Title (Upper case)

SCREENING FOR JAUNDICE IN GHANAIAN NEONATES BY SMARTPHONE SCLERA IMAGING

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Introduction *(include hypothesis)*

Timely identification of jaundice remains problematic. Specialised screening devices such as the transcutaneous bilirubinometer exist but are rarely available in the home setting, particularly in low-income parts of the world. In Sub-Saharan Africa, long-term impairment following kernicterus is eight times more common than in high-income countries [1]. Smartphones may serve as objective and ubiquitous colorimeters. We seek to show that a sclera imaging app could screen for jaundice with comparable accuracy to a transcutaneous bilirubinometer.

Methods (*include source of funding and ethical approval if required*)

The app was used to image the sclera of 101 newborns in the Greater Accra Regional Hospital before a blood test for determination of total serum bilirubin (TSB) concentration. Pixel values were extracted from manually drawn regions of interest in the sclera. A regression model was used to relate sclera chromaticity to TSB. We call the output of this model the Scleral-Conjunctival Bilirubin (SCB), in analogy with Transcutaneous Bilirubin (TcB). A TcB measurement was also made using the Draeger JM-105. This study is funded by Saving Lives at Birth with ethical approval from Ghana Health Services, UCL, and Univeristy of Ghana Ethics Committees.

Results

A correlation of r=0.79 (p<0.01) was achieved between SCB and TSB. In screening for newborns with TSB greater than 250µmol/L, the NICE-recommended threshold for blood test referral in term infants [2], a SCB decision threshold of 215µmol/L maximised Youden's Index. The sensitivity (95% confidence interval) was 96% (89% - 99%), with specificity 72% (62% - 81%). The area under the Receiver Operating Characteristic curve (AUROC) was 0.91. With the same subjects and decision criteria, the JM-105 gave correlation 0.79 (p<0.01), sensitivity 89% (81% - 94%), specificity 77% (67% - 85%), and AUROC 0.84.
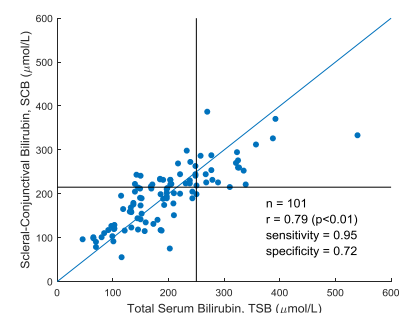
Conclusions

We have shown that a colour-based jaundice metric from a sclera image has a screening performance at least as good as the latest generation of TcBs, and that this imaging is feasible with a smartphone in a clinical setting in Ghana. We will integrate analysis into the app for real-time results and improve robustness and usability.

References *(include acknowledgement here if appropriate)*

[1] Bhutani, Vinod K., et al. *Pediatric research* 74.S1 (2013): 86.
[2] National Institute for Clinical Excellence. "Jaundice in newborn babies under 28 days." (2016).

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All authors have approved the abstract, actual or potential conflicts of interest have been declared to the meetings secretary, and the abstract has not been presented previously: ☒

Senior author supporting presentation on day of meeting: Dr Judith Meek