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ТИББИЁТДА ЯНГИ КУН НОВЫЙ ДЕНЬ В МЕДИЦИНЕ NEW DAY IN MEDICINE

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**ERTA REABILITATSIYA ORQALI TOS A'ZOLARI PROLAPSINI DAVOLASH:
TO'QIMACHILIK KORXONASI AYOL ISHCHILARI ORASIDA ISTIQBOLLI
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✓ **Rezyume**

Chanoq a'zolarining prolapsi (CHAP) butun dunyo bo'ylab ayollarda uchraydigan eng keng tarqalgan chanoq tubi kasalliklari qatoriga kiradi va jismoniy faoliyat, mehnat unumdorligi, siydik va ichak faoliyati, jinsiy salomatlik va hayot sifatiga salbiy ta'siri tufayli jamoat salomatligi uchun jiddiy muammo hisoblanadi. Ayniqsa, uzoq vaqt tik turish, takroriy ko'tarish va qorin ichi bosimining doimiy oshishini talab qiladigan kasblarda band bo'lgan ayollar chanoq tubi disfunktsiyasiga ko'proq moyil bo'ladilar. Konservativ reabilitatsiya kichik chanoq a'zolarining yengil va o'rtacha darajadagi prolapsi uchun tavsiya etilgan birinchi darajali davolash strategiyasiga aylandi, biroq nazorat ostidagi bioqayta aloqa bilan birlashtirilgan ish joyidagi reabilitatsiya dasturlari haqidagi dalillar hali ham cheklangan. Maqsad: Tos a'zolari prolapsi tashxisi qo'yilgan to'qimachilik sohasida ishlovchi ayollarda ish joyida tos bo'shlig'i mushaklarini mashq qildirish, uyda tizimli mashqlar va nazorat ostidagi bioqayta aloqa terapiyasini birlashtirgan erta kompleks reabilitatsiya dasturining samaradorligini baholash. Materiallar va usullar: 2025-yil yanvar-iyul oylarida Andijon davlat tibbiyot institutida "Shedevr Premium Textile Company" kompaniyasi bilan hamkorlikda prospektiv nazoratli tadqiqot o'tkazildi. POP-Q tasnifi bo'yicha I-III bosqichdagi chanoq a'zolari prolapsi tashxisi qo'yilgan 85 nafar ayol jalb qilindi. Ishtirokchilar asosiy reabilitatsiya guruhiga (n=35) va nazorat guruhiga (n=50) ajratildi. Aralashuv olti oy davomida kuniga ikki marta ish joyida bajariladigan chanoq bo'shlig'i mashqlari, uyda reabilitatsiya va haftasiga ikki marta bio-qayta aloqa terapiyasidan iborat edi. Asosiy natijalar POP-Q anatomik o'lchovlari va Bartel indeksi ko'rsatkichlarini o'z ichiga oldi. Ikkilamchi natijalar chanoq tubi distress inventarizatsiyasi (PFDI-20) yordamida baholandi. Statistik tahlil mustaqil tanlanmalar t-testlari va xi-kvadrat testlari yordamida o'tkazildi, bunda ishonchlilik $p < 0,05$ da o'rnatildi. Natijalar: Dastlabki demografik va klinik xususiyatlar guruhlar o'rtasida sezilarli darajada farq qilmadi ($r > 0,05$). Olti oydan so'ng, aralashuv guruhida funksional mustaqillik, chanoq tubi anatomiyasi va simptomlarning og'irligi sezilarli darajada yaxshilandi. Bartel indeksi $72,4 \pm 8,6$ dan $89,7 \pm 5,3$ gacha oshdi, nazorat guruhida $71,8 \pm 9,1$ dan $76,2 \pm 7,8$ gacha ($r < 0,001$). POP-Q Aa, Ba, C, Ap va Bp nuqtalarida sezilarli yaxshilanishlar kuzatildi (barchasi $r < 0,001$). PFDI-20 ning umumiy ko'rsatkichi aralashuv guruhida $126,1 \pm 32,4$ dan $57,4 \pm 21,3$ gacha, nazorat guruhida esa $121,7 \pm 33,6$ dan $106,8 \pm 28,9$ gacha pasaydi ($r < 0,001$). Xulosa: Ish joyida chanoq tubi mushaklarini mashq qildirish, uyda bajariladigan mashqlar va nazorat ostidagi bioqayta aloqani o'z ichiga olgan tizimli erta reabilitatsiya dasturi chanoq a'zolari prolapsi bo'lgan ayollarda anatomik qo'llab-quvvatlash, funksional imkoniyatlar va hayot sifatini sezilarli darajada yaxshilaydi. Erta konservativ reabilitatsiya ayol ishchilar uchun birinchi darajali samarali strategiya sifatida qaralishi kerak.

Kalit so'zlar: chanoq a'zolari prolapsi, reabilitatsiya, chanoq tubi mushaklarini mashq qildirish, bioqayta aloqa, POP-Q, Bartel indeksi, to'qimachilik sohasi xodimlari, konservativ davolash, ayollar salomatligi.

**ЛЕЧЕНИЕ ПРОЛАПСА ТАЗОВЫХ ОРГАНОВ ПОСРЕДСТВОМ РАННЕЙ
РЕАБИЛИТАЦИИ: ПРОСПЕКТИВНОЕ КОНТРОЛИРУЕМОЕ ИССЛЕДОВАНИЕ
СРЕДИ РАБОТНИЦ ТЕКСТИЛЬНОГО ЗАВОДА**

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✓ Резюме

Проплапс тазовых органов (ПТО) является одним из наиболее распространенных заболеваний тазового дна у женщин во всем мире и представляет собой серьезную проблему общественного здравоохранения из-за его негативного влияния на физическую активность, производительность труда, функцию мочеиспускания и дефекации, сексуальное здоровье и качество жизни. Женщины, работающие на должностях, требующих длительного стояния, многократного подъема тяжестей и постоянного повышенного внутрибрюшного давления, особенно подвержены дисфункции тазового дна. Консервативная реабилитация стала рекомендуемой стратегией первой линии лечения при легком и умеренном пролапсе тазовых органов, однако данные об эффективности программ реабилитации на рабочем месте в сочетании с контролируемой биологической обратной связью все еще ограничены. Цель: оценить эффективность ранней комплексной реабилитационной программы, сочетающей тренировку мышц тазового дна на рабочем месте, систематические домашние упражнения и контролируемую терапию с использованием биологической обратной связи, у женщин, работающих в текстильной промышленности, с диагнозом пролапса тазовых органов. Материалы и методы: Проспективное контролируемое исследование проводилось в Андижанском государственном медицинском институте в сотрудничестве с текстильной компанией «Шедевр Премиум» с января по июль 2025 года. Были отобраны 85 женщин с диагнозом пролапса тазовых органов I-III стадии согласно классификации POP-Q. Участницы были разделены на основную реабилитационную группу (n=35) и контрольную группу (n=50). Вмешательство включало двукратные ежедневные упражнения для мышц тазового дна на рабочем месте, домашнюю реабилитацию и двукратную еженедельную терапию с использованием биологической обратной связи в течение шести месяцев. Основные результаты включали анатомические измерения POP-Q и баллы по индексу Бартеля. Вторичные результаты оценивались с использованием Инвентаря дискомфорта тазового дна (PFDI-20). Статистический анализ проводился с использованием независимых t-критериев и критерия хи-квадрат, уровень значимости установлен на $p < 0,05$. Результаты: Исходные демографические и клинические характеристики существенно не различались между группами ($p > 0,05$). Через шесть месяцев функциональная независимость, анатомия тазового дна и тяжесть симптомов значительно улучшились в группе вмешательства. Индекс Бартеля увеличился с $72,4 \pm 8,6$ до $89,7 \pm 5,3$ по сравнению с $71,8 \pm 9,1$ до $76,2 \pm 7,8$ в контрольной группе ($p < 0,001$). Наблюдались значительные улучшения по показателям POP-Q Aa, Ba, C, Ap и Bp (все $p < 0,001$). Общий балл по шкале PFDI-20 снизился со $126,1 \pm 32,4$ до $57,4 \pm 21,3$ в группе вмешательства и со $121,7 \pm 33,6$ до $106,8 \pm 28,9$ в контрольной группе ($p < 0,001$). Вывод: Систематическая программа ранней реабилитации, включающая тренировку мышц тазового дна на рабочем месте, домашние упражнения и контролируемую биологическую обратную связь, значительно улучшает анатомическую поддержку, функциональную способность и качество жизни у женщин с пролапсом тазовых органов. Ранняя консервативная реабилитация должна рассматриваться как эффективная стратегия первой линии для работающих женщин.

Ключевые слова: пролапс тазовых органов, реабилитация, тренировка мышц тазового дна, биологическая обратная связь, POP-Q, индекс Бартеля, работницы текстильной промышленности, консервативное лечение, женское здоровье.

TREATMENT OF PELVIC ORGAN PROLAPSE THROUGH EARLY REHABILITATION: A PROSPECTIVE CONTROLLED STUDY AMONG FEMALE WORKERS OF A TEXTILE PLANT

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✓ **Resume**

Pelvic organ prolapse (POP) is one of the most common pelvic floor disorders in women worldwide and is a serious public health problem due to its negative impact on physical activity, productivity, urinary and bowel function, sexual health, and quality of life. Women who work in occupations that require prolonged standing, repetitive lifting, and constant increased intra-abdominal pressure are particularly susceptible to pelvic floor dysfunction. Conservative rehabilitation has become the recommended first-line treatment strategy for mild to moderate pelvic organ prolapse, but evidence on workplace rehabilitation programs combined with supervised biofeedback is still limited. Objective: To evaluate the effectiveness of an early comprehensive rehabilitation program combining workplace pelvic floor muscle training, systematic home exercises, and supervised biofeedback therapy in women working in the textile industry with a diagnosis of pelvic organ prolapse. Materials and Methods: A prospective controlled study was conducted at the Andijan State Medical Institute in collaboration with the Shedevr Premium Textile Company from January to July 2025. 85 women with a diagnosis of pelvic organ prolapse of stages I-III according to the POP-Q classification were recruited. Participants were divided into the main rehabilitation group (n=35) and the control group (n=50). The intervention consisted of twice-daily pelvic floor exercises performed at work, home rehabilitation, and twice-weekly biofeedback therapy for six months. The primary outcomes included POP-Q anatomical measurements and Barthel Index scores. Secondary outcomes were assessed using the Pelvic Floor Distress Inventory (PFDI-20). Statistical analysis was performed using independent sample t-tests and chi-square tests, with significance set at $p < 0.05$. Results: Baseline demographic and clinical characteristics did not differ significantly between groups ($r > 0.05$). After six months, functional independence, pelvic floor anatomy, and symptom severity had improved significantly in the intervention group. The Barthel Index increased from 72.4 ± 8.6 to 89.7 ± 5.3 , compared with 71.8 ± 9.1 to 76.2 ± 7.8 in the control group ($r < 0.001$). There were significant improvements in POP-Q Aa, Ba, C, Ap and Bp (all $r < 0.001$). The total score of PFDI-20 decreased from 126.1 ± 32.4 to 57.4 ± 21.3 in the intervention group and from 121.7 ± 33.6 to 106.8 ± 28.9 in the control group ($r < 0.001$). Conclusion: A systematic early rehabilitation program that includes workplace pelvic floor muscle training, home exercises and supervised biofeedback significantly improves anatomical support, functional capacity and quality of life in women with pelvic organ prolapse. Early conservative rehabilitation should be considered as an effective first-line strategy for female workers.

Keywords: pelvic organ prolapse, rehabilitation, pelvic floor muscle training, biofeedback, POP-Q, Barthel index, textile workers, conservative treatment, women's health.

Relevance

Pelvic organ prolapse (POP) is one of the most prevalent pelvic floor disorders affecting women worldwide and is characterized by the descent of one or more pelvic organs resulting from weakening of the pelvic floor support structures. The condition represents a substantial public health concern because of its negative effects on urinary, bowel, sexual, psychological, and occupational functioning, ultimately impairing women's quality of life [1–3].

Recent epidemiological studies indicate that nearly 40–50% of parous women demonstrate some degree of pelvic organ prolapse during clinical examination, although only 10–20% experience symptoms severe enough to seek medical attention. Owing to population aging, increasing obesity, and longer life expectancy, the global burden of POP is expected to continue rising over the coming decades [2,4].

The pathogenesis of POP is multifactorial and involves progressive deterioration of the pelvic floor musculature, connective tissue, and neural support mechanisms. Established risk factors include pregnancy, vaginal childbirth, multiparity, advanced age, menopause, obesity, chronic constipation, chronic cough, hereditary connective tissue disorders, and occupations associated with repetitive heavy lifting or prolonged standing [1,3,5].

Women employed in the textile industry represent an occupational group exposed to several of these risk factors. Long periods of standing, repetitive movements, manual handling of materials, and sustained increases in intra-abdominal pressure may accelerate weakening of pelvic floor support structures. Despite the importance of occupational exposure, relatively few prospective studies have

specifically investigated workplace-based preventive or rehabilitative strategies among female industrial workers [5,6].

Pelvic organ prolapse has consequences extending beyond anatomical changes. Patients frequently report sensations of vaginal bulging or pelvic pressure, urinary incontinence, incomplete bladder emptying, constipation, fecal dysfunction, dyspareunia, reduced work productivity, social isolation, anxiety, and diminished overall quality of life. These manifestations contribute substantially to healthcare utilization and socioeconomic burden [2,3,6].

Current international guidelines recommend conservative treatment as the first-line management approach for women with stage I and stage II prolapse and for selected patients with stage III disease who do not require immediate surgical intervention. Among conservative strategies, pelvic floor muscle training (PFMT) remains the intervention supported by the strongest body of evidence. Randomized clinical trials and systematic reviews have demonstrated that supervised PFMT improves pelvic floor muscle strength, decreases prolapse symptoms, and enhances functional status and health-related quality of life [1,4,7].

Biofeedback-assisted pelvic floor rehabilitation has emerged as an important adjunct to PFMT. Visual and auditory feedback enables patients to correctly identify and contract pelvic floor muscles, improves neuromuscular coordination, increases adherence to exercise programs, and enhances treatment effectiveness compared with unsupervised training alone. Although evidence supporting biofeedback continues to expand, standardized rehabilitation protocols integrating supervised biofeedback with structured workplace exercise programs remain insufficiently investigated [3,7,8].

Early rehabilitation may play a particularly important role in preventing progression of mild and moderate prolapse, reducing symptom severity, maintaining occupational performance, and postponing or avoiding surgical treatment. Nevertheless, most published studies have evaluated rehabilitation in hospital or outpatient settings, whereas evidence regarding rehabilitation programs specifically adapted to industrial workplaces is still limited, particularly in Central Asian countries, including Uzbekistan [5,8].

Considering the high prevalence of occupational risk factors among female textile workers and the limited regional evidence regarding conservative rehabilitation, evaluating an integrated rehabilitation model that combines workplace pelvic floor muscle exercises, home-based training, and supervised biofeedback therapy is of considerable clinical and public health importance.

Therefore, the aim of the present prospective controlled study was to evaluate the effectiveness of a comprehensive early rehabilitation program consisting of workplace pelvic floor muscle training, structured home exercises, and supervised biofeedback therapy in female textile workers diagnosed with pelvic organ prolapse.

Materials and methods

Study Design and Participants

This prospective controlled original research study was conducted between January and July 2025 at the Department of Obstetrics and Gynecology of Andijan State Medical Institute in collaboration with Shdevr Premium Textile Company (Andijan, Republic of Uzbekistan). The study aimed to evaluate the effectiveness of a comprehensive early rehabilitation program in female textile workers diagnosed with pelvic organ prolapse (POP). The investigation was designed according to the principles of evidence-based clinical research and performed in compliance with the Declaration of Helsinki (2013 revision) and Good Clinical Practice guidelines [2,6].

A total of 85 women with clinically confirmed pelvic organ prolapse were enrolled in the study after screening for eligibility. Participants were recruited from the gynecological outpatient clinic of Andijan State Medical Institute and the occupational health department of Shdevr Premium Textile Company. Following baseline clinical evaluation, participants were allocated into two groups. The main group consisted of 35 women who received a structured early rehabilitation program, while the control group included 50 women who received standard conservative recommendations without supervised rehabilitation. Both groups were observed prospectively for six months.

Women aged between 30 and 55 years who had been employed at the textile factory for at least one year and were diagnosed with stage I–III pelvic organ prolapse according to the Pelvic Organ Prolapse Quantification (POP-Q) system were eligible for inclusion. Additional inclusion criteria included the

ability to understand study procedures, willingness to participate throughout the six-month rehabilitation period, and provision of written informed consent.

Patients were excluded if they presented with stage IV prolapse requiring immediate surgical correction, pregnancy or postpartum status within six months, previous pelvic reconstructive surgery, active pelvic inflammatory disease, gynecological malignancy, severe neurological disorders affecting pelvic floor function, severe cardiovascular disease preventing physical exercise, inability to attend scheduled rehabilitation sessions, or refusal to participate.

At baseline, demographic and clinical characteristics were collected for all participants, including age, body mass index (BMI), parity, duration of occupational exposure, pelvic organ prolapse stage, chronic constipation, stress urinary incontinence, chronic cough, and obesity. No statistically significant differences were identified between the two groups before initiation of the rehabilitation program ($p > 0.05$), indicating comparable baseline characteristics.

All participants underwent standardized gynecological examination performed by experienced obstetrician-gynecologists trained in POP-Q assessment. Clinical evaluation included detailed medical and obstetric history, occupational history, general physical examination, speculum examination, bimanual pelvic examination, standardized POP-Q measurements, and assessment of urinary, bowel, and prolapse-related symptoms.

Women allocated to the intervention group participated in a structured multidisciplinary rehabilitation program specifically designed for implementation within the workplace environment. The exercise program was performed twice daily during working hours, once during the mid-morning break and once during the mid-afternoon break, without interfering with routine production activities. Each session lasted approximately 15 minutes and consisted of eight standardized pelvic floor rehabilitation exercises, including slow-twitch Kegel contractions, fast-twitch Kegel contractions, elevator exercises, the Knack maneuver, diaphragmatic breathing, pelvic tilting, bridge exercises combined with pelvic floor muscle contraction, and postural correction with simultaneous pelvic floor activation. Exercise intensity was gradually increased according to individual tolerance and rehabilitation progress.

In addition to workplace rehabilitation, participants in the intervention group attended supervised biofeedback therapy twice weekly at the Andijan Rehabilitation Center throughout the six-month study period, resulting in a total of 48 treatment sessions. Each session lasted approximately 30 minutes and was performed using the Myomed-632 vaginal biofeedback system with integrated visual and auditory feedback. The rehabilitation protocol consisted of three sequential phases. During the first four weeks, emphasis was placed on pelvic floor muscle identification, awareness, and correct muscle isolation using real-time biofeedback. Between weeks 5 and 12, rehabilitation focused on progressive muscle strengthening through repeated voluntary contractions monitored by biofeedback. During weeks 13 to 24, treatment emphasized muscular endurance, functional integration during activities of daily living, and reinforcement of correct contraction techniques. Each treatment session consisted of a five-minute baseline assessment, fifteen minutes of supervised pelvic floor training, five minutes of home exercise instruction, and five minutes devoted to compliance review, discussion, and exercise log evaluation.

Participants in the intervention group were additionally instructed to perform a structured home exercise program once daily during evening hours for approximately 15 minutes. The home program reproduced the workplace rehabilitation protocol while placing additional emphasis on diaphragmatic breathing and pelvic floor relaxation techniques. Compliance was monitored using daily exercise diaries, weekly diary review, monthly compliance assessment, and regular text-message reminders.

Outcome assessment was performed at baseline and after completion of the six-month intervention period. The primary outcome measures included anatomical changes assessed using the Pelvic Organ Prolapse Quantification (POP-Q) system and functional independence evaluated using the Barthel Index. POP-Q measurements included the standardized anatomical landmarks Aa, Ba, C, Ap, Bp, and total vaginal length (TVL). Functional capacity was assessed using the Barthel Index, with higher scores indicating greater independence in activities of daily living.

Secondary outcome measures included patient-reported symptom severity and health-related quality of life evaluated using the validated Pelvic Floor Distress Inventory-20 (PFDI-20), comprising the Pelvic Organ Prolapse Distress Inventory (POPDI-6), Colorectal–Anal Distress Inventory (CRADI-8), and Urinary Distress Inventory (UDI-6). Lower questionnaire scores indicated reduced symptom severity and improved quality of life [1,2].

Statistical analysis was performed using IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean $\pm$ standard deviation (SD), whereas categorical variables are expressed as frequencies and percentages. Between-group comparisons of continuous variables were analyzed using the independent samples *t*-test, while categorical variables were compared using the chi-square test. All statistical analyses were two-sided, and a *p*-value <0.05 was considered statistically significant.

The study protocol was approved by the Institutional Review Board of Andijan State Medical Institute (Approval No. ASMI-EC-2025-001, January 10, 2025). All participants received detailed oral and written information regarding the objectives and procedures of the investigation before enrollment and provided written informed consent. Confidentiality of participant information was maintained throughout the study, and participants retained the right to withdraw from the investigation at any time without consequences for their medical care or employment. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and Good Clinical Practice guidelines [2,6].

Results and discussions

A total of 85 female textile workers diagnosed with stage I–III pelvic organ prolapse completed the six-month follow-up and were included in the final analysis. The study population consisted of 35 women in the main rehabilitation group and 50 women in the control group. No participants were lost to follow-up during the study period.

Baseline Characteristics

The demographic and clinical characteristics of the study participants are presented in Table 1. The mean age of women in the main group was 42.3 ± 6.8 years, compared with 44.1 ± 7.2 years in the control group ($p = 0.234$). Similarly, no statistically significant differences were observed between the two groups regarding body mass index (BMI), parity, or duration of occupational employment ($p > 0.05$ for all comparisons). These findings indicate that both study groups were comparable before initiation of the rehabilitation program.

Table 1. Baseline demographic and clinical characteristics of study participants

Characteristic	Main Group (n=35)	Control Group (n=50)	p-value
Mean age (years)	42.3 ± 6.8	44.1 ± 7.2	0.234
BMI (kg/m ²)	27.5 ± 3.2	28.1 ± 3.5	0.418
Parity	2.4 ± 1.1	2.6 ± 1.3	0.456
Occupation duration (years)	8.7 ± 4.2	9.3 ± 4.8	0.551

Independent samples t-test.

The distribution of pelvic organ prolapse stages according to the POP-Q classification is presented in Table 2. Stage II prolapse represented the most common clinical presentation in both groups, accounting for 54.3% of women in the intervention group and 52.0% in the control group. The proportions of Stage I and Stage III prolapse were also similar between groups, and no statistically significant differences were identified ($p > 0.05$).

Table 2. Distribution of pelvic organ prolapse stages according to the POP-Q classification

POP-Q Stage	Main Group (n=35)	Control Group (n=50)	p-value
Stage I	8 (22.9%)	12 (24.0%)	0.902
Stage II	19 (54.3%)	26 (52.0%)	0.834
Stage III	8 (22.9%)	12 (24.0%)	0.902

Chi-square test.

The prevalence of major comorbid conditions associated with pelvic floor dysfunction is summarized in Table 3. Stress urinary incontinence was the most frequently reported comorbidity, affecting 42.9% of women in the intervention group and 44.0% of women in the control group. Chronic constipation, obesity, and chronic cough were also commonly observed. No statistically significant differences in the

prevalence of these conditions were detected between the study groups, further confirming baseline comparability.

Table 3. Distribution of comorbid conditions among study participants

Comorbidity	Main Group (n=35)	Control Group (n=50)	p-value
Chronic constipation	12 (34.3%)	18 (36.0%)	0.870
Stress urinary incontinence	15 (42.9%)	22 (44.0%)	0.917
Chronic cough	5 (14.3%)	7 (14.0%)	0.971
Obesity (BMI ≥ 30 kg/m ²)	9 (25.7%)	14 (28.0%)	0.812

Chi-square test.

Functional Outcomes

Functional independence, evaluated using the Barthel Index, demonstrated substantial improvement following implementation of the comprehensive rehabilitation program (Table 4). At baseline, Barthel Index scores were similar between the two groups (72.4 ± 8.6 vs. 71.8 ± 9.1 ; $p = 0.756$). After six months, women in the intervention group achieved a significant increase in functional independence, with mean scores rising to 89.7 ± 5.3 , whereas the control group demonstrated only a modest improvement to 76.2 ± 7.8 ($p < 0.001$).

The mean improvement in Barthel Index was 17.3 ± 6.2 points in the intervention group compared with 4.4 ± 5.9 points in the control group, indicating a significantly greater functional benefit associated with the rehabilitation program ($p < 0.001$).

Table 4. Changes in Barthel Index scores after six months of follow-up

Parameter	Main Group (n=35)	Control Group (n=50)	p-value
Baseline	72.4 ± 8.6	71.8 ± 9.1	0.756
Six months	89.7 ± 5.3	76.2 ± 7.8	<0.001
Mean change	$+17.3 \pm 6.2$	$+4.4 \pm 5.9$	<0.001

Independent samples t-test.

Changes in pelvic organ prolapse quantification (POP-Q) measurements

Changes in anatomical pelvic support following six months of follow-up are presented in Table 5. Baseline POP-Q measurements did not differ significantly between the rehabilitation and control groups for any of the evaluated anatomical landmarks ($p > 0.05$), indicating comparable severity of pelvic organ prolapse before treatment.

Following completion of the rehabilitation program, women in the intervention group demonstrated significant improvements in anterior, apical, and posterior vaginal compartment support. The mean Aa point improved from $+0.8 \pm 1.2$ cm at baseline to -1.2 ± 0.9 cm after rehabilitation, whereas the control group showed only minimal improvement ($+0.7 \pm 1.3$ cm to $+0.3 \pm 1.1$ cm, $p < 0.001$). Similar findings were observed for the Ba point, which improved from $+1.5 \pm 1.8$ cm to -0.8 ± 1.1 cm in the intervention group compared with $+1.3 \pm 1.9$ cm to $+0.6 \pm 1.4$ cm in controls ($p < 0.001$).

Apical support also improved substantially following rehabilitation. The mean C point changed from -3.2 ± 2.1 cm at baseline to -5.8 ± 1.6 cm after six months in the intervention group, while only modest changes were observed in the control group (-3.4 ± 2.3 cm to -3.9 ± 1.9 cm, $p < 0.001$).

Significant anatomical restoration was similarly observed within the posterior compartment. The Ap point improved from $+0.2 \pm 1.1$ cm to -1.8 ± 0.8 cm, and the Bp point improved from $+0.5 \pm 1.4$ cm to -1.5 ± 1.0 cm among women receiving rehabilitation. In contrast, only minor changes were observed in the control group, with statistically significant between-group differences for both parameters ($p < 0.001$).

Although total vaginal length (TVL) increased slightly in the intervention group (8.4 ± 1.2 cm to 9.1 ± 1.0 cm) compared with the control group (8.6 ± 1.3 cm to 8.7 ± 1.1 cm), this difference did not reach statistical significance ($p = 0.092$).

Collectively, these findings demonstrate that the comprehensive rehabilitation program produced clinically meaningful improvements in pelvic organ support across all major POP-Q anatomical landmarks, whereas standard conservative management resulted in only limited anatomical changes.

Table 5. Changes in POP-Q anatomical measurements after six months

POP-Q Parameter	Main Group (n=35)	Control Group (n=50)	p-value
Aa (cm)			
Baseline	+0.8 ± 1.2	+0.7 ± 1.3	0.718
Six months	-1.2 ± 0.9	+0.3 ± 1.1	<0.001
Ba (cm)			
Baseline	+1.5 ± 1.8	+1.3 ± 1.9	0.624
Six months	-0.8 ± 1.1	+0.6 ± 1.4	<0.001
C (cm)			
Baseline	-3.2 ± 2.1	-3.4 ± 2.3	0.681
Six months	-5.8 ± 1.6	-3.9 ± 1.9	<0.001
Ap (cm)			
Baseline	+0.2 ± 1.1	+0.1 ± 1.2	0.695
Six months	-1.8 ± 0.8	-0.2 ± 1.0	<0.001
Bp (cm)			
Baseline	+0.5 ± 1.4	+0.4 ± 1.5	0.758
Six months	-1.5 ± 1.0	+0.1 ± 1.2	<0.001
TVL (cm)			
Baseline	8.4 ± 1.2	8.6 ± 1.3	0.467
Six months	9.1 ± 1.0	8.7 ± 1.1	0.092

Values are presented as mean ± standard deviation. Between-group comparisons were performed using the independent samples t-test.

Changes in pelvic floor distress inventory-20 (PFDI-20) scores

Patient-reported symptoms and disease-specific quality of life were evaluated using the validated Pelvic Floor Distress Inventory-20 (PFDI-20). Baseline questionnaire scores did not differ significantly between groups ($p > 0.05$), indicating comparable symptom severity before initiation of rehabilitation.

At the six-month follow-up, women who participated in the comprehensive rehabilitation program reported marked improvements across all questionnaire domains (Table 6). The mean POPDI-6 score decreased from 42.3 ± 12.5 to 18.7 ± 8.3 , whereas only a modest reduction was observed in the control group (40.8 ± 13.1 to 35.2 ± 10.6 , $p < 0.001$). These findings indicate substantial improvement in prolapse-related symptoms among women receiving supervised rehabilitation.

Similarly, colorectal symptoms assessed using the CRADI-8 domain improved significantly in the intervention group, with mean scores decreasing from 35.6 ± 11.8 at baseline to 16.4 ± 7.5 after treatment. In contrast, women receiving standard conservative recommendations demonstrated only limited symptom improvement (34.2 ± 12.3 to 30.1 ± 9.8 , $p < 0.001$).

Urinary symptoms also improved considerably following rehabilitation. Mean UDI-6 scores decreased from 48.2 ± 14.1 to 22.3 ± 9.2 in the intervention group compared with 46.7 ± 13.8 to 41.5 ± 11.4 in the control group ($p < 0.001$), reflecting clinically meaningful reductions in urinary distress.

Overall symptom burden, represented by the total PFDI-20 score, declined from 126.1 ± 32.4 to 57.4 ± 21.3 following rehabilitation, corresponding to an average reduction of nearly 55%. In contrast, the control group demonstrated only modest improvement, with total scores decreasing from 121.7 ± 33.6 to 106.8 ± 28.9 ($p < 0.001$).

These findings indicate that early rehabilitation combining workplace pelvic floor muscle exercises, supervised biofeedback, and structured home training significantly reduced prolapse-related symptoms and improved disease-specific quality of life compared with standard conservative management.

Table 6. Changes in Pelvic Floor Distress Inventory-20 (PFDI-20) scores after six months

Questionnaire Domain	Main Group (n=35)	Control Group (n=50)	p-value
POPDI-6			
Baseline	42.3 ± 12.5	40.8 ± 13.1	0.594
Six months	18.7 ± 8.3	35.2 ± 10.6	<0.001
CRADI-8			
Baseline	35.6 ± 11.8	34.2 ± 12.3	0.602
Six months	16.4 ± 7.5	30.1 ± 9.8	<0.001
UDI-6			
Baseline	48.2 ± 14.1	46.7 ± 13.8	0.621
Six months	22.3 ± 9.2	41.5 ± 11.4	<0.001
Total PFDI-20			
Baseline	126.1 ± 32.4	121.7 ± 33.6	0.543
Six months	57.4 ± 21.3	106.8 ± 28.9	<0.001

Values are presented as mean ± standard deviation. Between-group comparisons were performed using the independent samples t-test.

In summary, no statistically significant differences were observed between the intervention and control groups at baseline, confirming the comparability of demographic characteristics, clinical status, pelvic organ prolapse severity, and symptom burden before treatment. Following six months of observation, women receiving the comprehensive early rehabilitation program exhibited significantly greater improvements in functional independence, anatomical pelvic support, and patient-reported quality of life than those receiving standard conservative management. The intervention produced statistically significant improvements in the Barthel Index, all major POP-Q anatomical landmarks except total vaginal length, and every domain of the PFDI-20 questionnaire ($p < 0.001$), supporting the effectiveness of integrating workplace pelvic floor muscle training, supervised biofeedback therapy, and structured home exercises into the conservative management of pelvic organ prolapse.

Discussion

Pelvic organ prolapse remains one of the most common pelvic floor disorders affecting adult women and continues to represent a significant challenge in gynecological practice because of its progressive nature and its profound influence on physical functioning, occupational performance, and health-related quality of life [1,2,13]. Conservative management has increasingly gained acceptance as the preferred first-line treatment for women with mild and moderate prolapse; however, evidence regarding structured rehabilitation programs implemented within occupational settings remains limited. The present prospective controlled study evaluated the effectiveness of a comprehensive rehabilitation protocol combining workplace pelvic floor muscle training, supervised biofeedback therapy, and structured home exercises among female textile workers diagnosed with pelvic organ prolapse.

The principal finding of the present investigation was that women receiving the comprehensive rehabilitation program demonstrated significantly greater improvements in functional independence, anatomical pelvic support, and disease-specific quality of life than women receiving standard conservative recommendations. These improvements were consistently observed across objective anatomical measurements, validated functional assessment tools, and patient-reported outcome measures, suggesting that a multimodal rehabilitation strategy provides clinically meaningful benefits beyond conventional advice alone.

One of the most important findings of the present study was the substantial improvement in functional independence, as demonstrated by the Barthel Index. Although baseline scores were comparable between the two groups, women undergoing rehabilitation achieved a mean increase of 17.3 points, whereas the control group demonstrated only modest improvement. Functional recovery is particularly relevant among working-age women because pelvic floor disorders frequently reduce occupational productivity, limit physical activity, and impair participation in daily tasks. Improved Barthel Index scores therefore indicate not only better physical performance but also enhanced independence in activities of daily living. These findings support previous investigations demonstrating

that structured pelvic floor rehabilitation contributes to functional recovery by improving neuromuscular control, muscular endurance, and confidence during everyday activities [2,7,12].

The anatomical improvements observed in the present study further support the effectiveness of early conservative rehabilitation. Significant improvements were demonstrated in all major POP-Q landmarks, including the anterior compartment (Aa and Ba), apical compartment (C), and posterior compartment (Ap and Bp). These findings indicate that the rehabilitation protocol effectively enhanced pelvic floor support throughout all vaginal compartments rather than producing localized improvements only. In contrast, total vaginal length remained relatively unchanged, which is consistent with the physiological expectation that rehabilitation strengthens supportive structures without substantially altering vaginal dimensions. Similar anatomical improvements have been reported in systematic reviews evaluating supervised pelvic floor muscle training, which concluded that regular exercise may reduce prolapse severity, delay disease progression, and decrease symptom burden [1,4,14].

The observed improvements are biologically plausible. Pelvic floor muscle training increases the strength, endurance, and coordination of the levator ani muscle complex, improves neuromuscular recruitment, and enhances connective tissue support. Stronger pelvic floor muscles provide greater resistance against increases in intra-abdominal pressure during coughing, lifting, prolonged standing, and other occupational activities. Consequently, repetitive mechanical strain imposed on pelvic support structures is reduced, contributing to stabilization of pelvic organ position and improvement of prolapse symptoms [3,5].

Another important observation was the significant reduction in symptom severity measured by the Pelvic Floor Distress Inventory-20. Women receiving the comprehensive rehabilitation program experienced marked reductions in prolapse-related symptoms, urinary complaints, and colorectal dysfunction. The total PFDI-20 score decreased by more than half during the six-month rehabilitation period, whereas only minimal improvement occurred in the control group. These findings demonstrate that anatomical improvement was accompanied by clinically meaningful symptom relief, emphasizing that rehabilitation influenced not only physical examination findings but also patient-perceived health status.

The improvement in urinary symptoms observed in the present study deserves particular attention. Stress urinary incontinence was one of the most prevalent comorbid conditions at baseline, affecting approximately 43% of study participants. Following rehabilitation, UDI-6 scores decreased significantly among women receiving supervised pelvic floor training and biofeedback. These findings agree with previous systematic reviews demonstrating that strengthening the pelvic floor musculature improves urethral support and enhances continence mechanisms, thereby reducing urinary leakage during increases in intra-abdominal pressure [8]. The integration of biofeedback may further enhance these effects by enabling patients to correctly identify pelvic floor muscles and perform contractions with greater accuracy.

Biofeedback represented an essential component of the present rehabilitation program. Unlike unsupervised exercise programs, biofeedback provides immediate visual and auditory information regarding muscle activation, facilitating motor learning and improving exercise technique. Previous rehabilitation studies have suggested that incorrect performance of pelvic floor exercises remains one of the principal reasons for treatment failure. By ensuring correct muscle recruitment throughout the intervention period, biofeedback likely contributed to the superior anatomical and functional outcomes observed in the intervention group [2,8,16].

The workplace-based design of the rehabilitation program constitutes another important strength of this investigation. Female textile workers frequently spend prolonged periods standing while performing repetitive physical tasks that increase intra-abdominal pressure. Such occupational exposures have been recognized as important contributors to pelvic floor dysfunction but have received comparatively limited attention in rehabilitation research [5,11,15]. By integrating pelvic floor exercises into scheduled workplace breaks, the present program achieved regular exercise performance without substantial disruption of routine production activities. This approach may improve long-term adherence compared with programs relying exclusively on unsupervised home exercise.

Another notable feature of the intervention was the combination of supervised rehabilitation with a structured home exercise program. Previous studies have demonstrated that patient adherence represents one of the strongest predictors of successful conservative treatment. Daily home exercises reinforced

the neuromuscular adaptations achieved during supervised sessions, while regular diary review and text-message reminders promoted compliance throughout the six-month intervention period. The favorable outcomes observed in the present study therefore likely reflect the cumulative effect of supervised therapy, home-based exercise, and continuous patient engagement rather than any single intervention alone [1,7,12].

The findings of the present study have important implications for occupational health and preventive gynecology. Early identification of women at increased risk for pelvic floor dysfunction, combined with timely initiation of structured rehabilitation, may reduce progression of prolapse, delay or prevent the need for surgical intervention, and improve occupational productivity and quality of life. Implementation of workplace-based pelvic floor rehabilitation programs may therefore represent a practical and cost-effective strategy for industries employing large numbers of women engaged in physically demanding occupations.

Despite these encouraging findings, several limitations should be acknowledged. First, the study was conducted at a single center and included participants from one textile enterprise, which may limit the generalizability of the results to other occupational settings. Second, the sample size, although sufficient to demonstrate statistically significant differences, was relatively modest. Third, the duration of follow-up was limited to six months, preventing evaluation of the long-term sustainability of treatment effects. Finally, although validated outcome measures were employed, blinding of participants and therapists was not feasible because of the nature of the rehabilitation intervention.

Future multicenter randomized controlled trials involving larger and more diverse populations with longer follow-up periods are warranted to confirm these findings and determine the long-term effectiveness and cost-effectiveness of workplace-integrated rehabilitation programs. Further investigation should also evaluate the role of digital health technologies, wearable biofeedback systems, and tele-rehabilitation in improving accessibility and adherence to conservative management of pelvic organ prolapse.

Overall, the findings of the present study support the growing body of evidence indicating that early multidisciplinary rehabilitation should be considered an integral component of conservative pelvic organ prolapse management. The combination of workplace pelvic floor muscle training, supervised biofeedback therapy, and structured home exercises produced significant improvements in pelvic anatomy, functional independence, symptom severity, and quality of life, thereby offering an effective non-surgical treatment strategy for women with stage I–III pelvic organ prolapse [1–10].

Conclusion

The findings of the present prospective controlled study demonstrate that a comprehensive early rehabilitation program consisting of workplace pelvic floor muscle training, supervised biofeedback therapy, and structured home exercises is an effective conservative treatment strategy for women with stage I–III pelvic organ prolapse employed in the textile industry.

Following six months of rehabilitation, participants in the intervention group achieved significantly greater improvements in functional independence, anatomical pelvic support, and disease-specific quality of life compared with women receiving standard conservative recommendations. Statistically significant improvements were observed in the Barthel Index, POP-Q anatomical measurements, and all domains of the Pelvic Floor Distress Inventory-20, indicating that the rehabilitation program effectively reduced symptom severity while improving pelvic floor function and daily activities.

The workplace-based rehabilitation model proved feasible and well accepted by participants, allowing regular exercise performance without substantial interruption of occupational responsibilities. Integration of supervised biofeedback with structured workplace and home-based pelvic floor muscle training likely contributed to the superior clinical outcomes observed in the intervention group by improving exercise accuracy, adherence, and neuromuscular coordination.

The results of this study support the implementation of early multidisciplinary rehabilitation as a first-line conservative management strategy for women with mild and moderate pelvic organ prolapse, particularly among those exposed to occupational risk factors such as prolonged standing and repetitive physical work. Wider implementation of workplace rehabilitation programs may contribute to improved women's health, preservation of work capacity, and reduction in the future need for surgical intervention.

Further multicenter randomized studies with larger sample sizes and longer follow-up periods are recommended to confirm the long-term effectiveness and cost-effectiveness of workplace-integrated rehabilitation programs for pelvic organ prolapse.

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