

Using UmbiFlow™ to assess heat stress on fetoplacental blood flow.

Ana Bonell, Valerie Vannevel, Bakary Sonko, Nuredin Mohammed, Ana M. Vicedo-Cabrera, Andy Haines, Neil S Maxwell, Jane Hirst, Andrew M Prentice

Objective

To evaluate the impact of heat stress on umbilical artery resistance index (RI) measured by UmbiFlow™ in field settings and the implications for pregnancy outcomes.

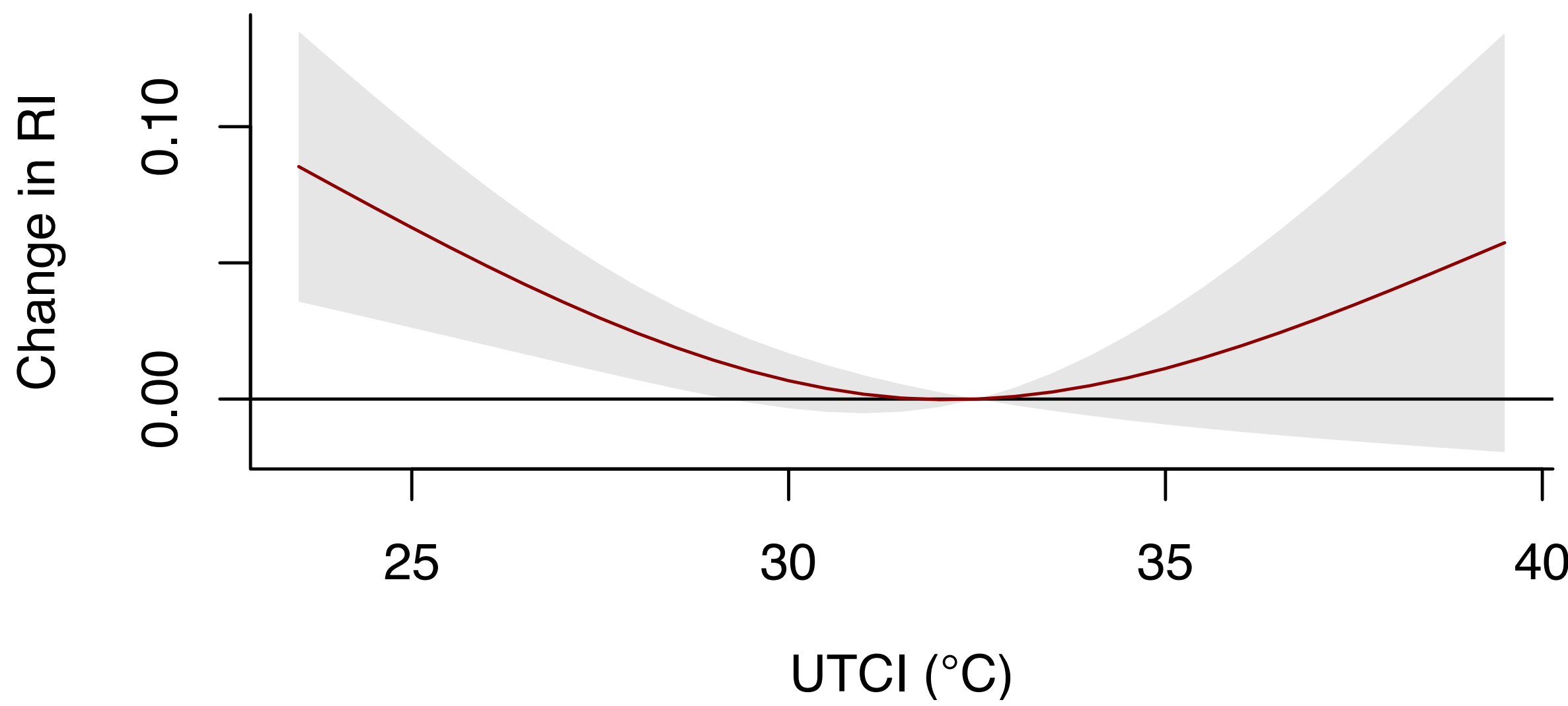
Methods

This feasibility study was conducted in West Kiang, The Gambia, West Africa; a rural area where mostly subsistence farming is practiced and at the forefront of the climate crisis with increasing exposure to extreme heat. We recruited women with singleton fetuses who performed manual tasks (such as farming) during pregnancy. The umbilical artery RI was measured at rest, during and at the end of a typical working shift in women ≥ 28 weeks' gestation. Adverse pregnancy outcomes (APO) were classified as stillbirth, preterm birth, low birth weight, or small for gestational age, and all other outcomes as normal.



Figure 1: Trained researcher performing an UmbiFlow™

Normal pregnancy outcome



Adverse pregnancy outcome

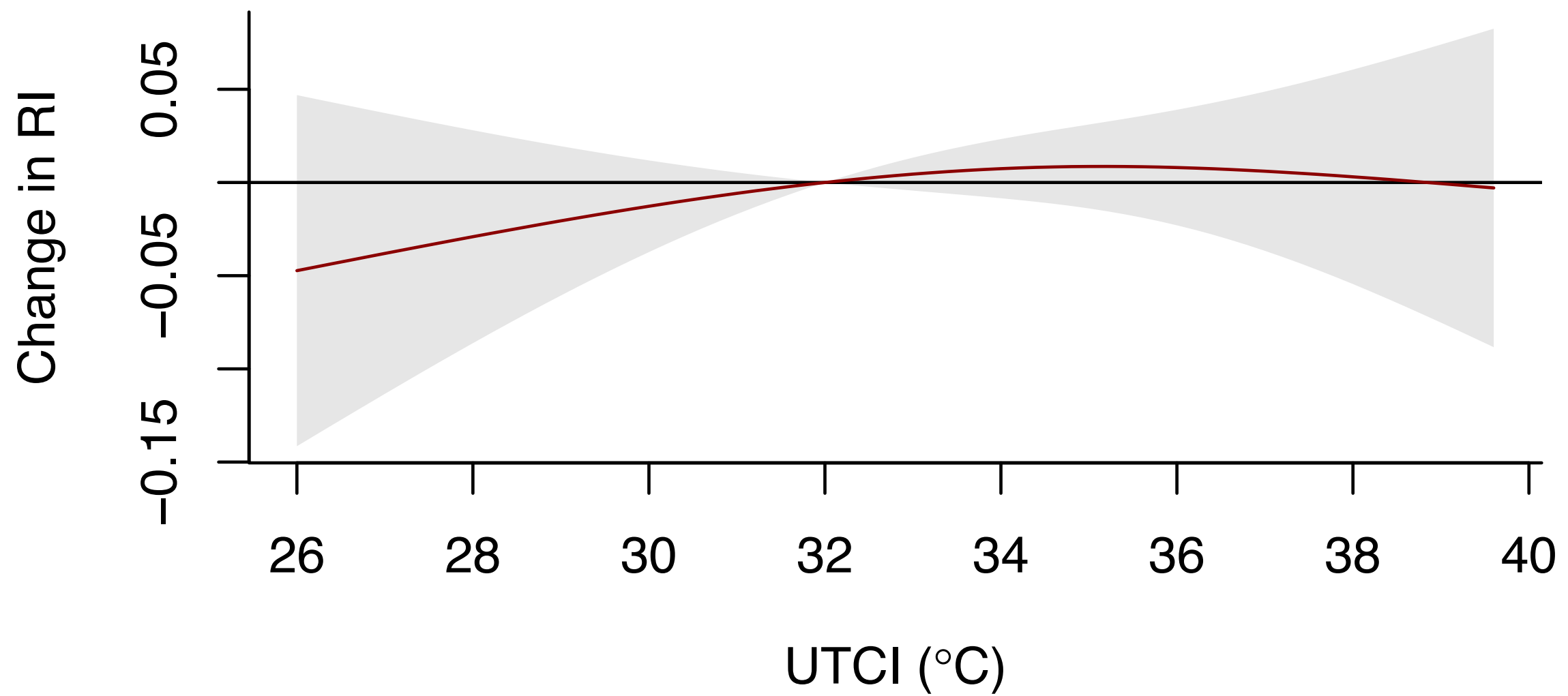


Figure 2: Association between change in umbilical artery RI under heat stress (UTCI) in those with normal birth outcomes and those with adverse pregnancy outcomes.

Results

A total of 40 participants were included; 23 normal births and 17 APO. Umbilical artery RI demonstrated a nonlinear relationship to heat stress, with indication of a potential threshold value for placental insufficiency around 32°C by universal thermal climate index. Preliminary evidence suggests the fetoplacental circulation response to heat stress differs in APO versus normal outcome.

Discussion

We show that the measurement of umbilical artery doppler in field conditions is possible and shows promising evidence of potentially enhancing the understanding of the fetoplacental circulation response to heat stress. Based on these preliminary findings, a simulated sample size of 997 pregnant women with APO, would reach statistical significance to demonstrate the relationship between umbilical artery RI z-score and heat stress.

Conclusions

The Umbiflow™ device proved to be an effective field method for assessing placental function. Dynamic changes in RI may begin to explain the association between extreme heat and APO.

Funding

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