The various colours of type 2 diabetes: Pathogenesis and epidemiology in different ethnic groups
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Ethnicity influences weight loss 1 year after bariatric surgery: a study in Turkish, Moroccan, South-Asian, African and ethnic Dutch patients

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Background

Obesity and its associated morbidities have become a major public health problem in both developed and developing countries (1). Compared with conventional behavioural and pharmacological therapies, bariatric surgery is the only long-lasting effective treatment for morbidly obese patients (2,3). Studies conducted in the USA have demonstrated that the effectiveness of bariatric surgery differs between ethnic groups (4-7). In a recently performed meta-analysis, we found an 8 percent higher excess weight loss (%EWL) 1 year after bariatric surgery in patients from European origin compared to patients from sub-Saharan African (henceforth African) origin (4). The aetiology of this difference in weight loss is unclear. Biological, psychological, genetic and socioeconomic factors have all been suggested to play a role (8-10).

The vast majority of studies on ethnic differences in outcomes of bariatric surgery have focused on African-Americans and white Americans (5-7). Consequently, little is known about differences in outcomes after bariatric surgery between individuals from other ethnic backgrounds. In Europe, migrants from Turkey and Morocco are among the largest minority groups. In the Netherlands, approximately 2.2% and 2.4% of the total population is Turkish or Moroccan, whereas about 6 percent is from South-Asian or African descent (11). Several studies have shown that these ethnic minority groups living in Western-European countries have higher levels of obesity and related morbidities than the indigenous populations (12-14). Therefore, it would be valuable to know whether differences in outcomes of bariatric surgery also exist between these ethnic groups. The aim of this study was to determine whether there are differences in weight loss 1 year after gastric bypass surgery between ethnic Dutch, African, South-Asian, Turkish and Moroccan patients.

Methods

A retrospective database review was conducted of patients undergoing a primary open or laparoscopic gastric bypass procedure (i.e. no revision procedures) between January 1, 2008 and July 31, 2011 in five specialized high-volume bariatric surgery units in the Netherlands (n=1885). All patients met the 2005 National Institute of Health Consensus requirements for bariatric surgery, which included a BMI>40 kg/m² or a BMI≥35 kg/m² with associated comorbidity (15). All Turkish, Moroccan, African and South-Asian patients that had attended a follow-up visit 10-14 months after surgery and had data available on post-surgical weight loss were included. To avoid center and selection bias, 5 randomly selected ethnic Dutch patients were additionally included for each included subject from the largest ethnic minority group in each hospital. For example, if 5 Turkish, 6 Moroccan, 8 African and 10 South-Asian
patients were included in one hospital, 50 randomly selected ethnic Dutch subjects were also included in that center. The study protocol was approved by the Medical Ethical Committee of the Academic Medical Center.

Data were collected on sex, age, ethnicity, height, weight (at the time of surgery and follow-up) and the number of days between surgery and follow-up. Ethnicity was self-reported and derived from the patients’ medical chart. Excess weight was defined as weight over the ideal body weight calculated according to Metropolitan Life Weight Tables (16). Furthermore, excess BMI was defined as BMI points over 25 kg/m².

Baseline data were expressed as percentages or means and standard deviations (SD). First, differences were determined in baseline characteristics and post-surgical weight related parameters between ethnic Dutch and non-Dutch patients (i.e. all non-Dutch ethnic groups combined) using Chi-squared or independent t-tests. Subsequently, these parameters were compared between ethnic Dutch and the African, South Asian, Turkish and Moroccan groups using Chi-squared or one-way-Anova-tests. If an overall ethnic difference was found between the 5 ethnic groups, post-hoc testing was performed to evaluate differences between two specific ethnic groups. Furthermore, multivariate regression analyses were performed to assess whether ethnic background was associated with BMI change, percentage excess BMI loss (%EBMIL) and %EWL after 1 year.

**Results**

The study population consisted of 48 African, 43 South Asian, 66 Turkish, 22 Moroccan and 404 ethnic Dutch patients (Table 1). The ethnic Dutch were older and had lower baseline BMI’s than the non-Dutch (i.e. all non-Dutch ethnic groups combined). Specifically, Turkish and Moroccan patients were younger than African, South-Asian and ethnic Dutch patients (p<0.05). Baseline BMI was highest in Moroccan patients, followed by Turkish, African, ethnic Dutch and South-Asian patients (Table 1).

One year after gastric bypass (median follow-up time 366 [IQR 358-394] days) the unadjusted BMI change, %EBMIL and %EWL were higher in ethnic Dutch than in non-Dutch (p<0.05, Table 1). Furthermore, ethnic Dutch achieved a %EWL higher than 50% more often than non-Dutch.

When comparing the ethnic Dutch to each ethnic group separately, ethnic Dutch patients generally still showed greater BMI decrease, %EBMIL and %EWL. These weight loss parameters did not differ between African, South-Asian, Turkish and Moroccan patients (Table 1).
Being from ethnic Dutch origin was associated with greater decrease after 1 year in BMI (B = -1.6 [95%CI -2.3, -0.9] kg/m\(^2\) p<0.001), %EBMIL (B = -6.7%, p<0.001) and %EWL (B = -4.3%, p=0.04) when compared to non-Dutch after adjustment for sex, age and baseline BMI. Furthermore, after adjustment for these factors, the ethnic Dutch still achieved a %EWL that was higher than 50% more often than non-Dutch subjects (OR 1.6 [95%CI 1.1, 2.4], p=0.03). Compared to the ethnic Dutch, the adjusted BMI change was least favourable in Moroccan patients (B = 2.3 [0.8, 3.9] kg/m\(^2\), p=0.002 in favour of ethnic Dutch), followed by African (B = 1.8 [0.6, 2.9] kg/m\(^2\), p=0.002), South-Asian (B=1.7 [0.5, 2.9] kg/m\(^2\), p=0.007) and Turkish (B = 1.2 [0.2, 2.2] kg/m\(^2\), p=0.02) patients. No differences were found between non-Dutch ethnic groups. Similar results were obtained when using %EWL and %EBMIL, instead of BMI change, as a marker of post-operative weight loss (data not shown).

**Conclusion**

This study demonstrates that, in terms of weight loss, bariatric surgery was less effective in African, South-Asian, Turkish and Moroccan patients than in ethnic Dutch patients. Our results underscore that ethnic differences in effectiveness of bariatric surgery are not limited to those between patients of European and African origin, but extend to other ethnic groups as well.

The finding of a %EWL of 61.1% in ethnic Dutch and 55.7% in African patients is in line with results of previous studies that have investigated weight loss after gastric bypass surgery in white and African-Americans (4,5,17-19).

The aetiology of differences in post-surgical weight loss between Africans and Europeans is unclear. As mentioned, studies in white and African-American patients have suggested that psychological, genetic, cultural and socioeconomic factors may play a role (6,8-10). For example, white Americans have shown greater improvement in energy-expenditure in response to weight loss than Africans-Americans, suggesting decreased weight loss efficiency among the latter (9,10). Furthermore, in the USA, those of African origin usually have lower socioeconomic backgrounds than white Americans, which is known to be associated with obesity and might also partly explain ethnic differences in post-surgical weight loss (6,9,10). To our knowledge, differences in weight loss after bariatric surgery between patients of European origin and South-Asian, Turkish and Moroccan patients have never been investigated. In this study, observed differences in weight loss between ethnic Dutch patients and other groups remained after adjustment for factors that influence post-surgical weight loss, such as baseline BMI and age (20). A possible explanation for our finding that Turkish, Moroccan, African and South Asian all achieved a lower amount of weight loss than their ethnic Dutch counterparts, might be that there were differences in the efficacy of post-surgical
programs between these ethnic groups. This may for instance be the result of language problems or lack of culturally adapted lifestyle advice. However, as we were not able to obtain uniform, comparable data on cultural factors and the post-surgical care in our studies, this remains speculative. In future prospective studies, socio-economic, cultural and biological factors should be all taken into consideration to properly determine the exact mechanisms behind the ethnic differences in post-surgical weight loss.

Despite ethnic differences in post-surgical weight loss, it should be taken into account that the mean %EWL in all ethnic groups in this study was higher than 50%. Furthermore, the percentage of patients achieving a %EWL of more than 50% was high in all groups as well. Therefore, the results do not imply that effectiveness of bariatric surgery for morbidly obese individuals in general should be questioned, but merely show that different weight loss results may be expected depending on a patients’ ethnic background. This knowledge is useful, as it can help professionals to provide realistic treatment expectations to all patients. Whether the ethnic differences lead to differences in long-term outcomes such as a difference in mortality, should be the focus of further prospective studies.

This study has limitations. As mentioned, because of the retrospective study design and the fact that data were collected in five different hospitals, it was not possible to include uniform, comparable data on socioeconomic status, lifestyle and understanding of the Dutch language in our analyses. Therefore, explanations for the ethnic differences in post-surgical weight loss are difficult to give based on the data of this study. Further prospective studies are needed to determine the mechanisms behind these ethnic disparities.

In conclusion, this study shows that in terms of weight loss, gastric bypass surgery is less effective in African, South-Asian, Turkish and Moroccan patients than in ethnic Dutch patients. The exact reasons for these disparities and their clinical impact warrant further investigation.
Reference List


Table 1. Baseline characteristics and weight change after 1 year stratified by ethnicity.

<table>
<thead>
<tr>
<th></th>
<th>Total (n=588)</th>
<th>Dutch (n=404)</th>
<th>Non-Dutch (n=184)</th>
<th>Dutch (n=404)</th>
<th>African (n=48)</th>
<th>South Asian (n=43)</th>
<th>Turkish (n=66)</th>
<th>Moroccan (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline age (yrs)</td>
<td>42.1 ± 10.4</td>
<td>43.0 ± 10.6</td>
<td>40.3 ± 9.5*</td>
<td>43.0 ± 10.1</td>
<td>43.0 ± 9.3</td>
<td>38.3 ± 9.1</td>
<td>38.2 ± 9.4*</td>
<td></td>
</tr>
<tr>
<td>Baseline BMI (kg/m²)</td>
<td>44.9 ± 5.5</td>
<td>44.5 ± 5.2</td>
<td>45.7 ± 6.2*</td>
<td>44.5 ± 5.2</td>
<td>44.4 ± 6.9</td>
<td>46.1 ± 5.2</td>
<td>47.9 ± 6.7*</td>
<td></td>
</tr>
<tr>
<td>Baseline weight (kg)</td>
<td>129.2 ± 20.9</td>
<td>132.0 ± 19.9</td>
<td>123.1 ± 21.9*</td>
<td>132.0 ± 19.9</td>
<td>124.1 ± 19.5</td>
<td>117.6 ± 25.3</td>
<td>130.1 ± 26.3</td>
<td></td>
</tr>
<tr>
<td>BMI change after 1 year (kg/m²)</td>
<td>-13.2 ± 4.2</td>
<td>-13.5 ± 4.4</td>
<td>-12.6 ± 3.7*</td>
<td>-13.5 ± 4.4</td>
<td>-11.9 ± 3.5</td>
<td>-13.2 ± 3.8</td>
<td>-12.9 ± 4.0*</td>
<td></td>
</tr>
<tr>
<td>%EBMIL after 1 year⁵</td>
<td>68.3 ± 20.8</td>
<td>70.6 ± 20.8</td>
<td>63.4 ± 19.8*</td>
<td>70.6 ± 20.8</td>
<td>64.6 ± 19.7</td>
<td>65.0 ± 20.1</td>
<td>58.5 ± 18.6*</td>
<td></td>
</tr>
<tr>
<td>%EWL after 1 year⁶</td>
<td>59.9 ± 18.2</td>
<td>61.3 ± 18.2</td>
<td>56.9 ± 17.7*</td>
<td>61.3 ± 18.2</td>
<td>58.2 ± 18.3</td>
<td>58.3 ± 17.7</td>
<td>53.7 ± 16.7*</td>
<td></td>
</tr>
<tr>
<td>%EWL &gt; 50% after 1 year</td>
<td>418 (70.9)</td>
<td>298 (73.7)</td>
<td>120 (65.2)*</td>
<td>298 (73.7)</td>
<td>31 (64.6)</td>
<td>31 (72.1)</td>
<td>45 (68.2)</td>
<td></td>
</tr>
</tbody>
</table>

%EWL= percentage excess weight loss; %EBMIL= percentage excess BMI loss
Data are presented in means ± standard deviations or as n (percentage)

⁵p<0.05 for independent t-test / One-Way ANOVA test for overall differences between the ethnic groups

⁶Excess BMI was defined as measured BMI - 25kg/m²

Excess weight was defined as measured weight minus ideal weight (as calculated using a formula corresponding with the 1983 Metropolitan insurance height and weight tables)