

THE AETIOLOGY OF OVERACTIVE BLADDER IN WOMEN: EVALUATION OF DIET AND LIFESTYLE FACTORS RELATED TO DIABETES AND OBESITY

Hypothesis / aims of study

Comorbidity studies suggest that the onset of urge incontinence is predicted by obesity (1) which is associated with specific morbid conditions including diabetes (2). Further, ischaemic and neurogenic pathophysiological processes have been suggested for related detrusor overactivity. The aim of this study was to develop and test a causal model for overactive bladder syndrome (OAB) that involves diet and lifestyle factors associated with diabetes and obesity. We describe the results of a literature review and the development of an evidence-based causal model using graphical modelling techniques. The study involved secondary analysis of a large scale epidemiological database using innovative statistical modelling software.

Study design, materials and methods

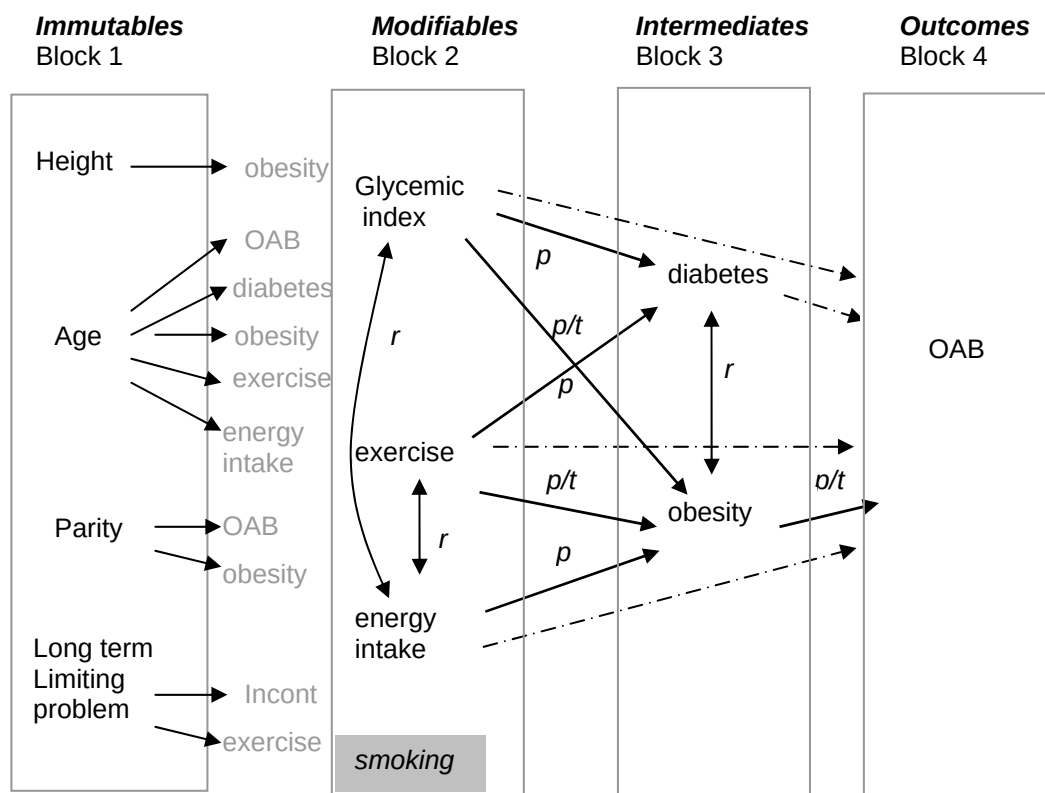
A literature review was used to identify existing evidence for associations between diet/lifestyle and other factors related to diabetes and OAB. The level of evidence required was at least three prospective studies or trials for predictive relationships and at least three associative studies for correlated relationships. On this basis a model was defined as the likely causal sequence of events leading to OAB as the main outcome (Fig). On the basis of these 'established' connections (solid lines) we hypothesised 'new' connections (dashed lines) between diet/lifestyle factors and OAB.

Testing of the causal model utilised a prospective cohort study which included 7000+ women aged 40 and over. Reported information on diet, lifestyle and co-morbidities was collected using validated measures, including the EPIC food frequency questionnaire (3). Information in relation to urinary storage symptoms was collected at baseline and at three annual data collections. Analysis of epidemiological databases such as this for hypothesised causes and mechanisms is complex because of the way that the variables inter-relate. Graphical modelling is a technique for understanding these inter-relationships and helps to avoid the misinterpretation of indirect associations as causal relationships (<http://www.hypergraph.dk>.) In conventional logistic regression, the explanatory variables are handled as separate predictors of a single outcome. In contrast, graphical modelling using MIM software looks to explain the relationships between all of the variables simultaneously. A new development in this method is Block-Recursive modelling which arranges related factors in blocks according to the likely causal sequence of events. In our model the first block includes immutable factors for older women (e.g. age, parity), then the second block includes modifiable factors (e.g. diet and lifestyle), the third block includes intermediate factors (e.g. morbidities), and finally the fourth block includes the outcome (e.g. OAB). The original study had a power to detect a 1.5 fold difference with > 80% power at a 5% level of significance for an exposure with 4% prevalence

Results

The results of the literature review showed that energy intake was correlated with exercise and Glycaemic Index (GI), and diabetes with obesity. Predictive relationships established in the literature were: obesity for OAB; Glycaemic Index (GI), exercise and energy for obesity; and GI and exercise for diabetes. On this basis (GI), exercise and energy intake were included in the model for OAB as modifiable factors; diabetes and obesity were included as intermediate morbid factors; and height, age, parity and long term limiting problems were included as immutable factors for this age group (see fig).

Preliminary analysis of the model was undertaken using all variables; for this analysis, glycaemic index was represented by fizzy drinks. Smoking was included as a potential modifiable confounder. The model of best fit generated showed the following associations between modifiable or intermediate and OAB outcome: physical activity -> OAB ($p < 0.0001$); fizzy drinks --> OAB ($p < 0.0001$); smoking --> OAB ($p < 0.0001$); obesity --> OAB ($p < 0.0001$); diabetes --> OAB ($p = 0.0050$). Other associations were: physical activity --> obesity ($p = 0.0408$); physical activity --> diabetes ($p = 0.1325$); fizzy drinks --> diabetes ($p = 0.0132$); fizzy drinks --> obesity ($p = 0.4040$); smoking --> diabetes ($p = 0.2209$); smoking --> obesity ($p = 0.9912$). Other significant associations between immutable factors and OAB in the model were: parity --> OAB ($p = 0.0003$); limiting long-term problem --> OAB ($p < 0.0001$). Age and height (socio-economic indicator) were not significantly associated with OAB in the model.



hypothesised causal

model for OAB relating to diabetes, including diet and lifestyle factors.

Concluding message

Substantial evidence exists in the literature to support the established connections in the proposed causal model for OAB via diabetes. The pattern of connections provides a framework within which to hypothesise new relationships between diet/lifestyle factors and OAB. The model demonstrates the possible complexity of the relationships between the factors represented in it and the need for full consideration of potential confounders within a logical framework in order to avoid misinterpretation of causation.

1. International Consultation on Incontinence. 3rd ed: Health Publications Ltd; 2005. p. 255-312.
2. Obstetrics and Gynecology 1999;94(1):66-70.
3. BJU International. 2003.Vol. 92(1)(pp 69-77).

FUNDING: BUPA Foundation

DISCLOSURES: NONE

HUMAN SUBJECTS: This study was approved by the Leicester medical research ethics and followed the Declaration of Helsinki Informed consent was obtained from the patients.