Treatment of adolescent obesity

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Article points

1. Obesity rates continue to rise in adolescents, and this can have long-lasting effects, both physical and emotional, that track through to adulthood.
2. Treating obesity in adolescents is complicated by changes in self-identity, autonomy and interpersonal relationships that occur in this age group.
3. The most effective treatments involve either restricting access to the obesogenic environment (e.g. residential weight loss camps) or by curtailing the individual's ability to respond to it (e.g. bariatric surgery).

Key words

- Children and adolescents
- Obesity

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The prevalence of obesity in children aged 11–15 years was 37.8% in 2013. Since 2004 there has been a statistically significant increase of 2.6% in prevalence, compared with stabilisation in the under-11s. The aetiology of this is multifactorial. Adolescent obesity is linked with comorbidities such as type 2 diabetes, cardiac abnormalities and obstructive sleep apnoea, and the psychosocial impact is significant. Weight management in this age group presents particular challenges. In this article, the evidence base for various weight loss interventions in adolescents, including residential weight loss camps, individual and family-based behavioural therapy, technology such as texting and apps, and bariatric surgery, are reviewed. The real challenge, however, is the obesogenic environment; failure to tackle this will result in increasing prevalence.

In recent years, while obesity rates appear to have stabilised in children aged 11 years and younger, there has been a pronounced rising trend in obesity in those aged 11–15 years, in whom the prevalence of obesity and overweight has risen from 26.7% in 1996 to 37.8% in 2013 (van Jaarsfeld and Gulliford, 2015). Between 2004 and 2013, there has been a statistically significant increase in prevalence of 2.6% in this age group, while prevalence has stabilised in the under-11s. Childhood obesity has a complex, multifactorial aetiology. Therefore, making an impact on the alarming upwards trend in child weight can only be achieved if the environment is changed to promote healthy weight (Davison and Birch, 2001). For children, this includes both the family and school, as well as the wider context of the community and society (Butland et al, 2007).

Childhood and adolescent obesity is a global problem (Lobstein et al, 2004), which is linked to development of serious comorbidities at an early age. These can include type 2 diabetes, hypertension, cardiac abnormalities and obstructive sleep apnoea (Kelly et al, 2013). Furthermore, adolescents are at an extremely vulnerable age, and the psychosocial impact that obesity can have on a young person is significant. Affected individuals can suffer from depression, low self-esteem and bullying (Nieman and Leblanc, 2012). These issues not only affect them as adolescents but can also track through to adulthood, with elevated morbidity and mortality (Freedman et al, 2012) and reduced quality of life and productivity.

Issues in the management of adolescent obesity

Weight management in young people can be challenging. They are learning to self-identify, they have increasing autonomy, their interpersonal relationships are changing and they may even be leaving home (Nelson et al, 2008). Body dissatisfaction is common; however, at the other end of the spectrum, there have been cases in which adolescents do not see themselves as obese, even though clinically they are (Yang et al, 2014; Jackson

et al, 2015). The high rate of size underestimation in overweight and obese adolescents has health implications for the future, as obesity in adolescence can track through to adulthood (Singh et al, 2008). It is recommended that healthcare workers help to explore any psychosocial issues – including bullying – when counselling adolescents and using motivational interviews with the family (Nieman and Leblanc, 2012).

Treatment of adolescent obesity: Comparative approaches

Residential weight loss camps

Residential weight loss camps act as an alternative to community-based weight loss programmes. They focus on providing information on diet, physical activity and behavioural changes (Gately, 2014). In addition, a major advantage of these types of programmes is that they can spend a greater amount of time addressing the problems that may exist for the participant, whether they be social, psychological or emotional, thus taking a more patient-centred and holistic approach to the treatment. Residential camps have been assessed in both the US (Huelsing et al, 2010) and Europe (Gately et al, 2005), with impressive short-term results.

A total of 76 obese 10–18-year-olds were enrolled in either a 4-week or an 8-week weight loss camp (Huelsing et al, 2010). BMI, BMI z-score and body weight were reduced in all participants, and there were improvements in systolic blood pressure and 1-mile run times ($P<0.001$). These improvements were greater in participants in the 8-week programme. However, long-term data are not available.

Gately et al (2005) compared weight loss between 185 overweight children who attended weight loss camps for 6 weeks and 94 children of similar ages who did not. They found that participants who stayed for a mean of 29 days reduced their BMI by 2.4 kg/m^2 and lost 6.0 kg in weight, whereas the control groups gained weight. Further long-term work is required in this area to see if weight loss and the associated health benefits are maintained.

Behavioural therapy

Sharma (2006) published a review of preventative interventions for obesity conducted in the general population. The review observed interventions that happened within schools and found that most were based on behavioural therapy but only focusing on one component (e.g. stimulus control and not self-monitoring, goal setting or reward). It also revealed that the most successful interventions were ones that both involved the parents and included out-of-school activities. However, it also found that many of these interventions focused on individual-level behaviour changes, not a broader policy, and the author suggested that a broader approach which takes into account physical activity and dietary habits (from type of food and drink consumed to portion sizing) should be taken. One systematic review conducted on already overweight and obese adolescents found that there is a lack of consistency when it comes to interventions to tackle the condition, owing to a lack of behavioural theoretical framework support (Kelly and Melnyk, 2008). However, the authors did conclude that structured programmes addressing nutrition, physical activity and parental involvement were the most efficient in eliciting weight loss, which is a well-supported idea. What is clear from this review is that interventions that aim to address adolescent obesity need to understand the behaviours of their participants in order to implement a change.

Use of technology: Texting and apps

In this vein, more novel ways of changing adolescent behaviour are starting to be studied. Woolford et al (2010) looked at using tailored mobile phone text messages as an adjunct to obesity treatment for adolescents. The aim of the study was to increase adherence to a weight management programme. The participants were enthusiastic about the intervention, finding that the personalised text messages made them feel more involved in their own care. The same results were produced the next year (Woolford et al, 2011). Many similar studies have taken place (Lubans et al, 2012; Nguyen et al, 2013), and a systematic review has been performed to assess the use of text messaging as an intervention for adolescent obesity (Keating and McCurry, 2015). This review found that there has not been enough research into this intervention and that, although it is an exciting and novel approach, it is difficult

Page points

1. Healthcare workers need to explore any psychosocial issues behind an adolescent's obesity, both with the individual and with family members.
2. Residential weight loss camps have been shown to be effective weight loss interventions in the short term by allowing a more patient-centred and holistic approach. However, long-term evidence is lacking.
3. Reviews of behavioural therapy have found that most interventions conducted in the general population are too narrow in focus and lack consistency, owing to a lack of theoretical framework support.
4. Supporting obesity treatment with text messaging is an exciting new approach but cannot yet be recommended owing to a lack of evidence.

Page points

1. Family-based behavioural therapy, while effective in younger children, appears to have very little effect in adolescents.
2. Bariatric surgery is the most drastic intervention for adolescent obesity and is reserved for exceptional circumstances in the UK; however, evidence suggests that it is highly effective.
3. Roux-en-Y gastric bypass (RYGB) is commonly used in this patient group and typically results in around 40% weight loss and improvement in obesity-related comorbidities.

to judge its impact as, in all of the studies, text messaging was used as an adjunct to approved weight management programmes. However, the authors did note that positive short- and long-term effects on behaviours that affect BMI were seen, which is encouraging.

Whilst texting is one option, smartphone applications are another. Pretlow et al (2015) created an app to provide an intervention based on addiction treatment. They found that with the use of this app there were significant reductions in BMI and, furthermore, significant improvements in self-esteem, control over food and responses to stress.

Family-based behavioural therapy

The efficacy of family-based behavioural therapy in the treatment of moderate childhood obesity is well established. Adolescents are a different treatment group, however, and the efficacy of behavioural therapy in this population is debatable. It has been observed that long-term behavioural treatment is successful for severely obese children; however, it had almost no effect on severely obese adolescents (Danielsson et al, 2012), suggesting behavioural treatment should be initiated early in life to reap the greatest reward.

Bariatric surgery for children

If all of the previously mentioned options are exhausted and the adolescent has still not improved, bariatric surgery can be used as a last resort. This is usually reserved for adolescents in exceptional circumstances, and only if they have achieved or nearly achieved physiological maturity (NICE, 2014). Not only this, but the candidates also have to undergo a comprehensive psychological, educational, familial and social assessment before undergoing any surgery. Furthermore, they must have either a BMI >40 kg/m^2 or one of 35–40 kg/m^2 alongside other significant disease (e.g. type 2 diabetes or hypertension) that would be improved if they lost weight. They must be fit for anaesthesia and commit to the need for long-term follow-up; this is partly because there is a lack of long-term data to assess safety and side effects (Sabin and Kiess, 2015).

Overall, data suggest that bariatric surgery is an effective treatment in severely obese adolescents, with sustained reductions in weight ranging from 58% to 73% (Stefater et al, 2013). There are several types of bariatric surgery, the most common being laparoscopic adjustable gastric banding (LAGB) and laparoscopic sleeve gastrectomy, which are generally viewed as "restrictive" procedures; biliopancreatic diversion with duodenal switch, which is malabsorptive; and Roux-en-Y gastric bypass (RYGB), which can be performed laparoscopically and is a combination of restrictive and malabsorptive (Hsia et al, 2012; Kelly et al, 2013).

RYGB has been used for the longest length of time, first being used in adults in the 1960s and in adolescents in the 1970s (Inge et al, 2007). It remains one of the most commonly used procedures for adolescents (Xanthakos et al, 2006). Postoperative outcomes usually comprise around a 40% reduction in BMI after 1 year, with most of the weight loss happening in the first 6 months (Inge et al, 2010). Conversely, only a 3% reduction in BMI was seen in a population of similarly obese adolescents who underwent a behavioural weight management programme (Lawson et al, 2006).

RYGB not only induces weight loss but is also associated with improvement in comorbidities, including obstructive sleep apnoea, features of metabolic syndrome and type 2 diabetes (Sugerman et al, 2003; Inge et al, 2009). Interestingly, improvement of type 2 diabetes markers has been observed very soon after surgery in adults and can even precede the weight loss, suggesting that RYGB may have an independent anti-diabetes effect (Wickremesekera et al, 2005). One of the largest prospective studies of adolescents undergoing RYGB to date (n=81) reported a BMI reduction of 32% after 2 years, whilst hyperinsulinaemia, which was reported in 70% of participants at baseline, was only present in 3% after 2 years. The prevalence of elevated fasting glucose levels was reduced from 21% at baseline to 5% after 2 years. Serum lipid levels were also lowered and the general quality of life of the participants increased (Olbers et al, 2012; Göthberg et al, 2014).

As with any procedure, RYGB has risks. Miyano et al (2013) analysed the perioperative outcomes of 77 adolescents undergoing RYGB, with a mean BMI of 59.4 kg/m^2. No deaths occurred during surgery and intraoperative complications occurred only in 3% of participants. The median

hospital stay was 3 days; however, 22% of participants had a complication within 30 days of discharge, and 13% had a complication 31–90 days after discharge (Inge et al, 2014). Treadwell et al (2008) have reported some potentially life-threatening postoperative complications, such as shock, pulmonary embolism, severe malnutrition, immediate postoperative bleeding and gastrointestinal obstruction.

LAGB is another type of bariatric surgery that could be performed on adolescents, and in Europe it is the most common type performed on this age group (Shield et al, 2008). Recent research has found that, rather than being a purely restrictive procedure, LAGB activates peripheral satiety mechanisms without physically restricting meals (Burton and Brown, 2011; Al-Momani et al, 2015). The benefits of this type of surgery include its reversibility, fewer staple lines and fewer nutritional deficits compared with a malabsorptive treatment. LAGB has been shown to outperform lifestyle interventions, albeit in a study of only 50 children, with a BMI reduction of 28% in the surgical group compared with 3% in the lifestyle intervention group (O'Brien et al, 2010). This study also demonstrated significant improvements in blood pressure, plasma insulin, triglycerides, HDL-cholesterol and features of metabolic syndrome following LAGB. Furthermore, no perioperative adverse events were noted. The mean length of hospital stay for the LAGB recipients was 26 hours; however, this same group had a mean of 20.4 hospital visits during the 2-year follow-up period, and this resulted in an average of 9.5 adjustments to the band per person. Over time, LAGB has been shown to improve comorbidities, resolving diabetes, hypertension and asthma (Treadwell et al, 2008).

Again, there are risks associated with this procedure, with band slippage and micronutrient deficiency being the two most common complications, and there are sometimes reports of band erosion, port dysfunction, hiatal hernia, wound infections and pouch dilation (O'Brien et al, 2010). No studies to date have analysed the impact of LAGB on growth and development.

Other effects of bariatric surgery

It has been shown that substantial improvements in mental health occur in adolescents in the years after their surgery, with most showing a level of mental health and self-concept similar to the norm (Järvholm et al, 2015). The second year after surgery is often associated with stabilisation of weight loss, as the more rapid loss occurs in the first year. This comes with a suggested relative decline in mental well-being (Zeller et al, 2011). Järvholm et al (2015) suggest that, bearing in mind this possibility of mental health decline, repeated monitoring of adolescents after bariatric surgery should be carried out in order to support those who develop mental health problems.

As with all surgical procedures, bariatric surgery carries risks along with its observed benefits. These risks include minor complications, such as dumping syndrome or dehydration, as well as more serious complications, such as nutritional deficiencies and pulmonary embolism. For these reasons, possible complications should be closely monitored by an expert multidisciplinary team. For adolescents, one of the most important aspects to monitor is nutrition, given the potential for significant metabolic and growth derangements (Hsia et al, 2012). Additionally, it is widely known that there are few studies with long-term follow-up of adolescent bariatric surgery. Large, longitudinal studies are needed to assess the efficacy and safety of bariatric surgery in adolescents.

Conclusion

Behavioural therapy in adolescence has shown some promising results but further work is required on an effective theoretical framework. The use of technology may help to support long-term behaviour change but there is insufficient data at this time for a recommendation. Unsurprisingly, the most effective treatments for adolescent obesity occur when either the obesogenic environment is removed (residential weight loss camps) or the individual's ability to respond to it is curtailed (bariatric surgery). While there is so little will to change the obesogenic environment, it is likely that these interventions will continue to provide the best results. Long-term follow-up data are required but, unfortunately, with such a high prevalence of obesity in adolescents, it will not be long before such data are available. ■

Page points

1. Despite its benefits, RYGB can be risky, with a high rate of complications in the first 90 days after discharge.
2. Gastric banding is the most common bariatric surgery procedure in adolescents. While it typically results in less weight loss than RYGB, it benefits from being a reversible procedure that causes fewer nutritional deficits.
3. Long-term monitoring for complications, nutritional deficiencies and declines in mental well-being is essential following bariatric surgery.

"Unsurprisingly, the most effective treatments for adolescent obesity occur when either the obesogenic environment is removed (residential weight loss camps) or the individual's ability to respond to it is curtailed (bariatric surgery). While there is so little will to change the obesogenic environment, it is likely that these interventions will continue to provide the best results."

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1. According to van Jaarsfeld and Guilford (2015), the prevalence of obesity in children aged 11–15 years is:

   A. 27.8%
   B. 37.8%
   C. 42.5%

2. Between 2004 and 2013 the prevalence of obesity in adolescents aged 11–15 years has increased significantly, by:

   A. 1.2%
   B. 2.6%
   C. 13.1%

3. According to Gately (2014), residential weight loss camps can reduce:

   A. BMI
   B. BMI z-scores
   C. Systolic blood pressure
   D. All of the above

4. According to Sharma (2006), the most successful interventions to prevent childhood obesity have which of the following characteristics:

   A. Are based in schools
   B. Have only one component of behavioural therapy
   C. Involve parents and have out-of-school activities

5. Keating and McCurry (2015) found that texting and apps are a promising area of study and that short- and long-term results show:

   A. Improvements in BMI
   B. Positive effects on behaviours that affect BMI
   C. No effect on health behaviours

6. Kelly and Melnyk (2008) found that family-based therapy:

   A. Reduces weight in obese adolescents
   B. Has almost no effect on obese adolescents
   C. Can be used later in adolescence, with good effect

7. NICE (2014) guidelines state that, for obese children and adolescents, bariatric surgery:

   A. Should be the first option
   B. Is a last resort if all other options have failed
   C. Is suitable for children with a BMI of 35–40 kg/m^2 with no comorbidities

8. In Europe, the most common bariatric procedure in adolescents is (Xanthakos et al, 2006):

   A. Roux-en-Y gastric bypass
   B. Laparoscopic adjustable gastric band
   C. Laparoscopic sleeve gastrectomy

9. According to Sugerman et al (2003) and Inge et al (2009), Roux-en-Y gastric bypass results in:

   A. Weight loss
   B. Improvement of comorbidities
   C. Improvement of type 2 diabetes markers independent of weight loss
   D. All of the above

10. Effective treatments for adolescent obesity include:

    A. Bariatric surgery
    B. Residential weight loss camps
    C. Behavioural therapy
    D. Use of texting and technology including smartphone apps
    E. All of the above