

# Documenting the changes in vertebral shape as children grow

<b>Submission date</b> 24/04/2023	<b>Recruitment status</b> No longer recruiting	<input checked="" type="checkbox"/> Prospectively registered
		<input type="checkbox"/> Protocol
<b>Registration date</b> 24/05/2023	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan
		<input type="checkbox"/> Results
<b>Last Edited</b> 05/04/2024	<b>Condition category</b> Musculoskeletal Diseases	<input type="checkbox"/> Individual participant data
		<input type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

The researchers' long-term goal is to improve the diagnosis and treatment of childhood osteoporosis by improving the detection of vertebral fractures (VF). To achieve this, they must understand the natural change in shape and height of vertebral bodies that occurs in healthy growing children.

Osteoporosis is thinning of the bones. There are over 25 disorders and well over 20 drugs associated with childhood osteoporosis, all predisposing affected children to VF, pain and deformity. Furthermore, 40% of an adult's total bone mass builds up during adolescence, so an adolescent with osteoporosis, if untreated, is likely to become an adult with osteoporosis. Early detection and treatment are important to prevent fracture and deformity.

Dual-energy x-ray absorptiometry (DXA, pronounced "dexa"), which measures bone mineral density (BMD), cannot reliably tell us which children will fracture because not all children with low BMD will fracture, while some will fracture even with normal BMD. Therefore, the International Society for Clinical Densitometry has said that the diagnosis of childhood osteoporosis should be based on the presence of fractures rather than on BMD. This highlights the importance of identifying VF in children.

Because DXA only has a low-radiation dose, the researchers will use DXA to document the normal change in vertebral shape that occurs in healthy children, so that they can more easily recognise the difference in shape caused by VF and therefore improve diagnosis and treatment of childhood osteoporosis.

### Who can participate?

Healthy children from schools in Birmingham and Sheffield including girls aged 7, 8, 11 and 12 years old and boys aged 7, 8, 13 and 14 years old.

### What does the study involve?

The researchers will explain the study to interested children and their parents. If they give their consent, then they will arrange for the child to attend the Radiology Department at the Children's Hospitals in Sheffield and Birmingham to have a DXA scan. The total scan time will not be more than 10 minutes and will usually be about 5 minutes. After the scan, the researchers will ask each

child to answer a short questionnaire about their experience. They will give each child a copy of their scan and then they will be free to leave. The child will have no further involvement in the study.

What are the possible benefits and risks of participating?

There are no direct benefits to taking part. The researchers anticipate that all children are healthy and that their scans will therefore be normal. All scans will be looked at by the study lead Professor Amaka Offiah and if an abnormality is detected, the child's GP will be contacted to arrange further investigations for the child. A radiation physicist has confirmed that taking part in the study exposes each child to an extremely small increased lifetime risk of developing cancer, equivalent to the risk of a few weeks' natural UK background radiation.

Where is the study run from?

Sheffield Children's NHS Foundation Trust (UK) and the University of Sheffield (UK). Birmingham Women's and Children's NHS Foundation Trust (UK) is also participating.

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

January 2019 to January 2025

Who is funding the study?

National Institute for Health and Care Research (UK)

Who is the main contact?

Prof. Amaka C Offiah, [amaka.offiah@nhs.net](mailto:amaka.offiah@nhs.net)

## Contact information

**Type(s)**

Scientific

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**Additional identifiers****Integrated Research Application System (IRAS)**

315446

**Central Portfolio Management System (CPMS)**

55277

**Study information****Scientific Title**

Developing normative standards for vertebral morphology in children: a feasibility study

**Study objectives**

It is feasible to recruit a sufficient number of children to develop an atlas of normal vertebral morphology in boys and girls from 5 to <18 years old.

**Ethics approval required**

Old ethics approval format

**Ethics approval(s)**

Approved 11/04/2023 Cambridge East REC (2nd Floor Equinox House, Health Research Authority, NG2 4LA, UK; +44 (0)20 7104 8096; CambridgeEastREC@hra.nhs.uk), ref: 23/EE/0043

**Study design**

Observational; Design type: Cross-sectional

**Primary study design**

Observational

**Study type(s)**

Diagnostic

**Health condition(s) or problem(s) studied**

Vertebral morphology in children

**Interventions**

70 healthy growing children (17 girls and 18 boys aged 7 to 8 years, 18 girls aged 11 to 12 years and 17 boys aged 13 to 14 years) will be recruited from schools in Sheffield and Birmingham. Researchers will visit the schools to present and promote the study at assemblies, open days and parents meetings. Posters will also be displayed in the schools. Subsequently, older children (11 to 14 years) who express interest in participating will receive study packs containing volunteer information sheets and parental consent/volunteer assent forms from their form teacher. Signed consent/assent forms will then be handed in to the form teachers. For younger children (7 to 8 years), the study packs will be handed to teachers to give directly to parents, who will then sign and return them to the teachers.

The researchers will recruit two children aged 11 to 14, two children aged 7 to 8 and two parents of children aged 7 to 8 years to assist with recruitment within their schools. They will also help with developing the volunteer information sheets, consent/assent forms and advertising /educational materials.

Contact details will be collected on the consent/assent forms. As part of the consent pack, parents will complete a health questionnaire with their child to ensure that they do not meet any of the exclusion criteria. Researchers will collect the signed forms from the schools and hand these over to the local radiology department receptionists; Sheffield Children's Hospital for children from Sheffield schools and Birmingham Children's Hospital for children from Birmingham schools. The receptionists will contact the parents/guardians to arrange a suitable appointment time and date to attend the local radiology department.

Each child recruited will attend the radiology department for a single visit with their parent /guardian. During this visit, each child will have a whole body DXA (low dose x-ray) scan, a DXA of their backbones and a DXA scan of their left hand. The child's height and weight will also be recorded.

These images will be reviewed by the researchers and the backbone measured. By looking at the range of different measurements in healthy children of the same age we can understand the degree of variability. The more variability there is, the more children we will need to recruit for a future, larger study. The results from the 70 children who participate will also be used in the full study.

Each participant will complete a self-assessed pubertal score during their visit.

The researchers will ask families for their feedback on the process at the end of their visit. They will analyse this feedback to make sure it is acceptable to both children and parents. They will use this feedback to improve the process for the future study.

Each child who participates will receive a copy of their DXA scan plus a £10 Amazon.co.uk voucher. A school assembly will be given including information on optimising bone health.

The results will be disseminated through the schools with the volunteer children and parents taking a lead on this. The researchers will publish the results on the website of Sheffield Children's Hospital and present the results at national and international research meetings. They will also publish the results in a scientific journal.

We estimate that the entire study will take 15 months with participant recruitment and imaging taking place over a period of 6 months.

## **Intervention Type**

Other

## Phase

Not Specified

## Primary outcome(s)

1. Participant acceptance of attending hospital, measured using a non-validated questionnaire on Day 1
2. Recruitment rate, defined as the number of participants recruited per month over the 7-month recruitment period

## Key secondary outcome(s)

Variability of vertebral morphometry in young children measured using analysis of variance for differences in anterior, middle and posterior vertebral heights by age and sex on Day 1

## Completion date

31/01/2025

# Eligibility

## Key inclusion criteria

1. Healthy growing children from school in Sheffield and Birmingham
2. 35 children (17 girls) aged 7 to 8 years, 18 girls aged 11 to 12 years and 17 boys aged 13 to 14 years. Ages have been selected to represent the periods of rapid childhood growth by sex

## Participant type(s)

Healthy volunteer

## Healthy volunteers allowed

No

## Age group

Child

## Lower age limit

7 years

## Upper age limit

14 years

## Sex

All

## Key exclusion criteria

1. Ongoing chronic disease
2. Ongoing long-term steroid medication
3. Scoliosis or significant kyphosis
4. History (within preceding 3 years) of road traffic accident
5. History (within preceding 3 years) of back pain/stiffness (particularly morning stiffness)
6. History (within preceding 3 years) of investigation for unexplained fever, malaise, aches/pains

7. Abnormal VFA identified during the study (ACO will review all images to confirm normality. Assent/consent will be obtained from volunteers and parents/guardians to inform the child's GP should any abnormality be detected, in order for the child to be appropriately referred and investigated)

**Date of first enrolment**

01/02/2024

**Date of final enrolment**

31/12/2024

## **Locations**

**Countries of recruitment**

United Kingdom

England

**Study participating centre**

**Sheffield Childrens Hospital**

Western Bank

Sheffield

United Kingdom

S10 2TH

**Study participating centre**

**Birmingham Children's Hospital**

Steelhouse Lane

Birmingham

United Kingdom

B4 6NW

## **Sponsor information**

**Organisation**

Sheffield Children's NHS Foundation Trust

**ROR**

<https://ror.org/02md8hv62>

## **Funder(s)**

**Funder type**  
Government

**Funder Name**  
NIHR Central Commissioning Facility (CCF)

## Results and Publications

### Individual participant data (IPD) sharing plan

The data-sharing plans for the current study are unknown and will be made available at a later date

### IPD sharing plan summary

Data sharing statement to be made available at a later date

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">HRA research summary</a>			26/07/2023	No	No