Comparison of weight loss achieved after laparoscopic adjustable gastric banding between Afro-Caribbean, Caucasian and South Asian adult female patients in a London bariatric centre

GK Phoenix, N Penney, DM Cocker, A Davies, J Smellie, G Bonanomi, J Thompson, E Efthimiou

Chelsea and Westminster Hospital NHS Foundation Trust, UK

ABSTRACT

INTRODUCTION It has been shown that following laparoscopic adjustable gastric banding (LAGB) procedures, Afro-Caribbeans achieve poorer weight loss compared with Caucasians. The reasons for this are multifactorial. However, studies have been based on mainly female patients from the US and none to date have been from the UK. Furthermore, South Asians have not previously been compared. The aim of this study was to compare excess weight loss percentage (%EWL) outcomes up to five years following LAGB in Afro-Caribbean, Caucasian and South Asian females in a London-based teaching hospital.

METHODS An analysis was carried out of prospectively collected data of female patients aged ≥ 16 years of Afro-Caribbean, Caucasian or South Asian origin who underwent LAGB between October 2000 and December 2011. Data included demographics, co-morbidities and anthropometrics.

RESULTS Overall, 596 females underwent LAGB; 316 Caucasians (53.0%), 64 Afro-Caribbeans (10.8%) and 27 South Asians (4.5%) formed the majority of those who disclosed ethnicities. Age and initial body mass index (BMI) were comparable between Afro-Caribbeans and Caucasians (mean BMI: 47.3 kg/m² [standard deviation (SD): 7.5 kg/m², range: 37.0–78.3 kg/m²] vs 45.8 kg/m² [SD: 7.1 kg/m², range: 24.7–79.8 kg/m²], $p=0.225$). A non-significant trend suggested less %EWL in Afro-Caribbeans than in Caucasians at 6 months, and at 1, 2, 3, 4 and 5 years (21.4% vs 24.4%, $p=0.26$; 27.4% vs 31.3%, $p=0.27$; 33.0% vs 36.8%, $p=0.15$; 39.0% vs 45.8%, $p=0.14$; 34.2% vs 45.3%, $p=0.16$; 37.1% vs 47.6%, $p=0.67$). South Asians and Caucasians had a similar age and preoperative BMI (mean BMI: 43.6 kg/m² [range: 32.5–59.1 kg/m²] vs 45.8 kg/m² [range: 24.7–79.8 kg/m²], $p=0.08$). The %EWL was greatest at three and four years among South Asians although numbers were small ($n=4$ and $n=3$ respectively).

CONCLUSIONS A non-significant trend suggests poorer weight loss outcomes in Afro-Caribbeans compared with Caucasians in our cohort. Discussion of realistic weight loss outcomes as well as enhanced follow-up and dietary modifications are required for Afro-Caribbean patients. Low numbers prevent definitive conclusions regarding South Asians. Multicentre studies across England are required to better define any differences between ethnicities.

KEYWORDS

Ethnicity – Afro-Caribbean – Caucasian – South Asian – Bangladeshi – Indian – Pakistani – Estimated weight loss – Laparoscopic adjustable gastric banding – United Kingdom

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CORRESPONDENCE TO

Evangelos Efthimiou, Department of Metabolic and Bariatric Surgery, Chelsea and Westminster Hospital, 369 Fulham Road, London SW10 9NH, UK T: +44 (0)20 8746 8000; E: e.efthimiou@doctors.org.uk

The prevalence of female obesity (body mass index [BMI] ≥ 30 kg/m²) is on the increase in the UK: in 2010 female obesity rates were 26.1% in England,¹ 28.9% in Scotland,² 22% in Wales³ and 23% in Northern Ireland.⁴ At all ages, females of Afro-Caribbean descent have been shown to be more overweight (BMI ≥ 25 kg/m²) and obese (BMI ≥ 30 kg/m²) than their Caucasian counterparts.^{5–7} An English governmental health survey that included 3,699 females showed the prev-

alence of obesity was considerably higher among Black Caribbean (31.9%) than Caucasian (20.9%) females.⁷

Afro-Caribbean females have greater difficulty in achieving and maintaining weight loss through exercise, dieting and behavioural interventions^{8–11} as well as following Roux-en-Y gastric bypass^{12,15} or laparoscopic adjustable gastric banding (LAGB) procedures.^{14,15} Resistance to weight loss among Afro-Caribbeans is thought to be multifacto-

Table 1 Patient demographics, preoperative anthropometric measurements and co-morbidities

	Caucasian	Afro-Caribbean	South Asian	p-value		
				C vs AC	AC vs SA	C vs SA
Female	316	64	27			
Age (SD, range) in years	43.5 (11.7, 17–71)	41.3 (8.8, 22–67)	41.2 (12.4, 21–65)	0.165	0.97	0.352
Initial weight (SD, range) in kg	123.8 (20.3, 61.7–233.4)	131.0 (20.0, 94.7–193.0)	113.9 (20.9, 82.1–157.0)	0.015	0.001	0.014
Initial BMI (SD, range) in kg/m ²	45.8 (7.1, 24.7–79.8)	47.3 (7.5, 37.0–78.3)	43.6 (6.6, 32.5–59.1)	0.225	0.03	0.08
Excess weight (SD, range) in kg	56.2 (19.0, -0.7–160.3)	61.5 (19.4, 31.5–131.4)	48.6 (17.7, 18.9–90.6)	0.065	0.01	0.038
Diabetes mellitus	18.1%	4.8%	28.0%	0.007	0.004	0.28
Hypertension	33.9%	41.3%	24.0%	0.31	0.15	0.38
Sleep apnoea	7.4%	10.5%	0%	0.42	0.17	0.4

SD = standard deviation; BMI = body mass index; AC = Afro Caribbean; C= Caucasian; SA = South-Asian

rial, including genetic, psychosocial and behavioural factors.^{8–12,16–21}

The prevalence of obesity (BMI ≥ 30 kg/m²) among South Asian females in the UK varies according to country of origin: 25.6% of Pakistani females are obese, 19.6% of Indian females and 9.5% of Bangladeshi females.⁷ However, the World Health Organization defines obesity among the Asian population with a lower BMI of ≥ 27.5 kg/m².²² Taking this into consideration, the prevalence rate of obesity among UK South Asians is likely to be higher. Furthermore, an Indian consensus from 2010 agreed that the National Institutes of Health guidelines for bariatric surgery were not suitable for Asians and that there was a need to lower the required BMI for bariatric surgery with the use of waist circumference as the main determinant.²³ Genetic, psychosocial and behavioural factors are thought to be responsible for resistance to weight loss among South Asians.²⁴

To date, no study from the UK has investigated the effect of ethnicity on weight loss achieved among Afro-Caribbean, Caucasian and South Asian female patients following LAGB. As female patients comprise the majority of patients who undergo bariatric surgery (over 80% in our unit) and constitute the higher proportion of our LAGB patients, we sought to assess any difference in the weight loss achieved among the Afro-Caribbean, Caucasian and South Asian female population operated on in our unit.

Methods

Prospectively collected data were obtained from the Department of Metabolic and Bariatric Surgery database (Access®; Microsoft, Redmond, WA, US) for all patients who underwent LAGB at our institution between 1 October 2000 and 31 December 2011. Female adult patients aged ≥ 16 years and older and who were of Afro-Caribbean, Caucasian or South Asian (Pakistani, Indian, Sri Lankan or Bangladeshi) origin were included. Data acquired comprised: popula-

tion demographics including age and sex; co-morbidities including hypertension, diabetes mellitus and obstructive sleep apnoea; and anthropometric measurements including preoperative and postoperative follow-up weights, BMI and excess weight loss percentage (%EWL).

Follow-up evaluation

All patients with a gastric band were included until lost to follow-up, the gastric band was removed as a result of a complication or when the patient underwent a further bariatric procedure. Patients were followed up in a dedicated band adjustment clinic (from 2009), which included surgical, dietetic and, if needed, psychology input. All bands were first adjusted at six weeks after insertion under radiological guidance and subsequently in a dedicated band adjustment outpatient clinic.

From 2010 the follow-up protocol was increased to two-monthly adjustments for the first year after LAGB. During the second year, the follow-up was dictated by the patient's weight loss but generally patients were seen at least twice and at least annually thereafter. Patients were allowed to contact the service for adjustment at any point. Adjustments were based on patient, symptoms, satiety and weight loss record. All patients were seen by both the dietetic and psychology teams for advice regarding dietary and lifestyle changes. Patients were sent frequent letter and telephone reminders for missed outpatient appointments.

All patients underwent laparoscopic insertion of either a LAP-BAND® (manufactured by BioEnterics, Carpinteria, CA, US, for Allergan Inc) or a Swedish Adjustable Gastric Band (Obtech Medical, Zug, Switzerland), according to the surgeon's preference. The bands were inserted using the standard pars flaccida approach.

Data analysis

Statistics were performed using Statistics Open For All (version 1.1.7). Data were not normally distributed so non-

Table 2 Outcomes for five years of follow-up by ethnicity (Afro-Caribbean, Caucasian and South Asian females)

	6 months	1 year	2 years	3 years	4 years	5 years
Caucasian						
Mean weight loss (SD) in kg	13.2 (10.9)	17.0 (13.3)	19.8 (14.5)	23.5 (13.1)	22.7 (15.0)	24.3 (14.8)
Mean BMI (SD) in kg/m ²	41.1 (6.1)	39.5 (6.8)	38.0 (6.8)	35.8 (6.1)	35.7 (6.8)	35.2 (5.7)
Mean %EWL (SD)	24.4 (20.2)	31.3 (23.7)	36.8 (26.2)	45.8 (23.9)	45.3 (27.5)	47.6 (25.5)
Number of patients	256 (81%)	229 (90%)	146 (73%)	85 (77%)	64 (91%)	37 (74%)
Afro-Caribbean						
Mean weight loss (SD) in kg	13.5 (9.8)	17.2 (11.8)	19.8 (14.5)	23.1 (15.6)	20.6 (20.4)	20.6 (20.9)
Mean BMI (SD) in kg/m ²	42.2 (6.0)	41.3 (6.4)	40.5 (8.1)	38.8 (8.0)	40.4 (9.5)	41.1 (13.2)
Mean %EWL (SD)	21.4 (15.1)	27.4 (18.6)	33.0 (26.0)	39.0 (27.8)	34.2 (32.1)	37.1 (36.6)
Number of patients	54 (84%)	40 (80%)	31 (86%)	20 (74%)	11 (73%)	4 (80%)
South Asian						
Mean weight loss (SD) in kg	13.0 (8.8)	11.8 (9.4)	19.4 (12.0)	29.6 (11.0)	39.1 (8.0)	27.4 (27.3)
Mean BMI (SD) in kg/m ²	38.7 (5.7)	36.2 (5.5)	34.3 (6.2)	33.3 (8.0)	35.4 (9.0)	40.6 (13.9)
Mean %EWL (SD)	25.4 (14.7)	29.2 (20.2)	44.7 (26.4)	62.2 (20.2)	61.4 (20.7)	43.7 (45.4)
Number of patients	20 (74%)	17 (89%)	13 (86%)	4 (40%)	3 (100%)	4 (100%)
%EWL	p-value					
AC vs C vs SA	0.41	0.54	0.16	0.11	0.01	0.90
AC vs C	0.26	0.27	0.15	0.14	0.16	0.67

SD = standard deviation; BMI = body mass index; %EWL = excess weight loss percentage; AC = Afro Caribbean; C= Caucasian; SA = South-Asian

parametric analysis was performed. The Mann-Whitney U test and Fisher's exact test were used for analysis of continuous and categorical demographic variables respectively. The Kruskal-Wallis test was used to compare %EWL between all three ethnic groups. Pairwise comparison between Caucasians and Afro-Caribbeans was carried out using the Mann-Whitney U test. Results were considered statistically significant if the *p*-value was <0.05.

Results

Overall, 596 adult females underwent LAGB between 1 October 2000 and 31 December 2011. A summary of patient demographics, initial anthropometric measurements and co-morbidities can be found in Table 1. The majority of patients were Caucasians (*n*=316, 53.0%). Afro-Caribbeans (*n*=64, 10.8%) and South Asians made up a smaller proportion (*n*=27, 4.5%). Those of mixed origin (*n*=13, 2.2%) and of Chinese heritage (*n*=2, 0.3%) made up the remainder of those who disclosed their ethnicity. Some patients listed their ethnicity as 'other' but did not provide any further information (*n*=39, 6.5%). A number of patients chose not to disclose their ethnicity (*n*=100, 16.8%) or the data were not available in the database (*n*=35, 5.9%).

Age was comparable between Afro-Caribbeans and Caucasians (mean: 41.3 years [standard deviation (SD)]: 8.8 years, range: 22–67 years] vs 43.5 years [SD: 11.7 years,

Figure 1 Excess weight loss percentage (%EWL) at 5-year follow-up of Afro-Caribbean, Caucasian and South Asian female patients following laparoscopic adjustable gastric banding

range: 17–71 years], *p*=0.165) as well as the preoperative BMI (mean: 47.3kg/m² [SD: 7.5kg/m², range: 37.0–78.3kg/m²] vs mean: 45.8kg/m² [SD: 7.1kg/m², range: 24.7–79.8kg/m²], *p*=0.225) and excess weight (mean: 61.5kg [SD: 19.4kg, range: 31.5–131.4kg] vs mean: 56.2kg [SD: 19.0kg, range: -0.7–160.3kg], *p*=0.065). There was a difference in the initial weight between Afro-Caribbeans and Caucasians, with

Table 3 Outcomes for five years of follow-up for all patients (Afro-Caribbean, Caucasian and South Asian females)

	6 months	1 year	2 years	3 years	4 years	5 years
Mean weight loss (SD) in kg	13.2 (10.6)	16.7 (12.9)	19.8 (14.3)	23.7 (13.5)	23.1 (15.9)	24.2 (16.2)
Mean BMI (SD) in kg/m ²	41.2 (6.1)	39.6 (6.7)	38.1 (7.1)	36.3 (6.6)	36.3 (7.4)	36.2 (7.5)
Mean %EWL (SD)	24.0 (19.2)	30.7 (22.9)	36.7 (25.9)	45.1 (24.7)	44.3 (28.1)	46.3 (27.8)
Number of patients	330 (81%)	286 (86%)	190 (81%)	109 (63%)	78 (88%)	45 (85%)

SD = standard deviation; BMI = body mass index; %EWL = excess weight loss percentage

Afro-Caribbeans being larger (mean: 131.0kg [SD: 20.0kg, range: 94.7–193.0kg] vs mean: 123.8kg [SD: 20.3kg, range: 61.7–233.4kg], $p=0.015$).

Table 2 shows the outcomes for five years of follow-up by ethnicity while Table 3 shows the overall outcomes for all patients. Although there was no statistical difference in %EWL between Afro-Caribbeans and Caucasians at six months or one, two, three, four or five years following LAGB, there was a trend to suggest Afro-Caribbean females have poorer weight loss outcomes at all endpoints (Table 2 and Fig 1).

South Asian and Caucasians had a similar age (mean: 41.2 years [SD: 12.4 years, range: 21–65 years] vs mean: 43.5 years [SD: 11.7 years, range: 17–71 years], $p=0.352$) and pre-operative BMI (mean: 43.6kg/m² [SD: 6.6kg/m², range: 32.5–59.1kg/m²] vs mean: 45.8kg/m² [SD: 7.1kg/m², range: 24.7–79.8kg/m²], $p=0.08$). At the two, three and four-year stages following LAGB, the %EWL appeared to be greater among the South Asian group. However, the number of South Asian patients compared with the Caucasian group was too small to allow firm conclusions to be drawn.

Discussion

The aim of this study was to compare the weight loss achieved following LAGB in Afro-Caribbean, Caucasian and South Asian females. The current literature suggests Afro-Caribbean patients achieve poorer weight loss outcomes.^{14,15} To our knowledge, there have not been any comparative studies that have included South Asian females.

We present an 11-year experience with performing LAGB among 407 Afro-Caribbean, Caucasian and South Asian females, demonstrating a mean %EWL of 46.3% at 5 years following LAGB for all ethnic groups (Table 3). Recently, in their 10-year single-centre experience in Sunderland, Alhamdani *et al* reported a median %EWL of 40% at 5 years following LAGB among their 575 patients but there was no comment on sex or ethnicity.²⁵

DeMaria *et al* reported 12% EWL and 44% EWL in Afro-Caribbean and Caucasian patients respectively at three years following LAGB ($p<0.05$).¹⁴ Age, sex and preoperative BMIs were not significantly different between groups. The number of Afro-Caribbean to Caucasian patients at three years was small (8 vs 26 respectively).

Parikh *et al* case-matched Afro-Caribbean and Caucasian patients on age, sex and preoperative BMIs, showing significant differences in %EWL at one, two and three years

following LAGB (39% vs 49% at 1 year, 44% vs 55% at 2 years, 41% vs 52% at 3 years respectively; $p<0.05$ for all values).¹⁵ Follow-up rates up to and including three years were not significantly different between Afro-Caribbean and Caucasians ($n=21$ [66%] vs $n=22$ [74%], $p>0.05$).

In 2012 Admiraal *et al* conducted a meta-analysis of five LAGB studies comparing Afro-Caribbean and Caucasian patients (including the studies by DeMaria *et al* and Parikh *et al*).²⁶ The overall absolute mean %EWL difference between Afro-Caribbean and Caucasian patients was -8.46% (95% confidence interval: -12.95–3.97%, $p=0.0002$).

Statistically, our study population included only female patients with comparable mean age and preoperative mean BMIs ($p=0.165$ and $p=0.225$ respectively) from an urban community population. All the patients had National Health Service treatment with a prior comprehensive multidisciplinary assessment. Follow-up rates at three years for Afro-Caribbean and Caucasian patients were similar ($n=20$, 74% and $n=85$, 77%) and comparable with those of Parikh *et al*.¹⁵

Afro-Caribbean females showed inferior weight loss at all follow-up points after LAGB. This was most evident at five years where the difference in %EWL was greatest (mean: 47.6% [SD: 25.5%] vs 37.1% [SD: 36.6%] for Caucasian and Afro-Caribbean patients respectively). Unlike previous studies, however, there was no statistically significant difference between Afro-Caribbean and Caucasian females up to and including five years following LAGB. This is possibly a result of one or more of the following reasons.

First, there were far fewer Afro-Caribbeans than Caucasians investigated in the study. The data included a large number of patients for whom the ethnicity was unknown ($n=135$, 22.7%) with several of them potentially being of Afro-Caribbean origin.

It is also possible that no statistical significance was reached because of the higher proportion of Caucasian patients that had diabetes mellitus preoperatively compared with Afro-Caribbean patients ($p=0.005$). Diabetics have been shown to lose less weight than those without diabetes through diet and medication interventions^{27,28} and following a laparoscopic gastric bypass.²⁹ Diabetic patients undergoing weight loss interventions are thought to have a hypothalamic response that results in an increase in hunger and a decrease in satiety, thereby preventing further weight loss.³⁰

All patients undergo close uniform monitoring from both the surgical and dietetic teams after LAGB, which is reflected in the comparable high five-year follow-up rates (80% and 74% for Afro-Caribbean and Caucasian patients

respectively). The free access to and hard work of the band adjustment service in our cohort may be the most important factor in the absence of significant difference in weight loss between Afro-Caribbean and Caucasian patients.

Nevertheless, a trend does exist that suggests poorer weight loss outcomes in Afro-Caribbean compared with Caucasian female patients. This has significance in the surgical management of Afro-Caribbean female patients before and after their bariatric procedure. During preoperative counselling, Afro-Caribbean patients should be made aware of the comparatively lower weight loss outcomes following LAGB to allow for informed consent. Postoperatively, enhanced follow-up with targeted weight loss outcomes may be required for Afro-Caribbean patients, with greater emphasis placed on dietary modifications of ethnic diets. Closer psychological and behavioural follow-up would also be beneficial.^{8–11}

Besides exercise, dietary and psychosocial factors, genetics has also been suggested as a potential cause for poorer weight loss outcomes in Afro-Caribbean patients.^{8–11} Further research into the impact of genetics on weight loss can allow bariatric services to offer more realistic weight loss targets for their patients.

South Asians appear to have a greater %EWL than Afro-Caribbeans and Caucasians, especially between three and four years following LAGB. This study is of importance because the literature does not include any evidence of weight loss in the South Asian patient subgroup. There is now evidence of greater weight loss among the South Asian population undergoing LAGB and this would form an essential part of informed consent and postoperative outpatient care. However, the number of South Asian patients was too small to allow meaningful conclusions.

Study limitations

Unlike Parikh *et al*,¹⁵ our study did not case-match patients based on their co-morbidities, psychological and socioeconomic status. Case-matching patients may have reduced data variability but it would also have reduced the size of the cohort, which in terms of our Afro-Caribbean and South Asian groups was small to begin with. All patients were female, of similar age and there was no significant difference in preoperative BMI between groups.

The ethnicity of several female patients was unknown. Some did not want to disclose their ethnicity ($n=100$, 16.8%) and for some the information was not available ($n=35$, 5.9%).

Psychosocial (behavioural compliance to diet and exercise) and socioeconomic differences have been suggested as explanations for poor weight loss results in Afro-Caribbeans following both non-operative and operative measures.^{8–12,16–21} Psychosocial and socioeconomic factors were not formally assessed in our study.

During the 11-year study period, different gastric bands were used for our patients: two versions of the LAP-BAND® and two versions of the Swedish Adjustable Gastric Band. Different bands may have impacted on the overall weight loss achieved but the impact would have been across all ethnicities. Furthermore, a meta-analysis of the Swedish Adjustable Gastric Band versus the LAP-BAND® suggests

comparable outcomes between the two, including in terms of %EWL.³¹

Finally, the benefit of bariatric surgery, with regard to mortality, is related to co-morbidity resolution and not just the %EWL achieved. Parikh *et al* showed major resolution in co-morbidities in both Afro-Caribbean and Caucasian groups (61% Caucasians vs 77% African-Americans, $p>0.05$).¹⁵ In a review from 2012, remission of diabetes mellitus was more frequent in Afro-Caribbean than in Caucasian patients following bariatric surgery although this was not statistically significant.²⁵ Our study did not assess resolution in co-morbidities.

Conclusions

Despite the absence of a statistically significant difference, there was a trend for Afro-Caribbean females to lose less weight after LAGB when compared with Caucasian females in our cohort of patients. Realistic weight loss targets must be conveyed to Afro-Caribbean patients during the preoperative counselling stage. Furthermore, bariatric centres may benefit from enhanced follow-up and modified weight loss targeted outcomes among ethnic groups to ensure comparative %EWL progress. South Asians appeared to lose more excess weight at two, three and four years following LAGB but low numbers prevented definitive conclusions. Multi-centre studies with greater power are required to better define any differences between ethnicities in the UK.

Conflicts of interest

Mr James Smellie has stocks in Allergan Inc. The LAP-BAND® gastric band that is used in our institution is manufactured by BioEnterics (Carpentaria, CA, US) for Allergan Inc. The study did not assess and compare different types of gastric bands used in our patient cohort.

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