

Under stress: Why women of black African-Caribbean heritage are at elevated risk of stroke

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		<input type="checkbox"/> Protocol
Registration date 06/03/2025	Overall study status Ongoing	<input type="checkbox"/> Statistical analysis plan
		<input type="checkbox"/> Results
Last Edited 01/04/2025	Condition category Circulatory System	<input type="checkbox"/> Individual participant data
		<input type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

Black African and Caribbean women are three times more likely to experience stroke and are more likely to have a stroke at a young age. What causes this is unknown, but stress appears to play an important role. High levels of daily stress may increase the risk of stroke in Black African Caribbean women. This is because Black women often have bigger spikes in blood pressure during stress. These large and frequent blood pressure spikes may cause damage to the brain over time. Therefore, we want to understand how the brain responds to these spikes in blood pressure and explore whether the blood vessels in the brain are less able to protect against these blood pressure spikes in Black African Caribbean women.

Who can participate?

Women of Black African and Black Caribbean heritage and women of White European heritage, between 18 and 75 years old.

What does the study involve?

Taking part involves two visits: one visit to the Clinical Research Facility in Bristol, which will take about 3 hours and one visit to the Cardiff University Brain Imaging Research Centre in Cardiff, which will take around 2 hours.

Visit 1: Screening tests to ensure eligibility. Completion of questionnaires assessing social determinants of health and health behaviours including physical activity levels, diet, sleep quality, experience of discrimination, and stress levels.

Non-invasive assessment of blood pressure and leg blood flow responses to a math task. Venous blood sample to determine stress hormone levels at rest and during a math task.

Visit 2: Non-invasive assessment of large artery stiffness.

Participants will then undergo a brain MRI. Scans will be taken at rest, during a mental math task and during occlusion of the forearm with a blood pressure cuff pumped to a high pressure (i.e., metaboreflex test).

What are the possible benefits and risks of participating?

This study is testing the impact of stress on blood pressure and brain function. Taking part will

help us understand why high levels of stress increase the risk of stroke in Black women. This can also help identify preventative treatments. You will get a full blood pressure screen, which may be of some benefit to you from a health check-up perspective. You will also get information on your cholesterol levels and diabetes risk

This study involves minimal risks

Venous blood sample and cannulation: mild discomfort during venepuncture/cannulation and mild swelling or bruising at the site.

Monitoring heart rate, blood pressure and breathing: mild discomfort from the inflation of the blood pressure cuff around the finger.

Mental math test: the task may cause some stress, however, this will stop when the task stops.

Metaboreflex test: mild arm discomfort with the blood pressure cuff being inflated to stop blood from leaving your arm.

Brain MRI: MRI is a safe, non-invasive and painless procedure. However, some people find being inside the scanner claustrophobic. Some people may experience discomfort from lying down in the scanner for 1 hour.

Where is the study run from?

University of Bristol (UK)

When is the study starting and how long is it expected to run for?

April 2024 to January 2028

Who is funding the study?

British Heart Foundation (UK)

Who is the main contact?

Dr Lydia Simpson, Lydia.simpson@bristol.ac.uk

Contact information

Type(s)

Public, Scientific, Principal investigator

Contact name

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Additional identifiers

Integrated Research Application System (IRAS)

347113

Central Portfolio Management System (CPMS)

64223

Protocol serial number

Sponsor Ref: 2024 - 4520

Study information

Scientific Title

Under stress: Why women of black African-Caribbean heritage are at elevated risk of stroke

Study objectives

Primary hypothesis 1: There will be a difference in the increase in large and small vessel pulsatility during mental stress in normotensive Black African-Caribbean women versus normotensive White European women.

Primary hypothesis 2: There will be a difference in the increase in large and small vessel pulsatility during mental stress in hypertensive Black African-Caribbean women versus hypertensive White European women

Ethics approval required

Ethics approval required

Ethics approval(s)

approved 05/02/2025, North East - Newcastle & North Tyneside 2 Research Ethics Committee (2 Redman Place, Stratford, London, E20 1JQ, United Kingdom; +44 (0)207 104 8086; newcastlenorthtyneside2.rec@hra.nhs.uk), ref: 24/NE/0209

Study design

Observational cross-sectional study

Primary study design

Observational

Study type(s)

Other

Health condition(s) or problem(s) studied

Hypertension

Interventions

This study will be a cross-sectional study of four groups: normotensive Black African and Black Caribbean women, normotensive White European women, hypertensive Black African and Black Caribbean women and hypertensive White European women.

Two study visits:

Visit 1: Consent and screening visit and determination of hemodynamic and sympathetic responses to mental stress.

Visit 1 will be undertaken at the NIHR Clinical Research Facility, Bristol. First, consent will be obtained, and participants' eligibility will be determined. Following screening, several

questionnaires will be completed to assess social determinants of health and health behaviours. Venous blood samples will be taken at rest to measure catecholamines and cortisol. BP, heart rate, respiratory activity and vascular ultrasound will be measured at rest and during a mental arithmetic task, used to induce mental stress. A second blood sample will be taken during the mental arithmetic task to determine changes in catecholamines and cortisol, from rest.

Study visit 2: MRI visit and determination of cerebrovascular responses to mental stress. Visit 2 will be undertaken at Cardiff University Brain Research Imaging Centre (CUBRIC). Participants will be familiarised using a mock MRI scanner. Resting pulse wave velocity will be assessed. BP, peripheral oxygen saturation, respiratory activity, and end-tidal partial pressure of CO₂ and O₂ will be measured, and MRI imaging will be completed at rest and during 1) mental arithmetic task and 2) during metaboreflex testing.

Intervention Type

Other

Primary outcome(s)

Cerebral pulsatility index measured from MRI at rest and during Paced Auditory Serial Addition Task (PASAT)

Key secondary outcome(s)

1. White matter hyperintensities measured using MRI at rest
2. Blood-brain barrier integrity measured using MRI at rest
3. Grey matter perfusion measured using MRI at rest
4. Cardiovascular hemodynamics measured continuously during a 10-minute resting period and during the PASAT:
 - 4.1. Heart rate measured continuously via ECG
 - 4.2. Beat-to-beat blood pressure measured via finger photoplethysmography
 - 4.3. Continuous femoral blood flow measured via Doppler ultrasound
5. Stress hormones (cortisol and catecholamines) during mental stress measured from venous blood samples taken at rest and during the PASAT
6. Systemic arterial stiffness measured using carotid-femoral pulse wave velocity at rest
7. Cerebral arterial stiffness measured from MRI at rest

Completion date

01/01/2028

Eligibility

Key inclusion criteria

All participants:

1. Female
2. 18-75 years of age
3. Non-obese (BMI <35 kg/m²)

Normotensive participants:

1. Office BP < 140/90 mmHg and daytime ambulatory BP <135/85 mmHg
2. No medications except oral contraceptives

Hypertensive participants:

1. Office BP > 140/90 mmHg and daytime ambulatory BP > 135/85 mmHg or diagnosis of

hypertension

2. No medications except treatment for hypertension and/or oral contraceptives

Participant type(s)

Healthy volunteer, Patient

Healthy volunteers allowed

No

Age group

Adult

Lower age limit

18 years

Upper age limit

75 years

Sex

Female

Key exclusion criteria

All participants:

1. Body mass index ≥ 35 kg/m²
2. Major illness e.g. cancer, inflammatory disease (including vasculitis) or receiving palliative care
3. Medical history of respiratory, cardiovascular (excluding hypertension), cerebrovascular, metabolic, renal or endocrine disorders (i.e. severe cardiac electrical conduction abnormalities, chronic heart failure, Chronic Obstructive Pulmonary disease, diabetes, polycystic ovary syndrome)
4. Inherited disorders e.g., sickle cell anaemia
5. Pregnancy/breastfeeding women
6. Taking nitrate, steroid, anti-coagulant or immunosuppressant medication or medication as part of a clinical trial
7. Diagnosed cardiovascular (including arrhythmia), respiratory (including asthma), renal or ophthalmic disease
8. Congenital or acquired neurological conditions (including dementia), language disorders, repeated or chronic pain conditions (excluding menstrual pain and minor sporadic headaches)
9. Diabetes or HbA1c $>6.5\%$
10. Symptoms of febrile illness within two weeks of participation
11. Excessive alcohol consumption (exceeding 28 units/week) or intravenous drug use
12. Needle phobia
13. History of panic attacks
14. Inability to understand instructions given in English
15. Current smoker
16. Pacemaker, implantable cardiac defibrillator, cerebral metallic clips or other implanted metallic devices/structures
17. Unable to tolerate scanner or history of claustrophobia
18. Learning disability or significant hearing and/or visual impairment, which may affect participants ability to communicate from within the MRI scanner
19. Inability to understand English

Normotensive:

1. Women with a history of hypertension, including hypertension in pregnancy

Hypertensive participants:

2. Secondary causes of hypertension

Date of first enrolment

18/02/2025

Date of final enrolment

01/10/2027

Locations

Countries of recruitment

United Kingdom

England

Wales

Study participating centre

NIHR Bristol Clinical Research Facility

60 St Michael's Hill

Bristol

United Kingdom

BS2 8DX

Study participating centre

Cardiff University Brain Imaging Centre

Maindy Road

Cardiff

United Kingdom

CF24 4HQ

Sponsor information

Organisation

British Heart Foundation

ROR

<https://ror.org/02wdwnk04>

Funder(s)

Funder type

Charity

Funder Name

British Heart Foundation

Alternative Name(s)

The British Heart Foundation, the_bhf, BHF

Funding Body Type

Private sector organisation

Funding Body Subtype

Trusts, charities, foundations (both public and private)

Location

United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated and/or analysed during the current study will be available upon request from Dr Lydia Simpson (Lydia.simpson@bristol.ac.uk)

IPD sharing plan summary

Available on request