OSTEOARTHRITIS
AND OBESITY

A report by the Arthritis Research Campaign
The Arthritis Research Campaign (arc) is the fourth largest medical research charity in the UK, and exists to find the cause of and cure for all forms of arthritis and musculoskeletal conditions.

We rely entirely on public donations to fund our research and educational programmes, and spend more than £20 million a year in universities and medical schools to support pioneering biomedical research in order to improve life for people who have arthritis and related conditions.

Our report, Osteoarthritis and obesity, is the second in an ongoing programme of commissioned reports in areas of public interest. Our previous report was Complementary and alternative medicines for the treatment of rheumatoid arthritis, osteoarthritis and fibromyalgia.

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What you need to know

Obesity is now recognised as one of the most serious causes of ill health particularly in later life. With obesity now reaching epidemic proportions in the UK, up to 20 per cent of adults are more likely to develop a whole range of life-threatening and chronic diseases purely because of their weight.

Diabetes, cardiovascular disease and some types of cancer are the most well known examples of obesity-related ill health. Osteoarthritis is a relatively recent addition to this list - and its inclusion may still seem surprising. To many people, including some health practitioners, this painful and disabling disease is considered an inevitable consequence of ageing, at least for people who have the wrong genes.

Such a belief is no longer tenable. **New research shows that the obese are up to four times as likely to develop knee osteoarthritis as they are to develop high blood pressure or type-2 diabetes.** The danger to health and quality of life is insidious: at every stage, excess body weight both increases the level of pain and disability and undermines the efficacy of treatment. And whereas high blood pressure and diabetes may be substantially improved on losing weight and are relatively easy to control with therapy, osteoarthritis is irreversible.

There is good news, however. Losing weight, however modest, when combined with exercise, is a panacea at every stage. Achieving a healthy weight reduces the risk of developing the disease in the first place, relieves existing symptoms and helps to prevent further deterioration. Weight loss and exercise combined have even been shown to achieve the same level of symptom relief as joint replacement surgery.

It is only recently that scientists have pieced together the evidence base that fully demonstrates the serious nature of this avoidable cascade of adverse events that faces the UK. With one in two of today’s children set to be obese in middle age, the Arthritis Research Campaign is now committed to bringing this data to the attention of parents and the public in general as well as health professionals and osteoarthritis patients.
Osteoarthritis is the most common disease affecting the joints of the body, particularly the knees and hips. It is estimated that over 6 million people over the age of 45 years in the UK have painful osteoarthritis in their knees and over 600,000 in their hips. Osteoarthritis is a disabling condition – about 80 per cent of people with osteoarthritis have compromised movement, and 25 per cent are unable to perform normal acts of daily living.

The most significant symptom is an aching, sharp or burning pain that is made worse with activity. This pain occurs when the cartilage that cushions the joint gradually becomes thinner as part of the disease process. Eventually, the cartilage wears away completely - at which point the bones rub against each other, worsening the pain and causing difficulty in movement. The joint itself becomes swollen and the bone at the edge of the joint starts to grow outwards, forming knobbly bony spurs. In addition, the muscles that move the joint may weaken and become thin or wasted.

There is a strong genetic factor in susceptibility to osteoarthritis and the risk of the disease increases significantly if there is an existing injury to the hip or knee. However, of preventable factors, obesity is far and away the single biggest cause of osteoarthritis in weight-bearing joints. The earlier someone becomes overweight or obese, the greater the risk of developing osteoarthritis.

Excessive loading of the joint is the most important means by which obesity causes osteoarthritis. It is in the weight-bearing joints - the knee and to a lesser extent the hips - that obese individuals are most at risk of developing osteoarthritis.

Because of the way the knee joint works, the effect of excess weight can be four or five times greater in key parts of the joint so that even modest weight gain speeds up the breakdown of cartilage and increases susceptibility to osteoarthritis. At the same time, poor posture and unhealthy gait are more common in obese people, further predisposing the joints to osteoarthritis.

Non-weight bearing joints such as those in the hand are also marginally affected by obesity. This suggests that excess weight causes additional damage through a separate pathway, probably by raising blood glucose and insulin levels, thereby increasing inflammation of the joint.

Once entrenched, osteoarthritis is likely to have the effect of further reducing activity, bringing about increased weight gain. As well as worsening osteoarthritis symptoms, this further increase in weight will also raise the risk of developing other obesity-related diseases.
The true impact of obesity on the development of knee osteoarthritis has only recently become clear. A pivotal study by the Medical Research Council’s Epidemiology Resource Centre at Southampton University compared the weight of 525 men and women aged 45 plus to the severity of knee osteoarthritis. The findings showed for the first time that the risk of knee osteoarthritis increases progressively throughout the Body Mass Index (BMI) categories. At the most extreme, very obese individuals with a BMI of 36 or more have a 14-fold higher risk of knee osteoarthritis compared to those within the healthy BMI range.

More recently, two major studies have provided a comparison between the risk of osteoarthritis of the knee and other obesity-related diseases. Public health researchers at University College London reported in the journal, Public Health Nutrition, that obesity doubles the risk of diabetes and hypertension in both men and women. Similar levels of obesity have recently been found to increase the risk of knee osteoarthritis by more than four times in men and by nearly seven times in women.

There is also no doubt that obesity causes osteoarthritis rather than the other way round. Research in the early 1990s proved conclusively that obesity precedes the onset of new osteoarthritis by several decades: the BMI of a group of healthy individuals predicted the presence of knee osteoarthritis up to 36 years later. And once osteoarthritis has developed, being obese will cause the range of symptoms to become more severe. Obese patients with existing osteoarthritis in one knee are five times more likely than those with healthy weight to have it spread to the other knee.

**Definition of obesity**

Obesity describes an excess of body weight compared to set standards. Although excess weight may come from fat, muscle, and/or body water, obesity refers specifically to having an abnormally high proportion of body fat. A person can be overweight without being obese, as in the example of a bodybuilder or other athlete with high levels of muscle tissue. However, these are special cases, and for the majority of people who are overweight the excess weight is due to excess body fat.
How to find your BMI
First, multiply your height in metres by itself – this will give you a figure (A). Then divide your weight in kilograms by the figure A. The result is your BMI. An ideal BMI for most people is 20-25. This corresponds to the ‘normal’ weight range shown in the following table:

<table>
<thead>
<tr>
<th>Weight status</th>
<th>BMI (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>below 18.5</td>
</tr>
<tr>
<td>Normal range</td>
<td>18.5 – 24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25 – 29.9</td>
</tr>
<tr>
<td>Obese</td>
<td>30 and above</td>
</tr>
<tr>
<td>Morbidly obese</td>
<td>40 and above</td>
</tr>
</tbody>
</table>

Am I the right weight for my height?
This figure shows a version of a BMI chart plotting height against weight.

Reproduced with permission of the Food Standards Agency www.eatwell.gov.uk
As well as causing osteoarthritis to develop, persistent obesity increases the level of pain and disability while reducing the efficacy of pain-relieving drugs. As a result, the need for joint replacement surgery becomes ever more urgent the greater the weight problem, particularly as far as women are concerned.

Knee and hip replacements are among the great success stories of modern surgery. Innovative implant design and new bearing surfaces permit greater ranges of activity following surgery and enable the operation to be carried out at an earlier stage in the degenerative disease, transforming the lives of millions of people with severe osteoarthritis by enabling them to stay active for longer.

Yet this success story does not apply when the operation is required because of obesity-related osteoarthritis. Research shows that nearly 50 per cent of obese patients have a poor outcome from joint replacement surgery compared to less than ten per cent of those with a healthy weight.

As a result, many surgeons advise the overweight and obese to delay knee and other joint replacement operations for as long as possible even though such delay means more pain and disability.

**Obesity and osteoarthritis – the need for surgery**

- More than two out of three knee replacements and one in four hip replacements in middle-aged women in the UK are attributable to obesity
- The body weight of a woman with osteoarthritis is a major factor in whether or not she will require joint replacement surgery. In a British cohort of almost half a million women aged 50 to 69 years, those who were obese were ten times more likely to need knee replacements and two to three times more likely to need hip replacements compared to women with a healthy weight
- Very obese women are 19 times more likely to need knee replacement surgery and four times more likely to need hip replacement surgery compared to women with a healthy weight

**Obesity: the bad news for surgery outcome**

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Why is joint replacement surgery less successful in obese people?

There are the four main problems:

i. Obese patients have a significantly higher risk of a range of short-term complications during and immediately after surgery.

   During the operation, obese people are more likely to need a transfusion because of excess blood loss. Operations on obese people take longer and there is therefore a greater risk of deep vein thrombosis (DVT).

   Following surgery, wound complications including infection are ten times more likely to occur in the morbidly obese.

ii. The heavier the patient, the less likely it is that surgery will bring about an improvement in symptoms.

   Obese patients are less likely to regain normal knee functioning or to experience a reduction in pain and stiffness compared to non-obese patients.

   Torn knee ligaments and other complications are also more common in obese patients.

iii. The implant is likely to fail more quickly, requiring further surgery in an obese patient.

   Within seven years, obese patients are more than ten times as likely to have an implant fail compared to healthy weight patients.

   Ten years after replacement surgery, the survival implant rate is 60 per cent in obese patients compared to almost 90 per cent in non-obese patients.

   Replacement joints are more likely to fail in ‘younger’ patients less than 60 years of age. In obese men in this group, only one in three knee implants survives for ten years.

iv. People who have joint-replacement surgery because of obesity-related osteoarthritis are more likely to gain weight post-operatively.

   A series of studies show that following knee or hip replacement surgery, overweight osteoarthritis patients gain more weight. This is despite the new opportunity to lose weight through exercise following a reduction or resolution of pain as a result of the operation.
Osteoarthritis: the impact of weight loss

There has been a great deal of emphasis in the recent past on the benefits of exercise in reducing pain and disability in osteoarthritis patients – and rightly so. Yet there is increasing evidence that exercise is most effective in reducing both pain and mobility when combined with weight loss.

A series of studies show that even modest weight loss, when combined with exercise, reduces pain in obese patients with knee osteoarthritis, as well as improving mobility and physical functioning. For instance, gradually losing just five to ten per cent of initial body weight over several months is worthwhile; for each pound lost, there is a reduction in pain and disability caused by knee osteoarthritis.

One of the largest studies to date, the US-based Arthritis, Diet and Activity Promotion Trial (ADAPT 2004) shows that weight loss when combined with exercise is extremely successful in reducing pain and disability.

The 18-month long trial monitored the impact of diet and activity on 316 overweight and obese adults who also had knee pain, self-reported physical disability and x-ray evidence of knee osteoarthritis. The participants were divided into four groups:

- diet only
- exercise only
- diet plus exercise
- a healthy lifestyle group which received no specific intervention except for booklets describing lifestyle change

The best outcome was seen in the diet-plus-exercise group where participants experienced the greatest reduction in pain levels and improvement in physical function including walking and climbing stairs.

Other clinical trials have shown that weight loss, particularly when combined with an appropriate exercise programme, greatly improves the symptoms of osteoarthritis, in some cases equaling the benefits of joint replacement surgery.

An important finding from ADAPT was that the least successful group was simply given good advice. Shedding excess pounds is problematical at the best of times without the pain and disability of osteoarthritis or the disruption of surgery. At the extreme, people who are morbidly obese benefit from surgical interventions that induce substantial and rapid weight loss.

Such drastic measures are not appropriate for everyone with an obesity problem. Yet anyone whose weight problem puts them at risk of developing or worsening the symptoms of osteoarthritis deserves appropriate help and support through counselling or another weight loss programme.
Non-surgical therapies for osteoarthritis
There is no cure for osteoarthritis. Medical treatments can improve symptoms but on their own, without lifestyle change, may have little benefit. Analgesics such as paracetamol may help to relieve pain. Non-steroidal anti-inflammatory drugs (NSAIDs) may reduce inflammation and thereby pain and stiffness – though doctors are increasingly reluctant to prescribe these drugs because of possible side-effects. Non-steroidal creams and gels can also be helpful with knee and hand osteoarthritis. A course of physiotherapy may reduce pain and strengthen muscles. In the case of severe, very painful osteoarthritis, a steroid injection into the joint may successfully relieve pain for a period of time, especially in the knee or thumb.

How common is osteoarthritis?
• Osteoarthritis is the most common form of arthritis and the most prevalent joint disorder
• It is projected that the prevalence of osteoarthritis will increase substantially in the next 20 years. Osteoarthritis is the fourth most frequent predicted cause of health problems world-wide in women, and the eighth in men
• The total number of under 65 year olds disabled from arthritis (of which osteoarthritis is by far the most common) and other musculoskeletal disorders is more than twice that due to heart, chest and stroke disease combined
• More than one million people visit their GP in a year because of osteoarthritis
• Ten million working days are lost each year due to arthritis and related conditions
• Ninety-four per cent of the 59,000 total hip replacements and 97 per cent of the 62,000 total knee replacements performed annually in England and Wales are due to osteoarthritis
Statistics on knee, hip and hand osteoarthritis

Knee:  
One in five of those aged 50-59 have painful osteoarthritis in at least one knee rising to two in five of those aged over 80. Over 6 million people in the UK have painful knee osteoarthritis.

Hip:  
Hip osteoarthritis is less common than knee osteoarthritis. Around 600,000 people in the UK with painful hip osteoarthritis.

Hand:  
Hand osteoarthritis is the most common site for osteoarthritis. Around 65 per cent of women aged 65-74 have x-ray evidence of hand osteoarthritis. The disease often starts in the 40s and 50s, most frequently affecting the base of the thumb and the joints at the end of the fingers. At times these joints become red, swollen and tender, especially when the condition first appears. Gradually, over several years, firm knobbly swellings form on the back of the joints; these are called Heberden’s nodes. Once the Heberden’s nodes are fully formed, pain and tenderness at the end of the fingers often improve. However, the base joint of the thumb may continue as a persistent problem.

How common is obesity?

Two out of three of adults and one in three children are overweight or obese, three times as many 20 years ago. One in five adults are currently clinically obese – and in 40 years, 60 per cent of men, 50 per cent of women and 25 per cent of children could be clinically obese.

Obesity is an established risk factor for some of the most debilitating and costly chronic diseases, including adult-onset type-2 diabetes, coronary heart disease, hypertension, stroke, cancer and osteoarthritis. Due to the increasing prevalence of obesity in children and young people, diseases associated with obesity are being seen at an increasingly younger age.

Obesity already costs the UK economy over three billion pounds per year, and this is expected to increase year on year up to a possible £45.5 billion by the year 2050.
Further reading list/source documents


17. Peat et al. Personal communication data form the CAS-K Study (the Knee Clinical Assessment Study).
