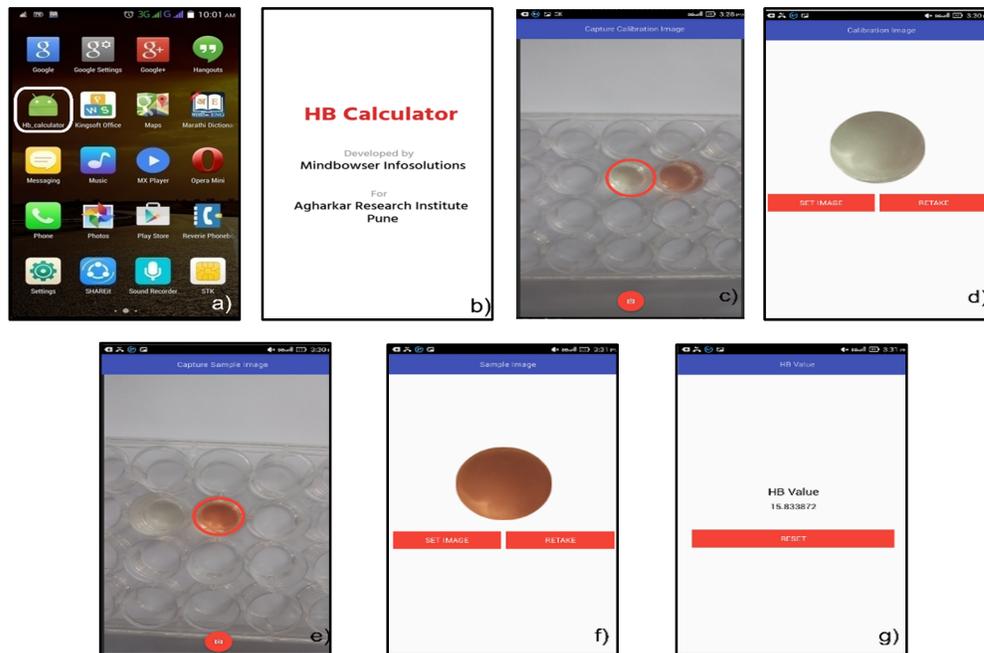


The smartphone-based application (app) developed provides an accurate and sensitive measurement of haemoglobin (Hb) and has been tested and validated through different analysis. The Hb values obtained using the app correlated significantly ( $R^2= 0.976$ ) with those obtained by automated haematology analyzer. Bland-Altman analysis, which is a popular biomedical graphical method to compare two measurements technique, showed that the standard deviation of the difference between Hb measured by two methods was 0.35 g/dL and limits of agreement between the two methods were -0.62 to 0.75. The limit of detection of 0.66 g/dL was achieved using the app along with 2 g/dL limit of quantification.

Further, the measurement using the app was highly sensitive (94%) and specific (90%). The app developed on a smartphone will particularly be useful in resource-limited conditions for rapid, accurate, highly sensitive and specific for the assessment of anaemia.

Determination of haemoglobin is one of the most frequently performed analyses in clinical diagnostic procedures. As is well known, iron is essential for the synthesis of haemoglobin and the maintenance of oxygen transport as well as for the function and formation of other physiologically important heme and non-heme compounds. Nutritional deficiency of iron is associated with developmental delay, impaired behaviour, diminished intellectual

performance and decreased resistance to infection. Disorders of iron metabolism, especially iron deficiency and disturbances in iron resorption, are being increasingly reported today.



Screen-capture of the "Hb calculator" smartphone app running on an Android operating system, detailing the workflow of the app.