Original Article

Should we consider obesity a risk factor for pelvic organ prolapse?

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Abstract. Objective: Obesity is a growing worldwide epidemic, with increasing prevalence in both children and adults. Although several publications and books describe obesity as a major risk factor of pelvic organ prolapse (POP), we assumed that obesity might not be a predisposing factor of symptomatic stage II or higher POP. *Methods:* In a prospective cohort study, 1911 women suffering from symptomatic POP were included. Their data was compared to 1995 age, and parity matching women, with no prolapse as control, from January 2009 to December 2016. Obesity was determined by calculating the body mass index (BMI). Detailed medical history and standard demographic data were revealed, and analysed using multivariate analysis. *Results*: The average age was 56 years ± 13 SD (min: 22, max: 89), and the mean parity was 2.04 ± 0.95 SD per patient (min: 0, max: 13). The study population had average weight and height, resulting in a mean BMI of 26.69 ± 4.45 kg/m^2 compared to the control group BMI 26.85 ± 5.56 kg/m^2. Two third (66.6 %) of the study population were in postmenopause with an average BMI of 27.14 ± 4.31 kg/m^2, while in premenopausal patients (33.4%) the BMI was found to be 25.78 ± 4.60 kg/m^2 respectively (p = 0.042). Multivariate analysis revealed no statistical significant difference between POP and control groups (p = 0.146). *Conclusion:* We emphasize that in our homogenous Caucasian Eastern-European population obesity might not act as a strong risk factor for symptomatic pelvic organ prolapse stage 2 or higher.

Keywords: Pelvic organ prolapse; Obesity; Risk factor.

INTRODUCTION

Pelvic organ prolapse (POP) is a condition of specific signs and symptoms that lead to impairment of normal function and diminished quality of life[1]. Almost all the experts of pelvic floor dysfunctions agree that the etiology of the disease is multifactorial and develops gradually over the years. Among the several risk factors of the disease, obesity provoked chronically increased intraabdominal pressure has been repetitively mentioned as one of the major risk factors of POP[2,3].

Obesity is a growing epidemic worldwide, with increasing prevalence in both children and adults[4]. The American Medical Association classifies obesity as a disease[5], which the World Health Organization considers to be the greatest public health issue of the 21st century[6]. More than half (65%) of the US population is overweight (25 > body mass index [BMI] < 30 kg/m^2), and the prevalence of obesity (BMI > 30 kg/m^2) is 34.9%[4,7]. Among adults in the European Union, these percentages are 50% and 10-30%, respectively. According to a recent survey among adults in Hungary, 30% of women and 26.7% of men were obese[8].

Although our study group acknowledge that increased abdominal pressure is considered to be a risk factor for POP, and also knowing that the relative importance, of each risk factor is not clearly established in the pathomechanism of the disease, our aim was to challenge obesity as a predisposing factor for symptomatic stage II or higher POP.

MATERIALS AND METHODS

Study population and data collection

Patients and study design

This prospective study was carried out at the University of Pecs Clinical Center, Pecs, Hungary, between 1 January 2009 and 31 December 2016, under the approval of the University of Pecs Institutional Ethical Review Board. Written informed consent was obtained from all enrolled patients. Women suffering from symptomatic POP (n=1911) were included. All women included in the study suffered from stage 2 POP or higher of either the anterior, middle or posterior compartment, or in combinations. All patients reported sensation of a bulge in the vagina with or without symptoms of urinary, bowel, or sexual dysfunction. Control subjects (n=1995) were matched with POP subjects by age, ethnicity and parity, and who were also hospitalized at our department for benign gynecological diseases such as uterine fibroids, abnormal bleeding, endometriosis, benign adnexal masses, or infertility, and were not pregnant, and had no malignant disease at the same timeframe. All the control patients were examined for the presence of prolapse. The following data were collected: basic demographics, maternal parity, age, height and weight, way of delivery, previous anti-POP operations, and the presence of urinary incontinence. The study population was further divided into two subgroups, based on the menopausal status. The postmenopausal group (n =1271) comprised women who had no regular menstrual cycle for at least 12 months. The premenopausal group (n = 640) comprised healthy fertile women who had regular menstrual cycles.

Diagnosis and classification of POP

All women were examined according to the International Urogynecological Association (IUGA) guidelines, and all terminology currently used refers to the recommendations of the International Continence Society (ICS). The level of altered pelvic anatomy was assessed by using the pelvic organ quantification system (POP-Q)[9]. All examinations were carried when patients were positioned in standard lithotomy position. Physicians were utilizing anterior and posterior vaginal retractors, while patients performed Valsalva manoeuvres, in order to reveal the predominant compartment of prolapse. The therapy offered was either conservative treatment with pessary or pelvic reconstructive surgery.

Determination of obesity

The level of obesity was based on the determination of the BMI, which was calculated as the woman's weight (in

kg) divided by the square of their height (in m^2) and was categorized as obese (BMI ≥ 30 kg/m^2), overweight (25 kg/m^2 < BMI < 30 kg/m^2), or normal weight (BMI < 25 kg/m^2).

Statistical analysis

Statistical analyses were performed by using IBM SPSS Statistic 20 (IBM Corporation, Armonk, NY, USA) at the University of Pecs, Institute of Bioanalysis. The sample size (n) was 3.906. Continuous measurements are summarized and presented as averages and standard deviation (SD). To determine the predictive factors for POP, multivariate analysis, ordinal logistic regression was used. For the analysis of the differences in the examined factors between the POP and control groups, and for the comparison of the POP pre- and postmenopausal groups, independent sample Student t-test was performed. Statistical significance was set at $p < 0.05$.

RESULTS

Demographic data

Seven hundred and eighty seven patients received conservative treatment for symptomatic POP, and insertion of vaginal pessaries, while altogether 1124 patients were subject of reconstructive pelvic organ surgery surgeries. The medical history revealed that the study population underwent previously 220 abdominal, and 229 vaginal hysterectomies, 843 anterior and 801 posterior vaginal wall repair, 51 laparoscopic ventrofixation, 17 Manchester-Fothergill operations, 59 sacrocolpopexy, and 7 vaginal Mesh implantations. The average age in the study group was 56.13 years ± 13.19 SEM (min: 22, max: 89), respectively the mean age was 50.19 years ± 8.78 SEM (min: 35, max: 70) in the control group. Those who developed POP had a mean parity 2.02 ± 0.95 SEM per patient (min: 0, max: 13), and did not vary significantly from the controls (1.98 ± 0.91 SEM per patient), although the rate of spontaneous vaginal and cesarean delivery significantly altered between the POP (spontaneous vaginal 99.6 %, cesarean 0.4%) and the control groups (spontaneous vaginal 69%, cesarean 31%, p< 0.01). Demographic data of POP and control patients are summarized in Table 1.

TABLE 1. Demographic characteristics of the POP and the control patients.

Demographic characteristic	POP group	Control group	p[a]
Age (years)	56.13 ± 13.19	50.19 ± 8.78	<0.0001
Height (cm)	163.65 ± 6.33	164.59 ± 6.42	<0.0001
Weight (kg)	70.75 ± 17.23	72.71 ± 15.53	<0.0001
BMI (kg/m^2)	26.69 ± 4.45	26.85 ± 5.56	0.146
Parity	2.02 ± 0.95	1.98 ± 0.91	0.123
Vaginal delivery	1.98 ± 0.95	1.38 ± 0.87	0.0023
Cesarean delivery	0.07 ± 0.35	0.59 ± 0.37	0.0012

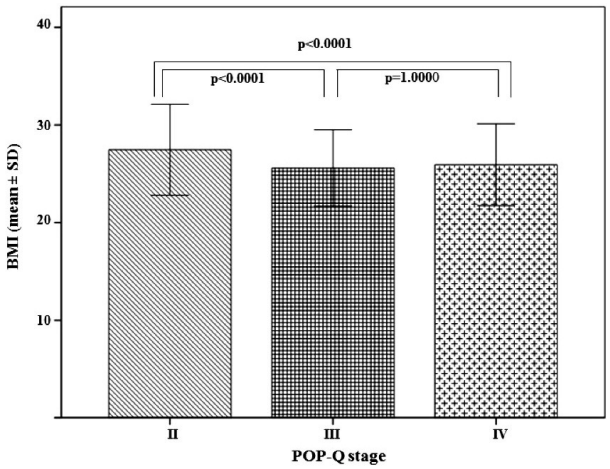

Figure 1. – One way ANOVA analysis, Bonferroni post hoc test comparison of BMI and POP severity, characterized by POP-Q stages (II-IV). The study population did not contain POP-Q I stage patients.

Obesity data

Mean weight and BMI of POP women were 70.44 ± 4.45 kg SEM (min: 44, max: 128) and 26.85 ± 5.56 kg/m^2 SEM (min: 18.19, max: 45.89). The mean weight and BMI of the control women were 72.71 ± 4.89 kg (min: 41, max: 145) and 26.84 ± 5.56 kg/m^2 (min: 22.19, max: 46.61), and we failed to demonstrate statistically significant differences between the groups ($p = 0.146$). Moreover only 21.6 % (413 /1911) of women with POP, and 26.2 % (5219 / 19953) of the control patients were found to be obese. Two third of the study group were postmenopausal women (1271 / 1911, 66.6%), and their BMI varied significantly from the premenopausal patients (640/1911, 33.4 %), with an average BMI of 25.77 ± 0.21 kg/m^2 SEM compared to 27.14 ± 4.30 kg/m^2 SEM (p = 0.042). The multiple comparisons of BMI and POP-Q stages revealed a slight, but significant decrease in BMI with advanced POP-Q stages (Figure 1). The logistic regression and the multivariate analysis demonstrated the significantly strong correlation between age, BMI, and POP, albeit the coherence was found to be negative (Table 2). We failed to demonstrate significant correlation between parity and POP (data not shown).

DISCUSSION

Although POP has been proposed to be a multifactorial disease, with a natural history of slow progression, the relative impact of each predisposing factor is not clear yet. According to the literature, multiparity seems to be the most important risk factor[10-12]. Several studies suggest that increased incidence of POP is associated with higher number of vaginal birth compared to caesarean delivery[10,11,13], which has been confirmed by our findings as well. Other obstetrical risk factors include operative vaginal delivery,

TABLE 2. Regression and multivariate analysis to reveal the predictive factors for POP. Coefficient estimates β and standard error se(β), and corresponding p-value are summarized.

	POP		Univariate analysis			Multivariate analysis		
Variable	Premenopausal (*n*= 640)	Postmenopausal (*n*= 1271)	*β*	SE (*β*)	*p*	*β*	SE (*β*)	*p*
Age (years)	41.00 ± 6.10	63.73 ± 8.35	-0.047	0.004	<0.0001	-0.046	0.004	<0.0001
Parity (n)	2.05 ± 0.99	2.01 ± 0.92	-1.225	1.867	0.512	-0.892	1.894	0.637
BMI (kg/m^2)	25.78 ± 4.60	27.14 ± 4.31	-0.088	0.010	<0.0001	-0.072	0.011	<0.0001

and birth weight[13], while non-obstetrical risk factors includes age[14,15], connective tissue disease, due to decreased ratio of collagen I to collagen III and IV[16], race[17], hysterectomy[18], and increased abdominal pressure. In addition cigarette smoking and chronic obstructive pulmonary disease (COPD) have also been suggested to play role in the development of POP[19].

Obesity might be an important aspect of pelvic organ disorders, since it has been well-documented to have a negative impact on lower urinary tract symptoms (LUTS)[20], moreover it is a well established risk factor for stress urinary incontinence (SUI)[21], and overactive bladder (OAB)[22]. The role of obesity in the development of POP, on the other hand, is till date remains to be uncertain.

Therefore our aim was to investigate obesity as a risk factor for symptomatic stage II or higher POP. Despite we found a statistically significant increase of BMI with age in the study group, we revealed no statistical difference between the POP and the control group weight, height, or BMI. In contrast to our findings, Hendrix et al.[2] found that overweight or obesity was significantly associated with greater severity prolapse in every compartment. However in that study prolapse was measured in the absence of anterior and posterior vaginal retractors or the POPQ standardization. Prolapse was categorized as either present or absent based on visualization of the external genitalia during Valsalva. Washington et al.[23] as well as Fornell et al.[24] found that being overweight or obese was strongly associated with urinary and fecal incontinence but not with symptoms of pelvic prolapse. Several studies suggest that weight loss may be an effective treatment for the management of urinary incontinence[25,26,27]. On the other hand weight loss does not appear to be significantly associated with regression of pelvic organ prolapse[3,28]. Kudish[3] suggests that damage to the pelvic floor related to weight gain might be irreversible. From our point of view, there is a second possibility to consider, namely that overweight and obesity are major risk factors for urinary and anal incontinence but not for pelvic organ prolapse.

In our current study included a relatively high number of ethnically homogenous Caucasian, Eastern-European women where we could not identify obesity as a strong risk factor for POP development, although the multivariate analysis revealed that increased body mass has an impact on the disease severity. The racial homogeneity of our study and population might the limitation of our investigation. Based on our results and clinical observations we do not believe that obesity is a key risk factor for POP. We consider that different pelvic floor disorders have different strong risk factors. As the prevalence of obesity increases, understanding how weight impacts pelvic floor disorders is imperative because body weight is a modifiable risk factor. Understanding the impact of risk factors for pelvic floor disorders is very important to facilitate patient education and counselling. Prospective research evaluating for a causal relationship between obesity and pelvic floor symptoms is essential.

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Invited commentaries

The authors compared two large series of patients, with pelvic organ prolapse and without, and concluded there was little difference in outcomes. The BMI in both groups, POP or control, was slightly more than 26 Kg / m^2, up to 25 being normal. We believe the patients should have been defined as 'overweight', not 'obese'. To reach this conclusion we believe the comparison should be the presence of prolapse between a group with obesity (BMI greater than 30) and a normal group (BMI of 25), or perhaps in several subgroups according to the classification: Overweight, Obesity type I, II and III (that is morbidly obese with BMI> 40 kg / m^2). We used such a classification for incontinence when we evaluated patients before and after bariatric surgery[1]. We demonstrated that BMI > 35 kg/m^2 was strongly related to stress urinary incontinence, overactive bladder, severe fecal incontinence, and use of diapers. We endorse the authors' conclusions that obesity is an epidemic and that *"prospective research evaluating for a causal relationship between obesity and pelvic floor symptoms is essential,"* From our perspective, prospective evaluation on the impact of bariatric surgery and weight loss in POP resolution would help determine whether POP is a herniation influenced by intra abdominal pressure, or caused by loose ligaments.

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Obesity epidemic is worldwide affecting a consistent portion of general population, topping up 40% in US. Severe obesity is associated not only with metabolic comorbidities, such as type 2 diabetes, steatohepatitis, hypertension, dyslipidemia, obstructive sleeve apnea syndrome, but also with a significant impairment on the quality of life (QoL) as far as daily life and activities. Pelvic floor disorders directly impact on the QoL and it is well known that people with BMI above 30 kg/m^2 have a higher prevalence and incidence of fecal and urinary incontinence and sexual dysfunction. Increased intra-abdominal pressures induced by obesity, infact, strain and weaken the supporting structures of different pelvic organs, thus leading to some degree of dysfunction in 90% of patients. Severe obesity can be safely and effectively treated with bariatric surgery (BS), although the penetrance and dissemination of this latter is not yet so extensive, due to insurance coverage and affordability constraints. Although BS is primarily aimed to achieve weight loss and comorbidities resolution, the major trade-off is the amelioration of QoL. This is best perceived by the patient since the early post-operative course, when the common sensation is that of regaining a "true-life". This paper did not show a significant correlation between overweight and "symptomatic pelvic organ prolapse stage 2 or higher", the mean BMI of patients (cohort study and control group) being around 26 kg/m^2, that is in the range of overweight (25-30). On the other hand there is a strong evidence of positive associations between obesity and pelvic organ prolapse and the positive effects of weight loss surgery on pelvic floor disorders. Post BS weight loss improves pelvic floor and ultimately also sexual function, although the latter is also mediated by an increased self-esteem[1,2].

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