The Royal College of Surgeons of England

ORTHOPAEDICS

Ann R Coll Surg Engl 2010; **92**: 23–26
doi 10.1308/003588410X12518836438967

Obesity and recovery from low back pain: a prospective study to investigate the effect of body mass index on recovery from low back pain

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ABSTRACT

INTRODUCTION We describe a prospective cohort study to investigate any association between recovery from low back pain and body mass index (BMI) in patients with low back pain undergoing physiotherapy.

PATIENTS AND METHODS A total of 140 patients with low back pain and no evidence of neurological deficit were divided into three groups based on their BMI. All patients underwent a back-specific physiotherapy programme for 6 or 12 weeks. Recovery parameters such as pain intensity (visual analogue scale scores) and physical impairment index scores were measured. The range of motion of the lumber spine was also recorded. These variables were compared pre- and post-treatment.

RESULTS Mean age of the patients was 38 years (range, 18–67 years) with 62% males and 38% females. The treatment resulted in significant improvements in all the recovery parameters ($P < 0.005$, paired *t*-test). No significant association was detected between the BMI of subjects and percentage changes in pain intensity, physical impairment index, and range of motion of the lumbar spine. A comparative analysis of the after treatment recovery parameter scores in normal (BMI ≤ 24.9 kg/m^2), overweight (BMI 25–29.9 kg/m^2) and obese (BMI ≥ 30 kg/m^2) patients revealed no significant differences in the mean pain intensity and mean self-experienced impairment and disability scores amongst the groups.

CONCLUSIONS This study demonstrates that BMI does not influence the overall recovery from low back pain in patients undergoing physiotherapy treatment.

KEYWORDS

Low back pain – Body mass index – Physiotherapy – Recovery

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Low back pain is a common problem affecting 70% of the population of the developed countries at some point in their life.[1] It places a considerable burden on primary and secondary healthcare services in the UK, costing the NHS in excess of £500 million each year.[2]

The aetiology of low back pain is not well understood.[3,4] Some of the well-known risk factors for low back pain include occupational factors, postural and heavy manual work,[5–7] tall stature,[8] smoking,[5,6,9] and psychological factors such as depression.[10] An increased risk of back pain has also been reported in relation to obesity.[5,6,9,11,12] Some studies suggest a positive linear trend between back pain risk and adiposity,[5,9] while others show that the risk is confined to those at the extreme of the body mass index (BMI) distribution (upper fifth of obesity).[11] Several hypotheses have been proposed to explain a link between obesity and low back pain. Excessive wear and tear through increased mechanical demands,[9,13–15] and metabolic factors associated with obesity[13] have been thought to be responsible for low back pain in the obese.

There are a large number of studies[5,6,9,11,12,16] investigating the influence of obesity on the prevalence and causation of low back pain. A small number of studies[17,18] have looked at the effect of surgical weight reduction in morbidly obese patients with low back pain. In this prospective cohort study, we determined the association between BMI and recovery from low back pain in patients undergoing a structured physiotherapy programme.

Patients and Methods

The study sample consisted of 149 consecutive patients with low back pain who presented to a specialised physiotherapy clinic. Nine patients were lost to follow-up and were not included in the study. A total of 140 patients underwent a back-specific structured physiotherapy programme in which their pain intensity (visual analogue scale scores 0–100), physical impairment index (using a validated self-experienced impairment and disability questionnaire, Documentation Based Care; DBC™, Finland) and range of motion of the lumbar spine (using a standard measurement machine) were recorded at the beginning and end of the programme. Specially trained physiotherapists were responsible for the interviews, measurements and treatments. Of the study cohort, 111 patients received bi-weekly treatment for 6 weeks and the remaining 29 patients for 12 weeks. The decision regarding 6 weeks or 12 weeks was made based on severity of symptoms on initial assessment using DBC™, Finland protocols.

Exclusion criteria for the physiotherapy programme were:

1. Spinal cord compression.
2. Current nerve root entrapment with intolerable pain.
3. Active spinal infection or malignancy.
4. Recent spinal trauma.
5. Severe spinal instability indicative of stabilisation surgery.
6. Severe osteoporosis.
7. Severe systemic diseases.
8. Severe psychological disturbance/psychiatric disease.

The body weight (to the accuracy of 0.1 kg) and the height (to the accuracy of 0.1 cm) of the patients were measured in light sports wear with no shoes. The BMI was calculated prior to treatment using the standard method (kg/m²). The patients were classified into three groups according to their BMI: ≤ 24.9 kg/m² (normal weight); 25–29.9 kg/m² (overweight) and ≥ 30 kg/m² (obese). No diet modifications were recommended for any groups.

Recovery parameters were defined as pain intensity and physical impairment index scores. Range of motion of the lumber spine (flexion, extension, lateral flexion, and rotation) was also recorded. These variables were compared pre- and post-treatment.

Table 1 **The effect of the structured physiotherapy programme on the recovery parameter scores in each of the BMI groups**

Recovery parameter	Before treatment score	After treatment score	Mean improvement in score	95% CI of the mean improvement	*P*-value
Group 1 (BMI ≤ 24.9 kg/m²; males, 46%; mean age 36.1 years, SD 10.8)					
Pain intensity	53.25 (3.03)	31.18 (2.88)	–22.07	–28.39 to –15.76	< 0.0005
Physical impairment index	13.75 (0.76)	9.28 (0.75)	–4.46 (0.82)	–6.11 to –2.82	< 0.0005
Flexion	34.34 (1.11)	42.45 (1.12)	8.10 (1.14)	5.83 to 10.38	< 0.0005
Extension	15.61 (0.47)	18.16 (0.59)	2.55 (0.60)	1.36 to 3.75	< 0.0005
Lateral flexion	75.79 (1.79)	88.82 (1.85)	13.03 (1.24)	10.56 to 15.50	< 0.0005
Rotation	61.30 (1.67)	84.50 (2.23)	23.19 (1.89)	19.41 to 26.97	< 0.0005
Group 2 (BMI 25–29.9 kg/m²; males, 75%; mean age, 38.8 years, SD 9.9)					
Pain intensity	57.02 (3.83)	34.32 (3.53)	–22.70 (4.54)	–31.87 to –13.54	< 0.0005
Physical impairment index	14.55 (0.91)	10.30 (1.02)	–4.25 (0.89)	– 6.04 to –2.47	< 0.0005
Flexion	30.39 (1.47)	39.55 (1.23)	9.16 (1.38)	6.37 to 11.95	< 0.0005
Extension	15.07 (0.93)	18.49 (0.71)	3.42 (0.69)	2.02 to 4.81	< 0.0005
Lateral flexion	71.95 (3.18)	87.95 (2.35)	16.00 (2.38)	11.20 to 20.80	< 0.0005
Rotation	60.52 (2.61)	85.16 (2.71)	24.64 (2.64)	19.31 to 29.97	< 0.0005
Group 3 (BMI ≥ 30 kg/m², males, 72%; mean age, 40.5 years, SD 11.2)					
Pain intensity	64.41 (4.55)	38.24 (4.67)	–26.17 (5.40)	–37.23 to –15.18	< 0.0005
Physical impairment index	16.45 (1.23)	13.21 (1.32)	–3.24 (1.05)	–5.40 to –1.08	0.005
Flexion	26.66 (1.47)	33.93 (1.36)	7.28 (1.50)	4.20 to 10.35	< 0.0005
Extension	15.00 (0.88)	19.21 (0.81)	4.21 (0.70)	2.78 to 5.64	< 0.0005
Lateral flexion	66.21 (3.13)	80.86 (2.73)	14.66 (2.19)	10.17 to 19.14	< 0.0005
Rotation	56.52 (3.38)	82.52 (3.20)	26.00 (2.54)	20.79 to 31.21	< 0.0005

The pre- and post-treatment recovery parameter score values are mean values (SEM). In the paired *t*-tests, the differences in the same patient pre- and post-treatment recovery parameter scores are also presented as mean values (SEM) with 95% confidence intervals (CI).

Statistical analysis

The data were analysed with the SPSS (v.11.5) statistical software package. Longitudinal changes in recovery parameter scores were compared in each of the three BMI groups with paired *t*-tests, for fairly normally distributed variables, in order to assess the efficacy of the treatment. Scatterplots and Spearman's rank correlation coefficients (r_s) were used to examine possible associations (not necessarily linear) between BMI and percentage changes in the recovery parameters. It was felt that analysing percentage change alone did not take into account the fact that patients with low pain intensity and self-experienced impairment and disability scores at baseline may be less likely to achieve percentage changes as great as those with high baseline scores (*vice versa* with range of motion of the lumber spine). Near normality of the data and homogeneity of variance (using Levene's test) allowed a further analysis to be undertaken to assess whether post-treatment recovery parameter scores differed amongst the three BMI groups. This was performed using analysis of co-variance (ANCOVA), which controlled for demographic differences in the groups, and adjusted each patient's after-treatment score for his or her baseline score. All tests were two-sided, and the level of significance was set at 0.05.

Results

There were 87 males and 53 females. The mean age was 38 years (range, 18–67 years). There were 67 patients in group 1 (BMI ≤ 24.9 kg/m^2), 44 in group 2 (BMI 25–29.9 kg/m^2) and 29 in group 3 (BMI ≥ 30 kg/m^2). Following treatment, 115 (82%) patients had a reduction in their pain intensity scores and 105 (75%) patients improved with respect to their physical impairment index scores. The range of motion of the lumbar spine increased in all patients.

The treatment resulted in a statistically significant improvement in pain intensity, physical impairment index and the range of motion of the lumber spine in all the BMI groups when comparing pre- and post-treatment scores (Table 1).

No significant association was detected between the BMI of patients and percentage changes in pain intensity (r_s = 0.093, P=0.276), and physical impairment index (r_s = 0.069; P = 0.416). There was no significant correlation between BMI and percentage changes in flexion (r_s = 0.099; P = 0.246), extension (r_s = 0.037; P = 0.664), lateral flexion (r_s = 0.158; P = 0.062) and rotation (r_s = 0.150; P = 0.084) of the lumbar spine.

Analysis of covariance (with baseline recovery parameter scores, age and sex as co-variates) showed that the groups did not differ significantly in pain intensity ($F_{2,137}$ = 0.588; P = 0.557), physical impairment index ($F_{2,137}$ = 1.477; P = 0.232), extension ($F_{2,137}$ = 1.063; P = 0.348), lateral flexion ($F_{2,137}$ = 0.774; P = 0.463) or rotation ($F_{2,137}$ = 0.004; P = 0.996) scores after treatment. However, the after-treatment flexion scores were significantly different ($F_{2,137}$ = 4.085; P = 0.019) in the groups. Group 1 had significantly higher after treatment flexion scores than group 3 (P = 0.016), but no significant differences were detected in the scores between group 1 and group 2, or between groups 2 and 3.

Discussion

Low back pain remains a source of both direct as well as indirect economic burden on the healthcare system. A variety of risk factors such as high body weight, smoking, bad posture, heavy manual work and other psychological and occupational factors have been implicated.

In a systemic review of epidemiological literature, Leboeuf-Yde[19] reviewed 56 original research reports for the frequency of a positive association between body weight and low back pain. Thirty-two percent of all studies reported a statistically significant positive association between body weight and low back pain. The author concluded that body weight should be considered as a possible weak risk indicator and not as a true cause of low back pain.

Mortimer *et al.*[20] examined the influence of increased body weight on low back pain in men and women. Higher incidence of low back pain was reported for men with high body weight, but not for women. They also suggested that smoking did not influence the risk of low back pain.

In the past, obesity has been labelled as a marker[21] or confounder[9,13] for some other true causative factor of low back pain. In a recent study, however, Webb *et al.*[16] found a significant and independent association between obesity and back pain. They concluded that BMI is an important independent predictor of back pain and its severity.

Our results show that there is no correlation between BMI and recovery parameters such as change in pain intensity, physical impairment index and range of motion of the lumbar spine in patients undergoing physiotherapy for low back pain. On further statistical analysis, there was no difference in the three BMI groups with respect to their pain intensity, physical impairment index scores, extension, lateral flexion and rotation after treatment. However, group 1 (normal) had a greater improvement in flexion compared with group 3 (obese), but there was no difference between group 1 (normal) and group 2 (overweight) or groups 2 and 3. Although this may be an interesting observation, offering a suitable explanation for this finding may be difficult; in view of no differences amongst the three BMI groups and other recovery parameters, it may not have any clinical significance.

One of the limitations of the study is that it does not assess the effect of BMI on recovery from low back pain in patients with a specific low back spinal pathology (*e.g.* lumbar disc herniation). In addition, the effect of BMI on other modalities of treatment of low back pain is not assessed.

Conclusions

Although a BMI within normal range is desirable for the prevention of many health conditions including low back pain, it does not influence the overall recovery in patients undergoing physiotherapy treatment. Based on the findings of this study, a prospective randomised, controlled trial is suggested to investigate further any association between BMI and recovery from low back pain. It would also be interesting to assess the influence of BMI on other modalities of treatment of low back pain.

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