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TITLE: The relationship between adipose mass and bone density in an over-weight/obese population: a systematic review protocol. [Protocol]

YEAR: 2015

Version history:

The first version of this protocol was originally made available on 2015-08-15.
This version of the protocol was originally made available on 2015-08-15.
In total, there have been zero known revisions of the protocol.

The relationship between adipose mass and bone density in an over-weight/obese population: a systematic review protocol

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Citation

Eimear Dolan, Aoife Healy, John O'Reilly, Paul Swinton. The relationship between adipose mass and bone density in an over-weight/obese population: a systematic review protocol. PROSPERO 2015 CRD42015024313 Available from: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42015024313

Review question

What is the relationship between adipose mass and bone density in an overweight/obese population?

Searches

An electronic search based on three databases will be undertaken (MEDLINE, EMBASE and ScienceDirect), using key words relevant to the research question. Only studies published in the English language and from the year 1980 until the date of searching will be included. The original search using the same criteria will be repeated immediately prior to data extraction and analysis and any further studies retrieved for inclusion. The reference lists of original and review studies deemed relevant to the research question will also be searched.

Types of study to be included

All study designs will be considered for inclusion within this review, although it is expected that analytic cross-sectional, or cohort studies will comprise the majority of included studies. Intervention based studies will only be included if the baseline data reports the required correlation coefficients.

Condition or domain being studied

Excess adiposity and bone related conditions both represent major public health concerns, and both may benefit from the use of physical activity and nutrition based prevention and/or management orientated intervention. A factor impacting the development of such interventions however, is the seemingly paradoxical relationship which appears to exist between these two compartments of body composition, as excess body mass has been suggested to be protective of bone health, potentially due to the increased loading which an overweight state induces. The available evidence does appear to support evidence of a positive relationship between adipose mass and bone density when considered from a population level. There are however factors specifically associated with an overweight/obese state that are thought to be detrimental to bone health, e.g. increased oxidative stress and physical inactivity. It is possible therefore that the relationship between adipose and bone mass, which appears positive when considered from a population perspective, may in fact not be when considered from the upper end of the adiposity continuum. The aim of this review therefore is to quantify the relationship between adipose mass and bone density in an overweight/obese population.

Participants/population

Human participants (both male and female), of any age and who are overweight or obese as defined by their BMI will be considered for inclusion within this review. Individuals suffering from conditions or taking medications that may be related to the development of secondary osteoporosis, e.g. thyroid dysfunction; hypogonadism; genetic abnormalities (e.g. osteoporosis imperfecta) or physical disabilities will be excluded from the study. In addition, athletic populations will also be excluded, as regular training may result in a state of overweight or obesity due to high muscularity rather than adiposity.

Intervention(s), exposure(s)

No specific intervention will be identified for this study, however only studies that report a relationship between adipose mass and bone density in an overweight/obese population will be considered for inclusion.

Comparator(s)/control

No comparator or control group will be included within this study.

Context

The available evidence does appear to support evidence of a positive relationship between adipose mass and bone density when considered from a population level. There are however factors associated with an overweight or obese state, that have been shown to be detrimental to bone health, e.g. an increased state of oxidative stress, and physical inactivity. It is possible therefore, that the relationship between adipose and bone mass, which appears positive when considered from a population perspective, may in fact not be when considered from the upper end of the adiposity continuum.

Primary outcome(s)

Outcome measures included a measure of adipose mass (kg or % body fat); and bone density (g/cm^2) of the total body; hip or lumbar spine.

Secondary outcome(s)

None

Data extraction (selection and coding)

A three stage approach, will be used to screen potential studies, i.e. title; abstract and full text screen respectively. Data will be extracted using a standardised form, and will include details related to population demographics (including age; gender; ethnicity; BMI); adipose mass (kg), bone density (g/cm2) and the correlation coefficients between the two. All data extraction procedures will be independently undertaken by two members of the review team, and final outcomes from each stage will be agreed through discussion, or third party mediation if required.

Risk of bias (quality) assessment

All selected studies will be independently critically appraised by two members of the review team,using an adapted version of the McMaster critical appraisal form for quantitative studies. Given the nature of the anticipated study designs to be included, studies will not be excluded based on the results of this appraisal, provided they meet the inclusion and exclusion criteria of the review. All potential sources of bias assessed through this process will however be synthesized and considered within the interpretation of the results of the review.

Strategy for data synthesis

Extracted correlation coefficients will be meta-analysed and forest plots generated, to quantify the cumulative direction and strength of the relationships identified. A statistical test of heterogeneity will be undertaken using a random effects model and the calculation of the Chi-square test and the I-squared statistic.

Analysis of subgroups or subsets

If sufficient data are available, subgroup analyses will be undertaken for relevant groups, including stratification into age-group, gender or overweight vs obese populations. The same data synthesis approach will be undertaken for any subgroup analysis.

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Anticipated or actual start date
05 January 2015

Anticipated completion date
04 January 2016

Funding sources/sponsors
The development of this project was supported by a grant from the Hong Kong Scotland Partners in Postdoctoral Research Scheme.

Conflicts of interest
None known

Language
English

Country
England, Scotland, Hong Kong

Stage of review
Ongoing

Subject index terms status
Subject indexing assigned by CRD

Subject index terms
Adiposity; Bone Density; Humans; Obesity; Overweight

Date of registration in PROSPERO
15 August 2015

Date of publication of this version
15 August 2015

Versions
15 August 2015

Stage of review at time of this submission

Stage	Started	Completed
Preliminary searches	Yes	Yes
Piloting of the study selection process	Yes	Yes
Formal screening of search results against eligibility criteria	Yes	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No