

## CLINICAL UPDATE

# Persistent maternal tachycardia: A clinical alert for healthcare professionals providing maternity care in South Africa

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Cardiac disease is one of the commonest causes of indirect maternal deaths globally. This brief report is a reminder that isolated maternal tachycardia at rest is a clinical alert and warrants a detailed history in relation to cardiac disorders, thorough clinical examination of all organ systems, relevant investigations such as imaging, and expert advice to avoid serious adverse events. We reflect on a belatedly investigated persistent maternal tachycardia resulting in a fatal postpartum collapse due to mitral stenosis. The lost window of opportunity for appropriate investigation and management of the tachycardia provides an insight into many similar maternal deaths in South Africa. Key clinical messages regarding persistent maternal tachycardia are presented for midwives and doctors caring for pregnant women.

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Clinicians are traditionally taught that physiological changes during pregnancy lead to an increase in the heart rate of 10 - 20 bpm. Recent data from a large cohort study in the UK, however, suggest that the average maternal heart rate varies according to gestational age and that rates of  $\geq 100$  bpm occur in 10% of women at 18 weeks' gestation, and rates of  $>105$  bpm in 10% of women at 34 weeks' gestation.<sup>[1]</sup> These findings create challenges for clinicians in defining an absolute value for the upper limit of normal. If the threshold is set at 100 bpm, it may lead to over-investigation of normal women, and if set at 120 bpm, it may lead to missed diagnoses. Clinically, it seems practical and reasonable to initiate thorough history taking, physical examination and investigations in all pregnant women with persistent tachycardia of  $\geq 110$  bpm, to look for an underlying pathological cause.<sup>[2,3]</sup>

Maternal tachycardia at rest may be a manifestation of cardiac disease, which is one of the commonest indirect causes of maternal mortality globally. A key recommendation from the MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries) 2019 report<sup>[4]</sup> is the importance of 'investigating a persistent sinus tachycardia', and the report suggests that maternal tachycardia should be regarded as a 'red alert', particularly when associated with symptoms such as a cough, breathlessness or chest pain. In addition, the recognition of persistent maternal tachycardia at rest in low- and middle-income countries is of particular importance given that a sizeable proportion of young women only seek medical care for the first time when they are pregnant, and the sign therefore warrants further evaluation during the window of opportunity when the patient is stable.

The authors were prompted to write this article following review of a number of maternal death cases in South Africa (SA) over the past

2 years where persistent maternal tachycardia was not recognised as a 'red flag' at various levels of the healthcare system.

## Case report

A 23-year-old woman, gravida 2, para 1, had a previous history of a preterm birth (birth weight 1 200 g). The records of her previous pregnancy were not available.

In the current pregnancy she had made two antenatal clinic visits, at 8 and 16 weeks' gestation, both at a community health clinic. The resting pulse rates on both visits were recorded as 110 bpm. The blood pressure levels were within normal limits, there was no evidence of protein or leucocytes in the urine, and the haemoglobin concentration was 10 g/dL. The elevated pulse rates did not appear to create any concern for the attending midwife, and all other antenatal findings and clinical examinations at these visits were recorded as normal.

The third visit was an unscheduled visit at 18 weeks' gestation, when the patient presented with vaginal bleeding. A pulse rate of 110 bpm was recorded, and she was referred to a district hospital because of the bleeding.

At the district hospital a diagnosis of inevitable miscarriage was made. Again a pulse rate  $>110$  bpm was recorded, but no comments on the cause of this were noted. The haemoglobin concentration was recorded as 10 g/dL and the temperature recordings were within normal limits.

The patient had a complete miscarriage at the hospital, and because all findings were recorded as normal, despite the pulse rate being  $>110$  bpm, she was discharged. However, prior to her departure, she collapsed while collecting her medications in the hospital pharmacy. Following initial resuscitation, bedside echocardiography performed

by an experienced anaesthetist revealed acute cardiac failure, pulmonary hypertension and mitral stenosis. Pulmonary embolism was also suspected. A computed tomography (CT) pulmonary angiogram was arranged to exclude pulmonary embolism, but she collapsed again in the CT room and died there despite further attempts at resuscitation.

## Discussion

This case illustrates failure to recognise that persistent maternal tachycardia at rest warrants careful history taking, thorough physical examination and relevant investigations, despite the fact that tachycardia may be a common clinical finding in pregnancy. The patient should have been referred by the primary healthcare clinic for investigation of the tachycardia during the antenatal period. Appropriate clinical assessment and investigations would have allowed an earlier diagnosis of the cardiac pathology and initiation of appropriate treatment. This in all likelihood would have prevented the maternal death.

The following are the key points to consider when faced with maternal tachycardia in pregnancy:

- Pregnancy may be the first time a woman seeks professional healthcare, especially in poorly resourced communities.
  - Pregnancy provides an opportunity to detect underlying medical conditions (such as cardiac disease, endocrine disease and chronic infections) that have not been diagnosed previously.
  - Regular audits and Confidential Enquiries into Maternal Deaths in SA indicate the importance of investigating a persistent tachycardia in pregnancy, as this may be the first sign of an underlying illness, particularly cardiac disease, which if not attended to may eventually lead to an unexplained maternal death.
  - Persistent maternal heart rates  $\geq 110$  bpm with *or without* additional symptoms and signs should be regarded as abnormal and investigated. *Persistent* tachycardia means that the heart rate at rest remains above normal on continuous assessment (e.g. throughout the duration of an antenatal visit), or on repeated assessments (e.g. on multiple antenatal visits).
  - There are many possible pathological causes of persistent tachycardia in pregnancy. Some of them are anaemia, severe pain, pyrexia, sepsis, hypoxia, shock, cardiac failure/pulmonary oedema, cardiac arrhythmias, hyperthyroidism, thromboembolism and drugs (substance abuse).
  - Thorough and systematic history taking and examination are required to identify the most likely cause of persistent maternal tachycardia. This can be done using the 'Big 5, Forgotten 4, Core 1' approach, as recommended in the South African Essential Steps in the Management of Obstetric Emergencies training programme (ESMOE). The Big 5 systems are Neurological, Respiratory, Cardiac, Gastrointestinal tract and Renal; the Forgotten 4 systems are Haematological, Immunological, Endocrine, Musculoskeletal/skin); and Core 1 is the reproductive tract.<sup>[5,6]</sup>
  - Minimum investigations that can be performed at primary healthcare level include bedside haemoglobin, blood glucose and urine dipstick tests to assess the presence of blood, protein, sugar, ketones, leucocytes and nitrites, as well as an HIV test if not already done.
- **Do not send a pregnant or postpartum woman home while she has a persistent tachycardia ( $\geq 110$  bpm).**
  - If the cause of the tachycardia is not yet clear, further investigations such as a 12-lead electrocardiogram, a chest radiograph (depending on the clinical examination findings), and further blood tests, urine tests and imaging may be required. This means that the woman must be referred for assessment by a doctor.
  - After thorough history taking, clinical examination and assessment of available investigation results, the healthcare professional (doctor) must decide on the need for referral to a multidisciplinary specialist-level health facility, for review by relevant specialists (e.g. obstetrician, internal medicine physician, cardiologist, anaesthetist) and for subspecialist-level investigations such as echocardiography. If unsure about the need for specialist referral, the district-level doctor must consult (e.g. telephonically) with the specialist-level health facility and obtain an opinion.
  - All healthcare facilities must have defined referral routes and criteria for referral, and clear communication channels for consultation and arranging transfers.

## Conclusion

Persistent maternal tachycardia is often a manifestation of underlying serious pathology, and timely clinical management aimed at diagnosing and treating the cause during the window of opportunity when the patient is stable will save lives.

The key messages for healthcare professionals attending to pregnant women at all levels of care are: always take time to accurately measure the pulse rate at rest; do not ignore a persistent tachycardia; and ensure there are clear referral pathways for pregnant women with persistent tachycardia.

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