

MEDIA RELEASE

UP researchers use low-cost device to detect foetal growth restriction

PRETORIA – Researchers at the University of Pretoria (UP) have shown that a low-cost, easy-to-use screening device can detect foetal growth restriction in pregnant women which, if not diagnosed, can lead to stillbirth, neonatal death or suboptimal childhood growth.

The work was done at UP's Research Centre for Maternal, Fetal, Newborn and Child Health Care Strategies and published in peer-reviewed journal *PLoS ONE*.

Dr Helen Mulol of the research centre and co-author of the study explains, "The Umbiflow™ is a portable, continuous-wave Doppler ultrasound device that was developed in South Africa and costs about one-tenth of a conventional ultrasound device. All healthcare workers, including nurses, can be trained relatively quickly to operate it. The device can be connected to a computer, tablet or smartphone and a printer can be attached to print out results."

Healthcare workers would use the Umbiflow™ to find the wave pattern of the umbilical artery which indicates the blood flow between the baby and the placenta.

From this wave pattern, a parameter called the resistance index (RI) can be calculated. The result of the RI, according to the gestational age of the baby, is plotted on a graph, with the next clinical management steps then being determined according to a "traffic light" system. According to risk categorisation, an RI value in the red or yellow region of the graph is classified as an "abnormal Doppler" and the mother is referred to an obstetrician or doctor for further investigation. An RI value in the green area is classified as a "normal Doppler"; this means the mother can continue antenatal follow-up visits at a local clinic.

The Doppler result is important because it is a measure of placental function – the rate of blood flow from the placenta to the foetus. Dr Mulol says foetal growth restriction can be defined as failure of the foetus to reach its genetic growth potential. "It does not mean that all growth-restricted babies are small. It also does not mean that all small babies are growth restricted; some are just constitutionally small. Foetal growth restriction means the foetus is not growing as well as it should be in utero, which is exactly the group of babies that can be identified by the Doppler."

Professor Ute Feucht – Director of the Research Centre for Maternal, Fetal, Newborn and Child Health Care Strategies, and lead author of the study – explains the implications: "The foetus is not receiving enough nutrition and oxygen in utero and therefore does not grow optimally. If this is not picked up, the foetus is at risk of stillbirth and neonatal death."

There might also be long-term consequences such as the risk of neurodevelopmental delay and non-communicable diseases later in life. These include childhood obesity as well as type 2 diabetes, hypertension and strokes in adults.

What was done during the study?

The Umbiflow™ international study recruited healthy pregnant mothers in five low- and middle-income countries – Ghana, India, Kenya, Rwanda and South Africa – and looked at the percentage of abnormal Dopplers in these countries.

The UmbiBaby study is following up on 91 infants from the South African leg of the international study, assessing them at eight time points over the first two years of life. The *PLoS ONE* article studied the term-born infants (81) in the first six months of life. The main finding, according to Prof Feucht, was that the growth restriction identified in pregnancy by the Umbiflow™ device continued after birth.

Infants who had an “abnormal Doppler” in utero had a significantly lower fat-free mass (the non-fat portion of the body, which includes bones and muscles). It is also notable that only about a quarter of these infants were small-for-gestational age at birth, which is classified as a birthweight less than that of the 10th percentile.

The assessment of weight at birth would not have identified many of these growth-restricted infants, who may be in need of additional nutritional and neurodevelopment care postpartum. When taking the two definitions together, the growth-restricted infant (as identified by the “abnormal Doppler”) and small-for-gestational age is the most compromised in terms of postnatal growth.

It is therefore recommended that a Doppler device such as the Umbiflow™, which measures placental function, be utilised routinely during antenatal care, in addition to measuring the infant’s size at birth, as the latter is a once-off measurement that could fail to take into account the infant who might not be small at birth, but who is still at risk of poor growth postnatally.

Caption 1. The Umbiflow™ is a portable, continuous-wave Doppler ultrasound device that was developed in South Africa and costs about one-tenth of a conventional ultrasound device. All healthcare workers, including nurses, can be trained relatively quickly to operate it.

2. Umbiflow™ in use on a patient

Caption 3. Infographic to learn more about stillbirths and how the Umbiflow™ can help prevent them

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About the University of Pretoria

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on the Hatfield Campus, Pretoria. This 114-year-old institution is also the largest producer of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only University in the country with a Faculty of Veterinary Science, which is ranked top in Africa. UP has 120 academic departments and 92 centres and institutes, accommodating more than 55 000 students and offering about 1 100 study programmes.

UP is one of the top five universities in South Africa, according to the 2019-2020 rankings by the Center for World University Rankings. The QS World University Rankings also placed UP among the top 100 universities worldwide in three fields of study (veterinary science, theology and law), and UP is in the top 1% in eight fields of study (agricultural sciences, clinical medicine, engineering, environment/ecology, immunology, microbiology, plant and animal sciences and social sciences), according to the Web of Science Essential Indicators.

In May 2020, the annual UK Financial Times Executive Education Rankings again ranked GIBS as the top South African and African business school. The University also has an extensive community engagement programme with approximately 33,000 students involved in community upliftment. Furthermore, UP is building considerable capacities and strengths for the Fourth Industrial Revolution by preparing students for the world beyond university and offering work-readiness and entrepreneurship training.

For more information, go to www.up.ac.za