A report from Diabetes UK 2013: Obesity, diet, exercise and surgery

This year's *Diabetes UK Professional Conference* took place in Manchester on 13–15 March. The report herein summarises a selection of oral and poster presentations related to diet, physical activity and bariatric management, all aiming to offer insights into the management of obesity in the context of diabetes. The main study results are discussed here and research gaps highlighted. It is hoped that this report provides a shop window for the latest developments in combating diabesity, and inspires healthcare professionals to continue making a difference in the care of people with the overlapping conditions of diabetes and obesity.

Obesity and type 1 diabetes

Obesity is a global epidemic, affecting the general population including those with type 1 diabetes, as demonstrated by Hale and colleagues (P251). These researchers presented results from an analysis of the electronic database at Bournemouth Diabetes and Endocrine Centre, comparing the prevalence of overweight and obesity in people aged 16 and over with type 1 diabetes (n=1511) with the general population prevalence reported by the Health Survey for England 2010 (Health and Social Care Information Centre, 2010).

Results revealed that there was no significant difference for either gender in overweight and obesity prevalence. In 2010 this prevalence was 62.8% (n=7086) for the general population and 60.7% (n=789) for type 1 diabetes. The researchers also found that the rates of obesity in the last decade have increased significantly amongst men with type 1 diabetes aged 45–54 (+1.5% per year, P=0.001) and in women aged 35–44 (+1% per year, P=0.044). However, rates of obesity have fallen significantly for both genders aged 55–64 (–1.0% per year, P=0.02).

The study has shown that, similar to the background UK population, rates of overweight and obesity are unacceptably high for people with type 1 diabetes. For obesity in particular, rates have increased significantly in specific age groups within the local type 1 diabetes population.

Over the past decade, it has become apparent that more cases of type 1 diabetes are diagnosed in children and adolescents who were overweight or even obese (Verbeeten et al, 2010; Pozzilli et al, 2011). Lifestyle modification, including diet and exercise, which is relevant for the prevention of type 2 diabetes, may also be important modifiable environmental factors for type 1 diabetes prevention.

Lifestyle modification

Progression to type 2 diabetes can be delayed or prevented among people who have impaired glucose tolerance (IGT) with lifestyle interventions, as shown by major clinical trials of diabetes prevention (American Diabetes Association [ADA], 2004). The Greater Manchester Collaboration for Leadership in Applied Health Research and Care, together with NHS Bolton, has implemented and evaluated a primary care based, preventative lifestyle change programme; its outcomes were shared by Betzlbacher and colleagues at the conference (P254).

The local health trainer service, offering lifestyle support over a period of 6 months, was diversified to offer support to people with IGT. One year after completing the programme, among 80 people with IGT at the outset, 21.3% (n=17) successfully reverted to normoglycaemic levels, 32.5% (n=26) still had IGT, and 21.3% (n=17) progressed to type 2 diabetes. No follow-up data were available for 25.0% (n=20). These data are comparable to published studies and indicate that the local health economy and patients are benefiting from the health trainer service offered to people at risk of developing type 2 diabetes.

Diet

When it comes to dietary interventions, there is no shortage of advice. Various strategies have been investigated and at the conference the focus was largely on "carbohydrates versus calories" in diet.

Ajala et al from Plymouth (P247) reported a systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes, assessing the effect of various diets on glycaemic control, lipids and weight loss. They included randomised controlled trials (RCTs) with interventions lasting 6 or more months that compared low carbohydrate, vegetarian, vegan, low glycaemic index (GI),

Figure 1. Studies on dietary interventions reported at the conference focused on the role of carbohydrates versus calories.

high fibre, Mediterranean and high protein diets with control diets including low fat, high GI, ADA diet, European Association for the Study of Diabetes diet and low protein diet. A total of 20 RCTs were identified; across 3460 randomised individuals, 3073 were included in final analyses. Results showed that low carbohydrate, low GI, Mediterranean and high protein diets were effective in improving glycaemic control, reducing body weight, or increasing high density lipoprotein levels in people with type 2 diabetes compared with their respective control diets.

The benefit of low carbohydrate diet in type 2 diabetes was also demonstrated in a study reported by Lee and colleagues (P64), showing that low carbohydrate but not energy deficit diet significantly lowered the levels of high-sensitivity C-reactive protein, an inflammatory marker indicating cardiovascular risk.

Although Steven and colleagues from Newcastle University (P260) proved that short-term use of a very low calorie diet (VLCD) was effective in improving glycaemic control and promoting weight loss in health-motivated individuals with type 2 diabetes outside a research setting, this strategy may not offer sustainable long-term benefits, as seen in a 15-year follow-up study after VLCD intervention in obese people. Paisey and colleagues from Torquay (P249) reported an audit in 152 obese people with or without diabetes who lost more than 5% body weight in 3 months on a VLCD between 1994 and 2000. After 12–18 years, none of the 35 people with pre-existing type 2 diabetes sustained remission and 12 developed coronary artery disease. Thirty-one of those without diabetes at baseline developed impaired fasting glucose (n=7) or type 2 diabetes (n=24) after weight regain. Only six people sustained >5% weight loss. Use of VLCDs did not result in long-term maintenance of weight loss, remission of type 2 diabetes or prevention of later glucose intolerance.

Diet undoubtedly plays a key role in the management of diabetes and obesity; further research is needed to identify the most suitable interventions that are easy to follow and offer sustained long-term benefits.

Physical activity

It is well established that in both type 1 and type 2 diabetes exercise can increase insulin sensitivity, lower blood glucose, and have positive psychological effects (White and Sherman, 1999). But what is the most effective type of physical activity intervention? How could we deliver cost-effective services promoting physical activity? What role does physiotherapy play? How important are external networks? Researchers and healthcare providers shared their experiences and findings in their quest to answer these questions.

Aerobic exercise: A systematic review

To determine which is the most effective aerobic exercise intervention in reducing the risk of type 2 diabetes and cardiovascular disease in overweight adults with intermediate hyperglycaemia, Faulkner and colleagues (P261) conducted a systematic review using three electronic databases and relevant references. Following data extraction, nine published peer-reviewed papers from six studies were reviewed in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Eight articles reported significant improvements in type 2 diabetes and cardiovascular disease risk factors. The mode of exercise prescribed varied between studies. No consistency was observed in study duration (12 weeks to 6 years), outcome measures, exercise durations (5–60 minutes/day), frequency (1–7 days/week) or intensity (low, moderate and vigorous) between studies.

This review supports the health benefits of exercise within this population; however, it also highlights the need for further research to identify the most effective interventions.

A cost-effective service in Scotland

Many published weight loss strategies involving physical activity are difficult to accomplish and maintain (ADA, 2004). For example, in the Diabetes Prevention Program (DPP; DPP Research Group, 1999), group courses on exercise and weight loss lasting 4–6 weeks were offered every 3 months. Additionally, two supervised exercise sessions were offered each week. Moreover, anyone having difficulty achieving or maintaining the study's goals for weight loss or exercise were offered incentives, such as exercise tapes or equipment, free enrolment in exercise facilities, free low calorie foods, more structured eating plans, and home visits for encouragement and counselling. Such costly programmes can be difficult to implement widely.

Exploring cost-effective patient education and counselling interventions has therefore become popular among healthcare providers. McCallum and colleagues (P258) discussed their physical activity consultation service that involves limited time allocations. This 12-month intervention is currently being offered to adults with type 1 or type 2 diabetes within the area of NHS Grampian. Following self-referral by telephone, participants receive an initial 30-minute face-to-face consultation, monthly follow-up consultations for 6 months (face-to-face, email or telephone) and further follow-up consultations at 6 and 12 months. Consultations are guided by behaviour change strategies, tailored to stage of change and delivered by a health psychologist within a time slot of 4 hours per week.

Among the 43 people who enrolled in the service, 87.2% reported being ready for change. Nineteen people completed 6-month follow-up, of whom 57.9% reported meeting the current physical activity recommendations; self-reported weight loss was observed in 73.7% of these participants, and stage of change increased in 72.2%. These promising results show that physical consultation service can be a cost-effective method of supporting people with diabetes to increase physical activity and promote weight loss.

The role of physiotherapy

People with obesity have comorbidities affecting aerobic capacity and ability to perform physical activities (Racette et al, 2003). These people may consider getting

professional help from a physiotherapist whose role is enhancing people's aerobic ability and facilitating safe physical activity.

Ramasamy and colleagues from Mid Yorkshire (P248) presented results from a study to determine the effectiveness of physiotherapy intervention as part of a multidisciplinary team weight management programme. This programme involved education on energy systems and utilising body fat as a fuel source in daily activities, as well as sessions delivered either individually or in groups by an obesity specialist physiotherapist, consisting of breathing, warm-up and weight loss exercises with a combination of low impact aerobics, strengthening, high calorie burning and cool down exercises, and relaxation. Participants were trained with low, moderate and high intensity level on their aerobic ability and were encouraged to continue at home. They also attended a 2-hour programme from a specialist dietitian.

Forty people with BMI over 30 kg/m^2 participated in the study; their aerobic ability was evaluated before and after the program using the 2 Minute Step Test (2MST) to measure aerobic endurance and 10-point Borg Rate of Perceived Exertion (RPE) Scale to measure exercise intensity. At study end, 98% and 83% of the participants increased their 2MST and RPE scores respectively, with a significant difference (P<0.001) observed for both.

This study indicates that a structured exercise programme combining education and physical training for obese people is effective in improving their aerobic ability and physical activity.

Figure 2. Research highlights the need to explore the most effective exercise interventions and the most suitable way to deliver services promoting physical activity.

Involvement of external organisations

Apart from healthcare professionals, many external networks can also play an important role in promoting physical activity in people with diabetes.

As part of a larger systematic review exploring implementation of physical activity interventions for type 2 diabetes, Matthews and colleagues (P253) independently reviewed 50 articles, four of which were found to report the use of external organisations in the delivery of the intervention. A range of organisations were identified, including local employers and faith-based centres. Networks provided a venue for the promotion of information and resources, in addition to acting as an extra site for referral, recruitment and delivery of the intervention. Two key issues were: (1) identification of organisations and staff with strong motivation to adhere to intervention protocols, and (2) early establishment of clear routes of communication between the main site and the network. External organisations also reported a reciprocal benefit of their involvement by bringing new people to their centre and strengthening relationships with the community.

Clearly, external networks play a positive role in the delivery of physical activity interventions as shown in this study, and should perhaps be considered in the planning of sustainable and effective physical activity services.

Specialised versus routine management

As discussed above, service delivery is an important aspect in the management of diabetes and obesity. Research has been done to investigate the effectiveness of a specialised clinic for managing these two conditions. Brame and colleagues from Liverpool (P246) reported results from a retrospective audit assessing whether attending a specialised diabetes weight management clinic led to significant improvements in weight, BMI and HbA_{1c} compared with routine care.

The audit included 26 people attending the specialised clinic and 26 age and gender matched people attending general diabetes clinic. Those receiving specialised care were initially reviewed by the consultant, the diabetes specialist nurse (DSN) and the diabetes specialist dietitian (DSD) to agree a management plan that included pharmaceutical intervention and behavioural therapy where appropriate. After this a joint review by the DSN and DSD was offered, followed by 1-month and 3-month follow-up visits.

At 6 months, in people attending the specialised weight management clinic versus those attending routine clinic, weight loss was 9.58 kg versus 4.11 kg (P=0.07), BMI reduction was 5.00 kg/m^2 versus 1.54 kg/m^2 (P=0.008), and HbA_{1c} reduction was 1.7 mmol/mol (0.16%) versus 6.7 mmol/mol (0.61%; P=0.27).

This suggests that focused and specialised multidisciplinary team weight management planning with patient inclusion in decision making plays a vital role in weight reduction. HbA_{1c}, however, does not follow this trend and further research is required to explore the reasons.

Bariatric management

Lifestyle and pharmaceutical interventions can be effective in many people, but for some, bariatric surgery may help achieve long-term weight loss and offer a dramatic improvement in diabetes, hyperlipidemia and hypertension even before there is any weight loss (Polymeris et al, 2013).

Health benefits of bariatric surgery

Behbehani and colleagues from Manchester (P430) presented results from a study evaluating the effect of bariatric surgery on glycaemic and metabolic outcomes in people with type 2 diabetes. The study included 101 patients who had undergone gastric bypass surgery between September 2009 and December 2011. Compared with baseline,

24-month postoperative measurements revealed that surgery lowered mean BMI from 50.3 kg/m^2 to 34.2 kg/m^2 (P<0.001), HbA_{1c} from 65 mmol/mol (8.1%) to 41 mmol/mol (5.9%, P<0.001), as well as both systolic and diastolic blood pressure, and total-to-HDL cholesterol ratio. Furthermore, HbA_{1c} <48 mmol/mol (<6.5%) was seen in 84% of patients preoperatively, compared with 19% at 24 months (P<0.001). Remission of diabetes, defined as HbA_{1c} <48 mmol/mol (<6.5%) and no glucose-lowering treatment, occurred in 72% of patients. Of 24 patients who were on insulin preoperatively, eight (33%) stopped all glucose-lowering treatment, 12 (50%) converted to oral antidiabetes drugs and four (17%) required reduced insulin doses.

In addition to reductions in BMI, HbA_{1c} and blood pressure, a study (n=75) reported by Baqai and colleagues from London (P570) demonstrated the benefit of bariatric surgery on retinopathy and nephropathy in obese people with type 2 diabetes 1 year after intervention. Compared with the control group, the mean change in retinopathy score was –0.08±0.16 versus +0.52±0.17 (P=0.01), and the proportion of patients experiencing remission was 30% versus 15%. In terms of nephropathy, change in the median urine albumin/creatine ratio was –0.45 mg/mmol versus +0.2 mg/mmol, and the proportion of patients experiencing remission was 55% versus 4%.

These studies have confirmed that bariatric surgery in many obese people with type 2 diabetes results in remission of diabetes and related complications, or marked improvement in glycaemic control, blood pressure and lipid profile in short- to medium-term follow-up.

Pre-, peri- and postoperative management

Although studies have indicated that bariatric surgery can lead to resolution or improvement of type 2 diabetes in overweight or obese people, the postoperative management requires lifelong counselling and monitoring both in people who continue to have diabetes and in those in remission. The aim of such management is to avoid nutritional deficiencies, and to delay diabetes relapse by optimising the control of risk factors. Unfortunately, there are limited guidelines available for this population in managing their condition after surgery, as well as pre- and perioperatively.

Bhatti and colleagues from London (A34/P531) performed a retrospective study (n=16) that aimed to determine glycaemic control and insulin management following bariatric surgery in people with type 2 diabetes. Follow-up was at 0, 3 and 12 months. They found that insulin requirements fell by approximately two-thirds immediately postoperatively although there was a wide range; the results agree with published research which has shown that the majority of insulin-treated patients can discontinue insulin therapy by 6 weeks after surgery, and some may even be able to discontinue insulin before hospital discharge (Heber et al, 2010). Based on their findings, Bhatti et al recommended considerable insulin titration and monitoring perioperatively, and for those with persistent high glucose readings post-bariatric surgery, starting on a third of preoperative total daily dose of insulin with close postoperative follow-up.

Nutritional management is another key component of bariatric management. Presence of micronutrient deficiencies after bariatric surgery has been recognised for decades (Xanthakos, 2009; Heber et al, 2010); however, little research has been carried out on the prevalence of micronutrient deficiencies before surgery. To assess micronutrient status of obese patients awaiting bariatric surgery, London-based researchers Gordon and colleagues (A35/P252) conducted a retrospective study involving 100 obese people who underwent bariatric surgery at a local hospital. They discovered that 96% of patients were vitamin D deficient (defined as 25-hydroxy-vitamin D ≤59 nmol/L) and 81% severely vitamin D deficient (defined as 25-hydroxy-vitamin D ≤30 nmol/L) prior to surgery. In addition, a significant proportion was found to be deficient in folate, vitamin B_{12} and iron. Because these patients are likely to become more micronutritionally deplete after the operation, it is essential to assess and normalise micronutrient status prior to bariatric surgery.

Closing remarks

Lifestyle modifications with diet and exercise are an essential part of the management of obese people with diabetes. These measures alone are often insufficient and concomitant pharmacologic therapy may be required to achieve glycaemic and weight control; for severely obese individuals with diabetes, bariatric surgery may be the only effective treatment. Healthcare professionals should avail themselves of all of the strategies available in their speciality areas and work effectively alongside other members in the multidisciplinary team. ■

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