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Effect of aerobic exercise on quality of life in postmenopausal women with stress urinary incontinence

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ABSTRACT

Objective: To assess the effect of aerobic exercise on the quality of life in postmenopausal women with stress urinary incontinency (SUI).

Methods: Thirty participants with SUI were qualified for analysis (mean age 55.1 ± 4.5). They were allocated into two equal groups in number. Group (A) received pelvic floor muscles (PFM) training sessions three times per week for three consecutive months, while group (B) received sessions in which they did aerobic exercise in addition to the PFM training three times per week for three consecutive months. Assessment of all patients was carried out before and after the treatment program through a 36-item short form survey to assess their quality of life.

Findings: The analysis demonstrated that the training program for group B (PFM + Aerobic exercise) brought better effects in comparison to the program for group A (PFM only), with the improvement observed in such QoL domains at the physical functioning (PF), role limitation due to emotional problems (RE), social functioning (SF), general health (GH), but there was no significant difference between both groups in terms of vitality (VIT), emotional wellbeing (EW) or body pain (BP).

Conclusions: Aerobic exercise training is an effective treatment to improve quality of life in post-menopausal women with stress urinary incontinence.

KEYWORDS: Post-Menopause; Stress Urinary Incontinence; QoL; Aerobic Exercise

1. INTRODUCTION

SUI is defined as the involuntary loss of urine during exertion or when the intra-abdominal pressure increases, such as sneezing, exercise, coughing or laughing. The main cause of SUI is poor urethral support caused by the weakening of the pelvic floor muscles and intrinsic sphincter deficiency (1). Stress urinary incontinence is a common problem among post-menopausal women and has a significant impact on their quality of life as it causes physical and psychological deterioration such as anxiety, depression, and decrease self-confidence (2).

The onset of menopause is considered a risk factor for SUI due to the hormonal changes and estrogen deficiency (3). The reduction of estrogen levels associated with menopause can trigger signs and symptoms of pelvic floor dysfunction, such as urinary incontinence, this leads to a decrease in muscle tone and reduced blood circulation to the urinary-genital tract causing weakness and atrophy. Therefore, weaker PFM after menopause naturally occurs causing a decline in the urinary sphincteric pressure along with a lessened control and support for the pelvic organs, which leads to more frequent urination times (2).

SUI could reduce the quality of life (QoL) in many aspects. It also causes social and hygienic concerns, due to the fear of urine dripping and the need for more frequent changes of clothing (4). Moreover, a lot of studies showed that urinary incontinence affects the emotional and mental health, and there is a strong relationship between incontinence and depression (5). Other studies have been conducted to determine the negative effects of menopausal changes in quality of life, as the menopausal phase itself might also be a source of psychological distress or instability (6). Therefore, the patients with SUI normally change their lifestyle, and that leads to social isolation and reduction of social activity, depression, and anxiety, on top of having the potential alter the family relationships. As a consequence of this, when assessing or treating patient with SUI, we should consider well their lifestyle, their mental and social well-being (1).

Pelvic floor muscle training is an effective treatment for SUI and is considered the most important physical therapy method in the treatment of UI. It is believed that there is a relationship between functional capacity and UI, considering that performing exercise programs improves muscle strength, especially those muscles with postural or stabilizing roles as they are extensively employed during whole body exercises. Moreover, the PFMs that are responsible for the voluntary urinary continence mechanism are also considered stabilizers and postural muscles, and can be reflexively activated during physical exercise (7). A raise in intra-abdominal pressure causes reflexive contraction of the PFMs. Consequently, PFM training increases the muscles' mass and strength, as well as their

capacity to contract and resist greater intra-abdominal pressures, enabling them to prevent urine leakages (8).

To achieve this, a patient might perform aerobic exercises, that are defined as moderate-intensity exercises that involve larger muscle groups and are performed over prolonged periods to improve the cardiovascular function. Aerobic exercises increase the body's capacity to absorb, deliver, and utilize oxygen. It is necessary to maintain an adequate dose of 40% to 60% of the maximal aerobic capacity, regardless of the type of exercise used in the aerobic exercise program (e.g., walking and cycling) (9). Aerobic exercise might improve the quality of life by improving the psychological wellbeing, physical performance, and functional ability. Additionally, aerobic exercise has a significant effect in the management of mood disorders, depression, and anxiety (10). The possible scientific mechanism that allows exercises to enhance mood are based on raising endocannabinoid levels, which have a direct association with analgesia and a sense of well-being (11). On top of that, regular exercise has also been found to enhance health functions and physical capacity and increases self-esteem in elderlies (12). Finally, aerobic exercises reduce fatigue, improve the immune system, and play a part in enhancing the mental health, such as anxiety, depression, and mood disorders (10,13).

The short form 36 (SF-36) scale is a questionnaire measuring the QoL of patients with urinary incontinence. The Short Form 36 is a reliable, valid questionnaire with 36 questions. It was standardized as a self-report evaluation of physical and functional health and well-being. The scales are based on two outline measures which are the physical and mental health. It was used commonly as a general population survey and, in clinical researches, this questionnaire is translated to more than 40 languages (14,15).

2. METHODS

2.1. Participants

From among 50 patients, 30 were qualified for the study; and based on urodynamic test results, an interview was carried out with the gynaecological examination indicating stage 1&2 of SUI. The qualifying examinations for the study were performed at the Department of Gynaecology of the Kasr Al Ainy University hospital. The criteria for inclusion in the study were grade 1&2 SUI: grade I means that there are urinary incontinences while coughing or sneezing, and grade II means that there are urinary incontinences while running or picking up heavy objects without urinary urgency; being in the 50-60 years age-bracket; at least one vaginal delivery; and the patient's written consent to take part in the study. The criteria for exclusion from the study were a higher stage SUI, urge or mixed urinary incontinence, prolapse according to the Pelvic Organ Prolapse Quantification (POP-Q), system and

diabetes. This study was approved by the Ethical committee of the faculty of the physical therapy of Cairo University (decision no.012/002199). A written informed consent was required from all the volunteers before their participation in the study.

The patients (n = 30) were assigned into two groups by a computer draw, group A (n = 15) and group B (n = 15). Group (A) only received pelvic floor muscle training two sessions per week for 3 consecutive months. Group (B) performed pelvic floor muscle training in addition to aerobic exercise two sessions per week for the same period. An assessment of all patients was carried out before and after the treatment program through the short form 36 format to assess their quality of life. The SF-36 quality of life scale is a multipurpose, short form health survey containing 36 questions. It yields an eight-scale profile of physical function (PF; 10 items), physical role dysfunction (PRD; 4 items), role of mental status (RMS; 3 items), mental health (MH; 5 items), vitality/energy (V/E; 4 items), pain (2 items), general health (GH; 5 items), and social function (SF; 2 items). Its subscales award health points range from 0 to 100 with Lower scores means more disability (14, 15).

2.2. Intervention

2.2.1. Pelvic floor training program for both groups (A&B)

The participants were taught about the anatomy of the pelvic floor and lower urinary tract, physiology, and continence mechanisms and instructed on how to contract the pelvic floor muscles correctly. The exercises were performed three times a week following this routine: three series of 10 repetitions of PFM contractions (5-6 seconds) with a strength of 60-70% MVC (maximum voluntary contraction), and two series of 10 repetitions of PFM contractions with a strength of 30-60% MVC. The exercises were performed two times per week for three consecutive months.

2.2.2. Aerobic exercise training for group (B)

Each patient in group (B) performed aerobic exercise in the form of walking on a treadmill for 30 minutes. The first stage consisted of walking for 5 minutes as warming–up. The second stage consisted of walking on a treadmill at low speed for 20 minutes on a moderate intensity (65-75 % of maximum heart rate). The third stage consisted of walking for 5 minutes to cool down at low speed. The treatment sessions were repeated three times per week for 3 consecutive months.

2.3. Statistical analysis

Descriptive statistics analysis and t-test were conducted for comparison of the mean age, weight, height, and BMI between both groups. A Mann-Whitney test was conducted to compare mean

values of SF-36 between groups. The level of significance for all statistical tests was set at $p < 0.05$. All statistical measures were performed through the statistical package for social studies (SPSS) version 25 for windows.

3. RESULTS

The characteristics of the study subjects as age, weight, height and body mass index are shown in Table 1.

Table 1. The mean age, weight, height, and BMI of both groups (A and B).

	Group A	**Group B**	**t- value**	**p-value**	**Sig**
	$\overline{X}$ **± SD**	$\overline{X}$ **± SD**			
Age (years)	56.4± 2.6	57.23 ± 2.83	1.25	0.35	NS
Weight (kg)	84.6 ± 6.7	84.38 ± 9.23	0.60	0.55	NS
Height (cm)	155.6 ± 2.32	160.26 ± 4.75	-0.38	0.66	NS
BMI (kg/m²)	27.94 ± 1.77	27.33 ± 2.7	0.65	0.56	NS

$\overline{X}$: Mean; SD: Standard Deviation; MD: Mean difference value: Unpaired t value; p value: Probability value; NS: Non-significant.

3.1. The eight domains of SF 36 (Table 2 & Figure 1)

Physical functioning (PF): The median (IQR) of PF for group A before intervention was 40 (50-30) and that of group B was 45 (50-35). There was no significant difference in PF between both groups (A and B) pre-treatment ($p = 0.31$). There was a significant increase in the PF of group B compared with that of group A post-treatment ($p = 0.008$).

Role limitation due to physical health (RP): The median (IQR) of RP of group A before the intervention was 35 (40-20) and that of group B was 30 (40-25). There was no significant difference in RP between both groups (A and B) pre-treatment ($p = 0.86$).

Role limitation due to emotional problems (RE): The median (IQR) of RE pre-treatment of group A was 33.3 (33.3-33.3) and that of group B was 33.3 (33.3-33.3). There was no significant difference in RE between both groups (A and B) pre-treatment ($p = 0.63$). There was a significant difference in RE between groups post-treatment, in favour of group B ($p = 0.03$).

Vitality (VIT): The median (IQR) of VIT pre-treatment of group A was 40 (55-30) and that of group B was 45 (55-35). There was no significant difference in VIT between both groups (A and B) pre-treatment ($p = 0.42$). There was no significant difference in VIT between group A and B post-treatment ($p = 0.15$).

Emotional wellbeing (EW): The median (IQR) of EW pre-treatment of group A 44 (56-40) and that of the group B was 48 (56-40). There was no significant difference in EW between both groups (A and B) pre-treatment (p = 0.83). There was no significant difference in the EW of group B compared with that of group A post treatment (p = 0.2).

Social Functioning (SF): The median (IQR) of SF pre-treatment of group A was 50 (50-37) and that of group B was 50 (62.5-37.5). There was no significant difference in SF between both groups (A and B) pre-treatment (p = 0.83). There was a significant increase in SF in both groups (A&B) post-treatment (p = 0.01).

Bodily pain (BP): There was significant increase in the median (IQR) of BP pre-treatment of the group A was 45 (55-32.5) and that of the group B was 45 (50-35). There was no significant difference in BP between group A and B pre-treatment (p = 0.65). There was a significant increase in BP in both groups (A&B) post treatment (p = 0.01).

General health (GH): The median (IQR) of GH pre-treatment of group A was 35 (45-25) and that of group B was 40 (40-35). There was no significant difference in BP between both groups (A and B) pre-treatment (p = 0.28). There was a significant increase in GH in both groups (A&B) post treatment (p = 0.01).

Table 2. Values of SF-36 for both groups (A and B) before and after the intervention

	Pre-treatment					**Post-treatment**				
	Group A	**Group B**	**U - value**	***p***	**Sig**	**Group A**	**Group B**	**U-value**	***p***	**Sig**
	Median (IQR)	**Median (IQR)**				**Median (IQR)**	**Median (IQR)**			
PF	40 (50-30)	45 (50-35)	89	0.31	NS	45 (55-40)	55 (65-50)	49.5	0.008	S
RP	35 (40-20)	30 (40-25)	108.5	0.86	NS	50 (50-25)	50 (75-50)	48.5	0.005	S
RE	33.3 (33.3-33.3)	33.3 (33.3-33.3)	105	0.63	NS	66.7 (66.7-33.3)	66.7 (100-66.7)	70	0.03	S
VIT	40 (55-30)	45 (55-35)	93.5	0.42	NS	50 (60-35)	55 (65-45)	79	0.15	NS
EW	44 (56-40)	48 (56-40)	107.5	0.83	NS	52 (68-44)	60 (68-52)	82.5	0.2	NS
SF	50 (50-37)	50 (62.5-37.5)	107.5	0.83	NS	50 (62-50)	75 (78.5-62.5)	65.5	0.01	S
BP	45 (55-32.5)	45 (50-35)	102	0.65	NS	47.5 (55-45)	55 (55-50)	79.6	0.16	NS
GH	35 (45-25)	40 (40-35)	87	0.28	NS	40 (50-35)	50 (60-45)	55.5	0.01	S

IQR: Interquartile Range; U-value: Mann-Whitney test value; p-value: Probability value; NS: Non-significant; S: Significant

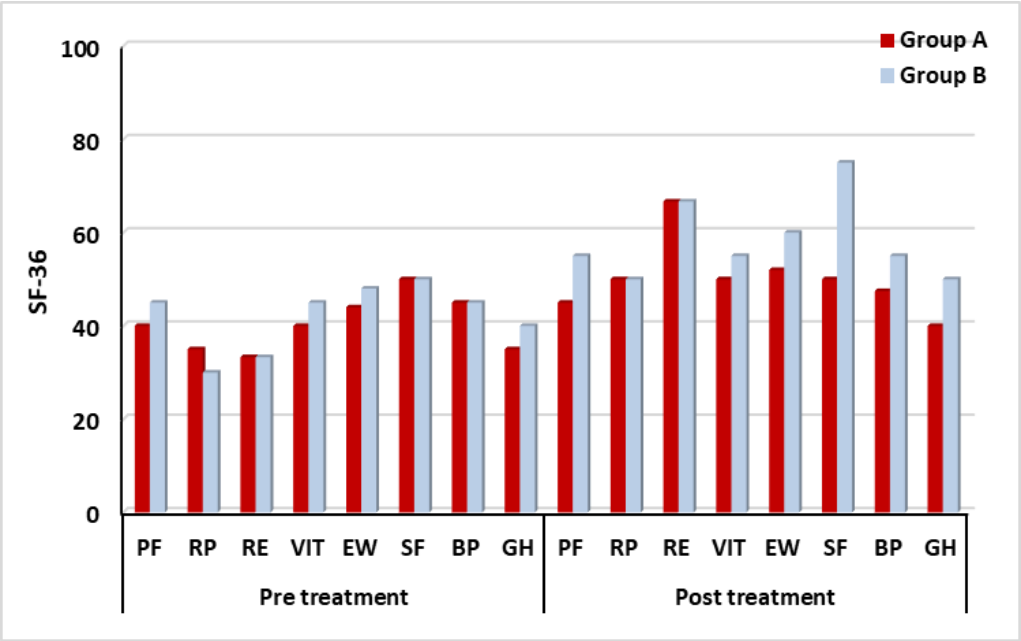

Figure 1. SF-36 scores for groups A and B prior to and following the intervention

4. DISCUSSION

Stress urinary incontinence (SUI) involves an involuntary leakage of urine that occurs following a sudden rise in intra-abdominal pressure caused by coughing, sneezing, straining, laughing, or other physical activities. It happens when the intravesical pressure exceeds the maximum urethral pressure in the absence of a detrusor contraction (16). SUI has a devastating effect on women's quality of life in the physical, social, sexual, and psychological spheres. Women restrict or diminish their activity and social participation, with serious implications (17). This clinical trial was designed to investigate the impact of aerobic exercise on health-related quality of life in women with stress urinary incontinence. We concluded that 12 weeks trial of aerobic exercise significantly improved their quality of life. The analysis results after the exercise training program demonstrated that conservative treatment based on group B's training program (PFM + Aerobic exercise) yielded statistically significantly better results than group A's program (PFM only). This was supported by Ptak et al. (18) who reported that PFM training and exercises for supporting muscles provided a significant enhancement in many domains of QoL while the similar effect was not observed for isolated PFM training only.

Moreover, other studies (8,19) reported that, women who engaged in a regular moderate physical exercise training have a lower prevalence of UI and pelvic organ prolapse compared to their sedentary counterparts because their pelvic floor would be stronger and more resistant. The PFM are responsible for stabilizing and maintaining the body balance, and they are directly engaged in the core system and postural control, so their activation will be even higher in the aerobic activities which require coordination. Also, El Nahas et al. (20) reported that, adding aerobic exercise to biofeedback-assisted Kegel exercises would improve PFMs' strength and thickness and improve quality of life to a higher degree than biofeedback-assisted Kegel exercises by themselves. The effect of aerobic exercise on the PFM activity and SUI symptoms depends on two points. Firstly, that the action and synergy will enhance the PFM activity and function. Secondly, that it has an excellent effect on the quality of life, self-esteem, and depression (8). Aerobic exercise training has a significant effect on the QoL in many aspects such as the physical, psychological, and cognitive functions, as it considered an effective and cost-efficient alternative therapy for anxiety disorders, as well as other psychological disorders. Aditionally, treadmill walking exercise training have proved to be an effective way in improving sense of wellbeing, physical performance, functional ability, cognition, and mental health (10).

The results of this study indicated a positive effect of PFM training on QoL in-group (A). In studies conducted by Pereira et al. (21) a group of 45 women was divided into 3 distinct groups – a vaginal cone group (VG), a PFMT group, and a control group (no therapy). After 6 weeks of therapy, a significant improvement ($p<0.01$) in terms of QoL was observed in both the VG group and the PFMT group, compared with the control group. The following 2 studies (186 women) compared abdominal muscle training (TrA) to PFMT monotherapy. Konstantinidou et al. (22) found that improvement in QoL was observed in both groups, and no significant differences were found between them. Whereas, Ptak et al. (18) observed better results in the combined therapy group (TrA+PFMT). Women who performed pelvic floor exercise for 8 weeks had fewer occurrences of UI and a better quality of life than those who did not exercise.

Therefore, women with UI should be encouraged to do pelvic floor exercises regularly to prevent or reduce incontinence and enhance their quality of life (23). Similarly, in the study conducted by Castro et al. (24) patients in the pelvic floor muscle exercise group (n=31), compared to the no treatment group, were found to have a significant improvement in their QOL score.

5. CONCLUSIONS

Aerobic exercise, specifically the treadmill walking exercise training, is an effective treatment to improve quality of life in post-menopausal women with stress urinary incontinence.

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AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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