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Is there an association between aspects of the metabolic syndrome and overactive bladder? A prospective cohort study in women with lower urinary tract symptoms

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ABSTRACT

Objective: The aim of our study was to determine whether there is a link between aspects of the metabolic syndrome (MetS) and overactive bladder (OAB) in women with lower urinary tract symptoms (LUTS).
Study design: A single-centre prospective study. We evaluated a cohort of consecutive women with LUTS attending a tertiary referral urodynamic clinic from October 2012 to January 2015. Obesity, diabetes, hypertension and dyslipidaemia were used as markers of MetS. OAB and detrusor overactivity (DO) were defined according to the International Urogynaecological Association/International Continence Society terminology.
Results: Eight hundred and forty women were enrolled. Three hundred and eight (36.6%) had normal weight, 260 (31%) were overweight and 272 (32.4%) obese. We identified 168 women (20%) with hypertension, 64 (7.6%) with diabetes mellitus, and 98 (11.7%) with dyslipidaemia. Seven hundred and four (83.8%) women were diagnosed symptomatically with OAB and 305 (36.3%) were diagnosed urodynamically with DO. Obesity ($p < 0.001$) was the only independent predictor for OAB (OR 1.09, 95% CI 1.05–1.13) and DO (OR 1.06, 95% CI 1.03–1.08), respectively.
Conclusion: Our study demonstrates a correlation between obesity and OAB/DO in female patients. However, other components of MetS do not appear to be associated with either OAB and DO. Weight reduction should be strongly recommended in women with OAB.

Introduction

Overactive bladder (OAB) is a highly prevalent symptom complex that is estimated to affect 12.8% of women and 10.8% of men [1]. It is associated with a significant impairment of health-related quality of life and, subsequently, with a substantial economic burden [2]. The International Urogynaecological Association (IUGA) and International Continence Society (ICS) defined OAB as urinary urgency, usually accompanied by frequency and nocturia, with or without urgency urinary incontinence, in the absence of urinary tract infection or other obvious pathology [3]. OAB has usually been linked to the urodynamic observation of detrusor overactivity (DO), which is the occurrence of involuntary detrusor contractions during filling cystometry. However, DO is demonstrated in only 44% of women and 69% of men with OAB [4]. The underlying pathophysiological mechanism of OAB and DO is poorly understood. It is thought that, not only the detrusor muscle, but also urothelium, peripheral afferent terminals and pelvic blood vessels may play a role.

Since the last decade, authors have looked into a causal relationship between markers of the metabolic syndrome (MetS) and lower urinary tract symptoms (LUTS) [5]. MetS represents a cluster of cardiovascular disease (CVD) risk factors including obesity, dyslipidaemia, hypertension and glucose intolerance. Its rapidly increasing prevalence has recently been reported as 33% in the United States [6]. However, comparisons between populations are challenging as numerous attempts have been made to define MetS and a conclusive agreement has not yet been received [7].

Several urological conditions, such as benign prostatic hyperplasia, nephrolithiasis, erectile dysfunction and OAB have been associated with different aspects of the MetS [8]. A number of mechanisms may be involved, mainly secondary to insulin-resistance and the subsequent production of chronic pelvic ischemia. However, while there is increasing evidence of a link

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between components of the MetS and OAB in men, limited data are available with regard to women [9,10]. Moreover, although it has been acknowledged that patients with DO experience more severe OAB symptoms [11], urodynamic findings have not been considered in the existing literature. A more comprehensive assessment of LUTS with urodynamics might give new insights.

The aims of this study were to determine whether there is a link between different aspects of the MetS and OAB/DO in women with LUTS.

Materials and methods

We prospectively studied a cohort of consecutive women with LUTS attending a urodynamic clinic in a tertiary referral urogynaecology department between October 2012 and January 2015. Formal ethical approval was obtained by the local Research Ethics Committees (12/SC/0012). We included women complaining of any LUTS [storage, urinary incontinence (UI), sensory, voiding and post-micturition symptoms]. Patients with at least one of the following characteristics were excluded: age <18 years old, neurological condition affecting bladder function (such as dementia, stroke, multiple sclerosis, spinal cord injury and Parkinsons's disease), urine dipstick positive for nitrites and inability to fill out a questionnaire in the English language.

All women were asked to complete the validated King's Health Questionnaire [12] and a 3-day frequency-volume chart, including the Patient's Perception of Intensity of Urgency Scale (PPIUS) [13]. Antimuscarinic medications and mirabegron were stopped 7 days prior to attendance in the clinic, where a detailed history was taken. Obesity, diabetes, hypertension and dyslipidaemia were considered as markers of MetS. Anthropometric measurements were calculated, including weight, height and body mass index (BMI) (weight [kg]/height [m]^2). Normal weight, overweight or obesity were defined as BMI 25 or less, between 26 and 30, or more than 30, respectively. Information regarding diabetes, hypertension and dyslipidaemia were collected from hospital records and patients were considered affected if already on relevant medical treatment.

Patients were asked to attend with a reasonably full bladder in order to obtain a uroflow study. A dipstick test to exclude urinary infection was performed. Examination findings were described using the pelvic organ prolapse quantification (POPQ) system during maximal Valsalva [14]. A Laborie Aquarius Triton machine was used to perform multichannel urodynamics by trained nurse specialists and trainees in urogynaecology in keeping with Good Urodynamic Practice [15].

Standard subtracted cystometry was performed with the patient in the supine position at a filling rate of 100 mL/min with physiological saline at room temperature. When DO did not occur, and following removal of the filling catheter, patients were instructed to perform provocative tasks (moving to the standing position, coughing, listening to running water and washing hands) and, finally, they were asked to void to completion.

Data were collected using a standardised proforma. Descriptive statistics were calculated for demographic information and clinical features. Several factors, including age, parity, menopausal status and markers for MetS (BMI, hypertension, diabetes mellitus and dyslipidaemia) were considered. These have been combined with both urinary symptoms and urodynamic diagnosis. Bivariate and multivariate logistic regression analyses were performed with associations presented as odds ratios (ORs) with 95% confidence intervals (95% CIs). When statistical significance, defined with a *p*-value of <0.05, was achieved in univariate analysis, covariates were entered into the multivariate model. SPSS (V22, Chicago, IL, USA) was used for statistical analysis.

Results

Eight hundred and forty women were enrolled in the study. The mean age was 50.6 years (SD: 14.4) and the median parity was 2 (range 0–7). Four hundred and eighteen (49.8%) were postmenopausal. Three hundred and eight (36.6%) had normal weight, 260 (31%) were overweight and 272 (32.4%) obese. Table 1 shows the characteristics of the study group. We identified 168 women (20%) with hypertension, 64 (7.6%) with diabetes mellitus, and 98 (11.7%) with dyslipidaemia. Seven hundred and four (83.8%) women were diagnosed symptomatically with OAB, in particular 574 (68.3%) with "wet" OAB and 130 (15.4%) with "dry" OAB. Three hundred and five (36.3%) were diagnosed urodynamically with DO. Out of the 704 women with OAB, 282 (40%) were found to have DO. On the other hand, out of 305 patients with DO, 282 (92.4%) were reporting OAB symptoms. Fig. 1 displays the study's flowchart.

Tables 2 and 3 report associations with outcomes OAB and DO, respectively. With regard to OAB, age ($p = 0.012$) and BMI ($p < 0.001$) were found to be significant at univariate analyses, but only BMI (OR 1.09, 95% CI 1.05–1.13, $p < 0.001$) maintained significance at multivariate analysis. When the outcome DO was considered, univariate analyses revealed significance for multiple factors, such as parity ($p < 0.001$), BMI ($p < 0.001$), hypertension ($p = 0.003$) and diabetes mellitus ($p = 0.004$). However, BMI (OR 1.06, 95% CI 1.03–1.08, $p < 0.001$) was still the only independent predictor at multivariate analysis. No associations were found for menopausal status and dyslipidaemia with either outcome.

Discussion

In this study we evaluated associations between different aspects of the MetS with both OAB and DO in a cohort of women with LUTS. Unlike dyslipidaemia, hypertension and diabetes, obesity was a statistically significant risk factor for OAB and DO. To our knowledge, this is the first study considering DO, an

Table 1
Baseline characteristics of the study population (n = 840).

Age, years, mean (SD)	50.6 (14.4)
Parity, median (range)	2 (0–7)
BMI, kg/m^2, n (%)	
<25	308 (36.6)
25–29.9	260 (31)
≥30	272 (32.4)
Menopausal, n(%)	418 (49.7)
Previous surgical procedures, n (%)	
Hysterectomy	186 (22.1)
Pelvic Floor Repair	89 (10.6)
Urinary Incontinence	85 (10.1)
King's Health Questionnaire, median (range)	
General Health Perception	25 (0–100)
Incontinence Impact	66 (0–100)
Role Limitations	50 (0–100)
Social Limitations	50 (0–100)
Physical Limitations	22 (0–100)
Personal Relationships	33 (0–100)
Emotions	44 (0–100)
Sleep/Energy	50 (0–100)
Severity/Coping Measures	50 (0–100)
Bladder diary, median (range)	
Daily urgency episodes	3 (0–14)
Daytime voids	8 (4–24)
Nighttime voids	1 (0–7)
Maximum functional capacity, mls	400 (90–1300)