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Examining the impact of weight loss and exercise on pelvic organ prolapse (POP) management

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Abstract

Introduction: Pelvic organ prolapse is a descent of pelvic organs such as the bladder, cervix, apex of the vagina, and rectum which create herniation and slide into the direction of the vagina entrance. Pelvic prolapse is caused by ligament and muscle weakness, and its risk increases with age, parity, and obesity. Proper exercise and weight loss can be a key component of pelvic prolapse management, especially in the I-III stages. Those interventions may decrease the need for pelvic surgery and the risk of complications that can arise from it.

Purpose of the study: This study aimed to explore the effectiveness of weight loss and exercise on pelvic organ prolapse (POP) symptoms and staging.

Materials and methods: A comprehensive analysis of research papers available on PubMed, and Google Scholar was undertaken using the keywords: ‘weight loss pelvic prolapse’, ‘exercise in pelvic prolapse’, ‘pelvic floor dysfunction’, ‘pelvic floor muscle training’, ‘hypopressive exercises’, ‘biofeedback prolapse’

Results: Conventional weight loss does not reduce the intensity of the pelvic prolapse symptoms. However, weight loss that is achieved via bariatric surgery is effective in reducing symptoms arising from pelvic organ prolapse. Furthermore, the bigger the amount of weight loss the greater improvement in symptoms. Pelvic floor muscle training showed improvement in symptoms and in the staging of pelvic organ prolapse. Hypopressive

exercises are not as effective as pelvic floor muscle training. Biofeedback and supervised exercises are helpful in proper exercise execution and thus may improve the strength of the pelvic floor muscles.

Keywords: pelvic organ prolapse, weight loss, pelvic floor muscle training (PFMT), bariatric surgery, biofeedback

Introduction

Pelvic floor dysfunction (PFD) in women describes a wide range of clinical disorders such as urinary incontinence (UI), pelvic organ prolapse (POP), fecal incontinence (FI), pelvic region pain syndrome, overactive bladder (OAB), vaginal laxity (VL) and vaginal wind (VW). PFD is a common problem, as roughly 50% of all women worldwide have been suffering from at least a single (from the above mentioned) disorder. The most frequent pelvic dysfunction is urinary incontinence, both stress and urge incontinence, comprise around 50% of all PFD, whereas the least frequent are pelvic organ prolapse (POP) and fecal incontinence (1,2).

Pelvic organ prolapse (POP) is a pelvic floor dysfunction in which the pelvic organs such as the bladder, cervix, apex of the vagina, uterus, small intestine, or rectum, move out of their normal position and create ‘a bulge’, in other words, herniation and prolapse. Anterior herniation of the bladder into the vaginal wall is called ‘ureterocele’, similarly, posterior herniation of the rectum into the vaginal wall is called ‘rectocele’. The prolapse of the apex of the vagina is called apical prolapse (3,4).

POP is mainly caused by ligament or muscular weakness of pelvic floor muscles that support organs located within the pelvis minor. All promoting factors that contribute to pelvic prolapse development cause, to a greater or lesser extent, the weakening of connective tissue of the pelvic floor. POP incidence is increasing significantly with age, as the average patient suffering from pelvic prolapse is in their 60s, however, despite POP being uncommon in women below the age of 40, those with a family history of POP, have a higher chance of the POP (5,6). However, age is not the only thing that contributes to POP development, as its cause is multifactorial. Other factors such as pregnancy and vaginal delivery can increase the risk considerably. Increased intra-abdominal pressure caused by obesity or heavy lifting, constipation, morbidities that are accompanied by a chronic cough, menopause, and hysterectomy are also associated with an increased chance of prolapse (3,7).

Prevalence of pelvic prolapse is difficult to establish, as only around 15% of women suffering from POP have symptoms related to prolapse itself. Manifestation of POP varies significantly, symptoms may be non-specific making them harder to diagnose and they differ based on what organ is sliding down and potentially leading to urinary and rectal issues, and also problems

in the sexual sphere (Table 1.) (1,3,8–10). The most common patient complaints include a sensation of a bulge or a bump coming out of the vagina, pelvic pressure, pain, soreness, or sexual dysfunction. Symptoms are generally exacerbated by gravity's impact on the pelvic minor and it's organs – in a standing position or doing standing exercises the prolapse is aggravated whereas laying in the supine position alleviates any symptoms that come with the prolapse (10). What is more, untreated prolapse can lead to complications such as urinary retention leading to hydronephrosis or even a bowel obstruction (11–13). What is crucial to mention that the number of women with asymptomatic prolapse is difficult to obtain, however, it is suggested that 50% of women, can have visible prolapse upon physical examination (3).

POP can be treated effectively, especially when detected in its early stages. Possible methods of treatment include surgery, removable pessary rings that provide support for pelvic organs, medication, exercise, and lifestyle changes. The choice of conservative or surgical treatment may depend on the patient's needs, age, and the severity of their symptoms (14).

This study aims to summarize current findings about exercise and weight loss in POP treatment, comparing it is effectiveness and showing possible contradictions among different studies. Understanding the importance of conservative treatment is a key aspect in decision-making when choosing the appropriate method of treatment, and it may help avoid surgery which is associated with more frequent complications (15).

Symptoms			
Vaginal	Urinary	Ano-rectal	Sexual
Bulge sensation or visualization	Frequency	Incomplete defecation	Dyspareunia
Pelvic pressure	Recurrent urinary tract infections	Digitation/splinting	Vaginal laxity
Low (sacral) back pain	Incomplete emptying/urinary retention	Rectal urgency	

Table 1. The most common symptoms of POP (10).

Anatomy of pelvic floor

The pelvis is divided into the pelvic floor, urogenital diaphragm, and perineum and extends from the pubis to the coccyx posteriorly. The pelvic floor, or diaphragm, consists of muscles such as levator ani (which is formed by the illio- and pubococcygeus muscles and puborectalis muscle) and the ischiococcygeal muscle, which is located posteriorly to levator ani. The role of the pelvic floor muscles is to support the organs located within the pelvis and

to resist an increase in abdominal pressure. The levator ani muscle plays the most crucial part when it comes to supporting organs. The muscle is innervated by the levator ani nerve, which originates from the 3rd, 4th, and 5th segments (16,17). The urogenital diaphragm is located below the pelvic floor and is situated between the ischium and the pubis symphysis. The urogenital area is made up mainly of deep transverse perineal muscle fibers, as well as and through passes the vagina and urethra (16). The perineum is the prolongation of the urogenital diaphragm, and it connects the urethra, vagina, and rectum with a muscle to the coccyx.

One of the crucial parameters of the pelvic floor anatomy regarding pelvic prolapse are hiatal dimensions, which are cross-sectional areas of pelvic floor/levator hiatus and include antero-posterior and transverse distances, as well as the entire levator hiatus area (10). In women with pelvic prolapse, levator area increases, as well as parameters of urogenital and levator hiatus are larger either at rest or during activities increasing intra-abdominal pressure such as heavyweight lifting or Valsalva maneuver. (18–20). What is interesting is that it seems that the urogenital hiatus parameter has a more significant impact on pelvic prolapse than the levator hiatus parameter (18).

Classification and staging

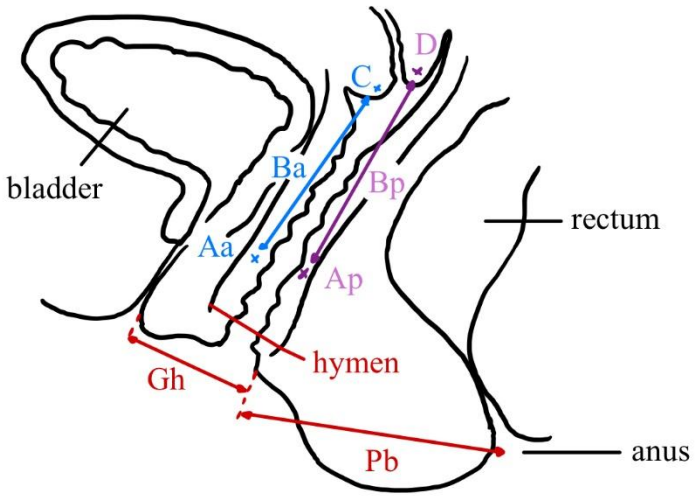
Since 1996 the most popular objective classification to describe pelvic prolapse was the Pelvic Organ Prolapse Quantification system (POP-Q) (10,21). Staging in POPQ, as well as, the location of certain points are in relation to the fixed point of the hymenal ring. Moreover, the staging depends on measurements and defined, six points – Aa, Ba, C, D, Ap, Bp. Two points (Aa, Ba) are located on the anterior wall, and another 2 points, similarly, are located on the superior (C, D) and posterior wall (Ap, Bp).

Location of the points (Figure 1.) (21):

- Point Aa is in the midline of the anterior vaginal wall, 3 cm above the hymen (this point ranges from -3 cm, which indicates no prolapse, to +3 cm which indicates full prolapse)
- Point Ba refers to the most distal portion of the remaining upper anterior side of the vaginal wall (from the vaginal fornix to point Aa), it ranges from -3 cm to +6/7 cm
- Point C is the most distal edge of the cervix
- Point D is the posterior fornix
- Point Ap is the point located in the midline of the posterior vaginal wall (same as Aa, Ap location is relative to the hymen that ranges from -3 cm to + 3 cm)

- Point Bp is the portion of the remaining upper posterior side of the vaginal wall, it ranges from -3 cm to +6/7 cm

Figure 1. The six defined points, and 3 measurements, used to quantify POP in women without hysterectomy. Genital hiatus (Gh), the perineal body (Pb), total vagina length (Tvl). (10,22).



Those points are used to present the extent of the sliding of the anterior or posterior wall, or apex of the vagina. When examination for pelvic prolapse is carried out, it should be done with the bladder and ideally, the rectum, empty, as it can underestimate the POP severity (10,22).

Moreover, measuring those 6 defined points should be done while performing the patient maximal Valsalva maneuver. If one of those points during the Valsalva maneuver did not move and stayed above the hymen, it is measured in centimeters as a negative number. However, if the point descends to the hymen or beyond the hymen, it is measured as 0 or a positive number, respectively. The measure of every point should be measured and recorded. During the Valsalva maneuver also 3 other things are measured: genital hiatus (GH), total vagina length (TVL), and perineal body (PB). Both GH and PB are measured during Valsalva, however, TVL is measured at rest (10,21).

The staging is made up of 5 stages:

- Stage 0: No prolapse is demonstrated. (points Aa, Ba, C, D, Ap and Bp are all ≤ - 3cm)
- Stage I: The most distal portion of the prolapse is more than 1 cm above the level of the hymen. (points Aa, Ba, C, D, Ap and Bp are < - 1 cm)
- Stage II: The most distal portion of the prolapse is situated between 1 cm above the hymen and 1 cm below the hymen. (any of the six points: Aa, Ba, C, D, Ap, and Bp has a value between -1 cm to +1 cm)
- Stage III: The most distal portion of the prolapse is more than 1 cm beyond the plane of the hymen but everted at least 2 cm less than the total vaginal length. (any of the points Aa, Ba, C, D, Ap, and Bp are ≥ + 2 cm, and TLV ≤ - 3 cm)
- Stage IV: Complete eversion or eversion at least within 2 cm of the total length of the lower genital tract is demonstrated. (any of the points Aa, Ba, C, D, Ap and Bp is ≥ to TVL – 2 cm) (10,21)

Certain measurements may be more associated with certain types of prolapses, more the others measurements. For instance, genital hiatus, as well as vaginal length are more linked to apical vaginal support loss (4, 5), than the location of any other of the 6 points (23,24). Usually, when the stage of the prolapse reaches ≥ 2 POP-Q is deemed to be symptomatic, it is when the leading point of the prolapse reaches the hymen or crosses its point (21,25). The most prevalent type of symptomatic prolapse is of only the anterior wall, rather than prolapse of the middle or posterior compartment (26).

Questionnaires

To assess the intensity and bothersome of the symptoms associated with pelvic floor disorders, in clinical practice, questionnaires are used. The Pelvic Floor Distress Invenstory-20 (PFDI-20) has 20 questions, each question is divided into 2 parts, first, whether they experience symptoms, and then, how are they bothered by the symptoms present. PFDI-20 is divided into 3 subscales, Pelvic Organ Prolapse Distress Inventory-6 (POPDI-6) – relating to prolapse symptoms, Colorectal-Anal Distress Inventory-8 (CRADI-8) – relating to colorectal symptoms, and Urogenital Distress Inventory-6 (UDI-6) – relating to urinary symptoms. The Pelvic Floor Impact Questionnaire-Short Form 7 (PFIQ-7) questionnaire assesses how symptoms (bladder or urine, bowel or rectum, and vagina or pelvis) affect the patients in the seven qualities of life (27).

Weight loss

Obesity is one of the most significant risk factors, next to parity, and age, for pelvic floor dysfunction, which includes pelvic prolapse. It disrupts the support system created by the pelvic floor by increasing intra-abdominal pressure. One of the many interventions for overweight or obese women with pelvic floor dysfunction involves lifestyle changes including weight loss, to counter the effect of increased pressure on the pelvic diaphragm. What is more, the risk of prolapse is greater in people with a BMI > 25, in comparison to those with a BMI within the normal range. Additionally, the risk of the progression of the prolapse and the intensity of bothersome symptoms is greater when obese, rather than overweight (28,29).

Despite, the seemingly easy idea, that by losing weight, the problems with dysfunction of the pelvic floor will subside, the solution is not that simple. For instance, the study carried out by Kudish et al. showed that weight loss was not associated with regression of POP. In this study, 10% weight loss resulted in an overall 3% reduction of cystocele 4% in rectocele, and 8% of worsening of uterine prolapse – overall minimal changes in prolapse. What is more, the weight loss did not affect the grades of the prolapse (28). However, it is important to emphasize that patients were not subjected to the POP-Q physical examination, which is most reliable when it comes to prolapse advancement. In the study, pelvic examinations even though repeated annually, were using the WHI Prolapse Classification System, which is not is not the objective tool in prolapse assessment. It consists of only 4 grades and could not determine subtle changes that could have occurred due to the weight loss. Additionally, the ages of the participants were 50 to 79, so results cannot be generalized to the entire population of women experiencing pelvic prolapse.

Gozukara et al. determined that weight loss is beneficial for alleviating symptoms of urinary incontinence (UI), however, similarly to Kudish, it did not show improvement in symptoms in patients with pelvic prolapse. However, Gozukara proved that weight loss at <10%, changes measurements of genital hiatus, perineal body, and Ap (30). In a study conducted by Myers et al., pelvic prolapse and its symptoms were more prevalent in obese rather than overweight women, however, weight loss also did not improve the prolapse POP-Q score in both of these groups (7). In the study, only a small subset of women were subjected to objective assessment with the POP-Q exam, which may be the reason behind not reaching statistical significance. Additionally, the study did not have a control group with women in the same age range with BMI within normal.

What is important to mention, is that in all of those 3 studies, the weight loss did not exceed 10% of the baseline weight. No studies have been carried out with weight loss, through

calorie deficit, between 10-15% of the original weight, and its effect on the symptoms, and POP-Q system simultaneously.

On the other hand, it seems that the weight loss achieved through bariatric surgery including Roux-en-Y gastric bypass, sleeve gastrectomy, and laparoscopic adjustable gastric band) decreases the intensity of the symptoms due to pelvic prolapse, which was proved by Avner Leshem et al., Collen D McDermott et al. and Wasserberg et al. (31–33). In the study of McDermott, they carried out the questionnaire – PFDI-20 and PFIQ-7, before and after surgery regarding bothersome symptoms of pelvic prolapse and its impact on the quality of life. Additionally, although, not statistically significant, there was a notable decrease in the prevalence of POP symptoms (32). Similarly, in the study of Leshem et al. the questionnaires were used, first regarding the intensity of the symptoms, second, focusing on sexual activity and the symptoms of pelvic floor dysfunction – PFDI-20 and PISQ-12. Mean scores in both of those questionnaires decreased, additionally, symptoms in both of the questionnaires regarding POP, showed improvement (31). Moreover, the beneficial effect of surgery increases over time – fewer symptoms were reported by women at 12 months after surgery, compared to the 3-6 months after (31).

Additionally, Iwona Gabriel Ali showed that it is not the weight loss itself, but the amount of weight lost thanks to surgery, that proportionally improves symptoms of POP (34). Furthermore, it seems that the larger amount of weight loss is associated with a reduced risk of subsequent pelvic prolapse. The downside of those papers is the usage only of the questionnaires – PFDI-20, PFIQ-7, POPDI-6, and not including POP-Q physical examinations, before and, after the surgery. Which, in turn, does not show, how the substantial weight (up to 20% from the baseline) after the surgery, affects the POP-Q scale, and dimensions, which may help explain which measures have the most importance in symptom improvement.

On the other hand, another study, carried out by Olivera et al., did not demonstrate improvement in the symptoms of pelvic prolapse after bariatric surgery, even after substantial weight loss. However, the patient sample was small, as only 36 were eligible in the study, moreover, even after the weight loss, at the follow-up, on average cohort was still obese, with an average BMI of > 30 kg/m^2 (35). There is speculation that perhaps bariatric surgery may work as a prophylaxis for pelvic floor disorder prevention, however, there need to be more studies carried out (36).

There has been speculation that being overweight or obese, causes irreversible damage to the pelvic floor (28), and that may be the reason for lack of the effect of weight loss. However, it was not true for women after the bariatric surgeries, which showed improvement in symptoms relating to pelvic prolapse. Additionally, weight loss achieved via surgery causes greater weight loss, than weight loss by conventional ways. Bariatric surgery allows for weight loss > 10% of the baseline, which was not possible for women in the studies where weight loss was achieved via calorie deficit - as maximal weight loss was barely reaching 10% of the original weight. These findings suggest, that the amount of weight loss, is the key point in alleviating the symptoms of pelvic organ prolapse.

Exercises

Non-invasive treatments, including exercises, are preferred by those suffering from pelvic prolapse, over invasive intervention (14,37). Exercises that are beneficial in improving the symptoms caused by pelvic floor dysfunction involve hypopressive exercises (HEs) and pelvic floor muscle training (PFMT) (38,39).

Hypopressive exercises consist of breathing techniques and their role is to decrease intraabdominal pressure, as it creates reflex activity in the muscles of the abdominal wall and pelvic floor (40). Breathing exercise consists of slow, diaphragm inspiration, total expiration, and then diaphragmatic aspiration which shifts the diaphragm close to the spine, thus decreasing intraabdominal pressure, however, the effect lasts only a couple of seconds (41). HEs are both effective in IU and pelvic prolapse (39,42).

Pelvic floor muscles training are exercises that focus on the voluntary contractions of the pelvic floor, their effectiveness is the highest when implemented in the daily routine (43,44). Despite its obvious advantages such as cost-effectiveness and non-invasive character, one of the factors limiting its effectiveness is the need to identify the right muscles and contracting them consciously, which may be difficult to execute for some patients (43,45,46).

PFMT was proven to be beneficial in decreasing symptoms of pelvic floor dysfunction, especially of urinary incontinence, as it increases contractibility of the pelvic floor and levator ani strength (44,47–49). It seems, that increasing contractibility that leads to strengthening weakened pelvic floor can also be beneficial for those suffering from pelvic prolapse.

Studies show that PFMT treatment is more beneficial than no treatment at all for women with symptomatic pelvic prolapse (39,48,50,51). Additionally, exercises are beneficial for all

women from the I to III stages (52). Furthermore, PFMT, helps to improve sexual function in some women, which is connected to an increase in pelvic floor strength (53).

Despite all studies executing different regimes of exercise, all still showed improvement in symptoms.

The physiology behind the beneficial effect of the PFMT is that it increases muscle volume, and shortens muscle length, thus closing, or reducing the levator hiatus (54).

The study performed by Ana Paula M Resende showed the superiority of PFMT over HEs in terms of the symptoms such as bulge appearing in the vagina entrance, heaviness/pressure or stress incontinence, and stage of prolapse. However, both methods showed overall improvement in POP symptoms and prolapse severity (39). However, when the hypopressive method was added to PFMT, it did not have better results in pelvic prolapse symptoms compared to PFMT alone (41). The reason behind this may be due to the latency of the effect of the hypopressive technique. On the other hand, the addition of a new conservative treatment approach, such as external rotation, adduction, and abduction of the hips in an inverted position, in addition to PFMT, can lead to a greater improvement in symptoms of pelvic floor dysfunction, such as pelvic prolapse (55).

Exercises could be done alone, or with biofeedback, which provides positive reinforcement while performing pelvic floor exercises. Biofeedback can be done either by intravaginal electromyography (EMG) or surface EMG, with the latter being a more preferred and advised method. It works by measuring neuromuscular and autonomic activity and conveying it to the patient in the form of visual or acoustic signals (56).

What is more, the exercises with biofeedback may be more beneficial for women, who do exercises at home without any supervision. Nonetheless, exercises both with or without biofeedback are effective in alleviating symptoms linked to pelvic prolapse (57–59).

When instructed, or given verbal instructions or feedback on the exercises of the pelvic floor, the pelvic floor muscle contraction performance increases, thus was more efficacious (60). Moreover, the PMFT 1-to-1, with a proper explanation of the anatomy, structure, and feedback on whether exercises are understood and properly done, is more effective in the improvement of the symptoms and quality of life, than exercises done after only receiving the instructions (52).

Discussion

Many of the studies mentioned that exercise, both Kegel and breathing exercises, can improve the symptoms associated with pelvic prolapse, either urinary, fecal, sexual or simply the

sensation of the bulge or heaviness that is bothersome to the patient. Still, the PFMT is the most effective in strengthening the pelvic floor, thus improving the symptoms of organ descent. However, adding hip exercises showed promise for further improvement of the endurance of the pelvic diaphragm, thus showing promise for future studies. Biofeedback or 1-to-1 exercises of the pelvic floor are better at improving the contractibility of the pelvic floor muscles than exercises performed alone.

When it comes to weight loss, the beneficial effect on the pelvic floor is inconclusive. Weight loss achieved on its own is usually not as substantial as the one achieved through bariatric surgery. This is probably the reason why there was no improvement in symptoms or POP-Q staging, nor symptoms. A weight loss of more than 10 but less than 20% of the original weight is possibly enough to alleviate the symptoms of pelvic organ prolapse. Moreover, the greater the weight loss, the greater the improvement of the symptoms of POP.

This study is not devoid of its limitations, they mainly occur due to the heterogeneity of the studies. Comparing papers on exercise was difficult to execute, as every paper had a different regimen and technique, as well as the duration in which the exercises were done. Additionally, when comparing weight loss, some papers were comparing only BMI, some were presenting weight loss in percentages, and some simply used kilograms. Moreover, not in every paper objective POP-Q exams were used, thus subtle changes of the prolapse could not be analyzed. There should be more studies carried out on weight loss and exercises that are done simultaneously, and their effect on the POP symptoms and POP-Q stage and changes in measurement should be compared, in comparison to those interventions alone. Furthermore, more studies should explore the effectiveness of weight loss and exercises in comparison to surgery, which is invasive, associated with a bigger risk of complications, and deemed to be the final option in pelvic prolapse treatment.

Conclusions

Exercise and weight loss are effective in the treatment of symptomatic (stages I to III in POP-Q) pelvic prolapse. Weight loss achieved through bariatric surgery is effective, unlike weight loss achieved conventionally. The factor that has the most significant impact on improving the symptoms caused by the prolapse was not the weight loss itself, but the amount of weight lost. Biofeedback and supervised exercises can be helpful tools in involving the right muscle during exercises, rather than exercises done alone. Integrating both initiatives in the conservative treatment could potentially be more effective in alleviating symptoms of pelvic prolapse, than incorporating them separately.

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Authors'contribution:

Conceptualization: Bartosz Moskal
Methodology: Bartosz Moskal
Software: Bartosz Moskal
Check: Małgorzata Maria Bednarczyk
Formal Analysis: Bartosz Moskal, Małgorzata Maria Bednarczyk
Investigation: Bartosz Moskal
Resources: Bartosz Moskal
Writing-Rough Preparation: Bartosz Moskal
Writing-Review and Editing: Małgorzata Maria Bednarczyk
Visualization: Małgorzata Maria Bednarczyk
Supervision: Małgorzata Maria Bednarczyk
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