

The impact of Femi Therapy on body weight, symptom occurrence in perimenopausal women, and long-term changes in dietary habits and lifestyle

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ABSTRACT

Aim: The aim of this study was to assess the impact of Femi Therapy, an important element of which is sulphur water crenotherapy, on body weight, the alleviation of menopausal symptoms, and the regulation of hormone levels in perimenopausal women, as well as to define new directions for treatment and development in Busko-Zdrój.

Materials and Methods: The research was carried out as part of project no. RPSW.01.02.00-26-0020/21 titled: «Use of crenotherapy with therapeutic sulphide water in alleviating menopausal symptoms», implemented under the Regional Operational Programme of the Świętokrzyskie Voivodeship for 2014-2020 and co-financed by the European Union from the European Regional Development Fund. A comparative study was conducted on a group of 100 menopausal women aged 45-60. Study group, which underwent crenotherapy, consisted of 70 women, while the control group, which did not drink sulphide water, included 30 women. Additionally, Femi Therapy included diet and physical activity. The main research tool was a diary in which participants noted their symptoms, physical activity, and the products and drinks they consumed.

Results: Statistically significant differences were found between the study group and the control group with normal body mass when comparing differences in body mass, body fat mass, and waist and hip circumference. Statistically significant differences were also observed between the overweight groups when comparing the percentage of body fat after the therapy.

Conclusions: The results of the analyses are promising and show that Femi Therapy can help improve body mass and composition, as well as lifestyle. However, further studies are needed to confirm the effectiveness of Femi Therapy.

KEYWORDS: diet, menopause, health resort tourism, Busko-Zdrój, crenotherapy

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INTRODUCTION

Menopause is a period in a woman's life marked by a decline in ovarian hormonal function and the permanent cessation of menstruation. This stage typically occurs around the age of 50 [1]. Hormonal changes, combined with improper nutrition and lifestyle habits, result in a range of physiological alterations that can lead to various ailments and diseases, thereby reducing quality of life. The symptoms experienced during menopause can vary greatly among women in both intensity and frequency. The most common symptoms include: fatigue, exhaustion, hot flashes, increased sweating, sleep disorders, reduced physical performance, weight gain, increased fat mass and changes in its distribution, lipid metabolism disorders, atherosclerosis, hypertension, ischemic heart disease, insulin resistance, type 2 diabetes, metabolic syndrome, osteoporosis, urinary incontinence, mood swings, depressive episodes, and mental health disorders [2-4].

In today's world, perimenopausal women are actively engaged in professional, family, and social life. Therefore, the symptoms and illnesses associated with menopause can significantly impact their functioning and quality of life. This life stage thus requires special attention to health. Research findings indicate that lifestyle modifications – including dietary habit changes, increased physical activity, and the elimination of stimulants – can alleviate menopausal symptoms and reduce the risk of diseases associated with this period [2,3,4]. For this reason, nutritional education for menopausal women and the promotion of a healthy lifestyle appear to be essential. At the same time, the search for new methods to minimize the negative effects of menopause remains a current challenge and an important need for contemporary women.

The research problem addressed in this study was to investigate the impact of crenotherapy on the occurrence of symptoms in perimenopausal women, and subsequently, as

part of development work, to create a therapeutic program which, in its final stage, was implemented as a commercial health tourism product.

The main objective of the first stage of the industrial research was to acquire new knowledge on the effects of sulphide water in alleviating menopausal symptoms, which was confirmed by the positive verification of the primary hypothesis:

H.0. Sulphide water crenotherapy contributes to the reduction of menopausal symptoms, as well as the supplementary hypothesis:

H.1. Sulphide water crenotherapy regulates hormonal changes during menopause. The second stage of the study included verification of the additional hypothesis:

H.2. Weight reduction positively correlates with the frequency of vasomotor symptoms. An additional objective was to submit a patent application for the invention regarding the use of crenotherapy in alleviating menopausal symptoms.

AIM

The aim of this study was to assess the impact of Femi Therapy, an important element of which is sulphur water crenotherapy, on body weight, the alleviation of menopausal symptoms, and the regulation of hormone levels in perimenopausal women, as well as to define new directions for treatment and development in Busko-Zdrój.

MATERIALS AND METHODS

The study was conducted as part of project no. RPSW.01.02.00-26-0020/21 entitled: «*The use of crenotherapy with therapeutic sulphide water in alleviating menopausal symptoms*», implemented under the Regional Operational Programme of the Świętokrzyskie Voivodeship for 2014–2020, co-financed by the European Union from the European Regional Development Fund. The project was carried out at the BRISTOL**** ART & Medical SPA Hotel in Busko-Zdrój.

The study was conducted among women aged 45–60 (52.66 ± 4.33) who reported experiencing at least 9 symptoms from a list of clinically recognized menopausal symptoms. These included: hot flashes, tension or nervousness, irritability, anxiety attacks, crying spells over trivial matters, difficulty falling asleep or insomnia, concentration problems, dizziness, headaches, heart palpitations, shortness of breath, lack of energy, and decreased interest in sexual activity. Preliminary selection also involved an analysis of a recruitment questionnaire to identify contraindications to crenotherapy.

A comparative study was conducted on a total sample of 100 menopausal women. The women were subjected to Femi Therapy, which included crenotherapy, diet and physical activity. The study group consisted of participants undergoing crenotherapy – i.e., drinking sulphide water – while the control group did not consume the sulphide water. The study participants were categorized into three groups based on Body Mass Index (BMI): normal weight (BMI 18.5–24.9 kg/m²), overweight (BMI 25–29.9 kg/m²), and obese (BMI >30 kg/m²). Eligibility for the groups was determined by physicians and dietitians, based on patient interviews and health contraindications to crenotherapy. Table 1 presents the numbers of each group.

Participants in the study stayed at the hotel for 10 days under the supervision of a multidisciplinary team (dietitians, physicians, physiotherapist, and personal trainer), after which they continued the therapy at home for 20 days following specific guidelines provided during nutritional education by a dietitian and recommendations from a personal trainer regarding physical activity. During the continuation of therapy at home, patients sent photos of the diary to specialists, which allowed them to maintain control over filling in the diary and adhering to the recommendations. After three months, long-term changes in lifestyle and symptom perception were also monitored.

The study group consumed a sulphide water blend (100 ml) from the Les Winiarski spring, mixed with freshly squeezed juice (200 ml). The control group received mineral water with juice in the same proportion. Table 2 presents the differences in the composition of these waters. Apart from this difference, all other aspects of the therapy – such as exercise, treatments, and diet – were implemented identically for both groups.

The diet provided during the hotel stay, as well as the nutritional recommendations for home continuation, were based on the recommendations of the normocalorie and Mediterranean diets and the healthy eating guidelines of the National Center for Nutritional Education. Physical activity included pelvic floor exercises, hormonal yoga, dance classes, personal training sessions, Nordic walking, and aqua aerobics. According to the assumptions, the participants were to perform at least 60 minutes of physical activity daily, both in the hotel and at home.

In both groups, the impact of crenotherapy was analyzed using both objective (measurable) and subjective (patient-reported) parameters. Assessments were conducted before the start of the therapy, during the therapy, after its completion, and three months post-intervention. These assessments included:

Table 1. Group size divided into study and control groups and groups according to BMI index

Groups	Group size	Group size according to BMI index		
		Proper body weight	Overweight	Obesity
Study group	70 women	32	27	11
Control group	30 women	10	15	5

Source: compiled by the authors of this study

Table 2. Comparison of the composition of sulphide water consumed by the study group and the mineral water drunk by the control group

Mineral content [mg/dm ³]	Study group	Control group
	Sulphide water from the Les Winiarski spring	Buskowińska mineral water
Mineralization	12 700	797,40
H ₂ S, HS ⁻ , S ²⁻	45,00	-
Iodine I ⁻	2,20	-
Chlorides Cl ⁻	5955,60	59,60
Sulphates SO ₄ ²⁻	1617,20	100,10
Bicarbonates HCO ₃ ³⁻	399,80	433,30
Bromides Br ⁻	5,00	-
Fluorine	-	0,20
Sodium Na ⁺	3896,80	24,35
Potassium K ⁺	106,80	8,04
Calcium Ca ²⁺	340,68	130,90
Magnesium Mg ²⁺	221,18	27,13

Source: compiled by the authors based on [5,6]

- Symptom tracking through a patient diary maintained over the 30-day therapy period (10 days at the facility and 20 days at home),
- Bone density testing (densitometry),
- Laboratory tests of blood and urine (including hormone levels),
- Body temperature imaging (thermographic photos),
- Dietary analysis of body composition and measurements.

The primary research tool was a diary in which participants recorded information related to food intake, course of therapy, menopausal symptoms, medications, and emotional well-being.

In order to check the significance of the differences obtained in the two studied groups, a mean comparison test was performed. For this purpose, the t-statistic was calculated and compared with the critical value selected from the t-student tables.

The study was conducted with the approval of the Bioethics Committee operating under the Świętokrzyskie Medical Chamber in Kielce. In accordance with the Committee's recommendations, all participant data, consents, and declarations were secured and stored in compliance with applicable legal regulations and the internal procedures of the research and development institution.

Due to the large number of tests conducted and data collected, this article presents only selected findings, focusing primarily on the impact of crenotherapy on anthropometric measurements, the occurrence of selected menopausal symptoms, and long-term changes in dietary habits and lifestyle. The remaining results will be presented in subsequent articles.

RESULTS

THE IMPACT OF FEMI THERAPY ON BODY WEIGHT, COMPOSITION, AND CIRCUMFERENCE MEASUREMENTS

In the normal weight group, some participants had BMI values bordering on overweight and showed abnormalities in body composition analysis, which qualified them for improvement. In this group, body weight decreased by 1.4 kg in the treatment group and by 0.6 kg in the control group (Table 3), leading to a corresponding reduction in BMI by 0.5 kg/m² and 0.2 kg/m², respectively. Visceral fat levels decreased by 0.7 points in the treatment group and 0.1 points in the control group. Femi Therapy also had a significant effect on body circumferences: a total reduction of 6.3 cm in the treatment group and 3.1 cm in the control group. Additional circumferential changes are detailed in Table 3. Statistically significant differences were obtained when comparing body weight, fat tissue mass and waist and hip circumferences.

Among overweight participants, the average body weight reduction was 2.7 kg in the treatment group and 2.4 kg in the control group, resulting in a BMI decrease of 1.0 kg/m² and 0.9 kg/m², respectively. Visceral fat levels decreased by 0.8 points in the treatment group and 0.9 points in the control group. Favorable reductions were also observed in waist and hip circumferences:

- Waist: -3.2 cm (treatment), -2.9 cm (control)
- Hips: -2.8 cm (treatment), -2.2 cm (control)

Further details are shown in Table 3. A statistically significant difference was obtained when comparing the percentage of body fat.

Table 3. Comparison of the effects of crenotherapy on body weight, composition, and circumference in the treatment and control groups over 30 days

Changes in measurements	Proper body weight		Student's t-test		Overweight		Student's t-test		Obesity		Student's t-test	
	Study group	Control group	t		Study group	Control group	t		Study group	Control group	t	
body weight, kg	-1,4	-0,6	2,033*		-2,7	-2,4	0,311		-4,0	-3,4	0,343	
body fat, kg	-1,2	-0,4	2,317*		-2,0	-2,4	1,665		-3,0	-2,2	0,744	
body fat, %	-1,3	-0,3	1,871		-1,4	-2,1	2,082*		-1,5	-1,1	0,473	
total body circumferences, cm	-6,3	-3,1	-		-9,0	8,9	-		11,3	-10,1	-	
waist circumference, cm	-2,5	-0,9	2,471*		-3,2	-2,9	0,611		-3,3	-2,9	0,355	
hip circumference, cm	-1,8	-0,5	2,724*		-2,8	-2,2	1,131		-3,0	-3,7	0,689	
arm circumference, cm	-0,5	-0,5	0,401		-0,9	-1,0	1,006		-1,4	-1,0	0,574	
thigh circumference, cm	-1,3	-1,2	0,365		-1,8	-2,3	1,114		-2,9	-2,2	0,993	
calf circumference, cm	-0,2	0,0	0,888		-0,3	-0,5	1,490		-0,7	-0,3	1,341	

* – statistically significant t-test results

Source: compiled by the authors of this study

Among women diagnosed with obesity, an average weight loss of 4.0 kg was recorded in the treatment group and 3.4 kg in the control group. BMI decreased by 1.5 kg/m² and 1.3 kg/m², respectively. Visceral fat levels dropped by 0.7 points in the treatment group and 0.8 points in the control group.

A substantial overall reduction in body circumference was observed:

- Treatment group: –11.3 cm
- Control group: –10.1 cm

Waist circumference decreased by 3.3 cm (treatment) and 2.9 cm (control).

Interestingly, in the case of gluteofemoral (hip/thigh) obesity, a larger reduction in hip circumference was recorded in the control group (3.7 cm) compared to the treatment group (3.0 cm). Other measurement changes are listed in Table 3. The differences presented in this group were not statistically significant.

Three months after starting the therapy, long-term effects on body weight and composition were assessed. It was observed that individuals who adhered to healthy dietary principles and regularly engaged in physical activity maintained the achieved weight reduction. In many cases, further weight loss was noted.

After three months:

- 52% of participants maintained their post-intervention weight,
- 17% continued to lose weight,
- 31% experienced weight gain.

THE IMPACT OF FEMI THERAPY ON LONG-TERM CHANGES IN DIETARY HABITS AND LIFESTYLE

Femi Therapy had a favorable effect on participants' lifestyle, leading to improved diet quality and increased physical activity.

Based on nutritional diaries, participants adopted regular eating patterns with appropriate meal frequency, better composition of balanced meals, greater intake of fruits, vegetables, and whole grains, and adequate hydration. Many women from both the treatment and control groups reported low water intake prior to the therapy – often only 1–2 glasses per day. After 30 days of therapy, both groups increased their water consumption to an average of 8.5 glasses per day, in line with dietary recommendations (1.5 to 2 liters per day).

Follow-up monitoring three months later showed that 43% of participants continued to follow healthy eating principles, 55% followed them partially, and 2% did not follow them at all.

Additionally, both groups increased their daily physical activity duration by approximately 70 minutes after the 30-day therapy period compared to baseline. In the treatment group, physical activity increased from an average of 23 minutes to 92 minutes per day, while in the control group, it increased from 26 minutes to 99 minutes per day. After the project ended, 31% of participants maintained this increased level of physical activity.

DISCUSSION

Menopausal symptoms and related health conditions can negatively affect women's daily functioning and diminish

their quality of life. As demonstrated by numerous studies, dietary habits and lifestyle – including physical activity – may influence not only the onset of menopause but also its progression. Furthermore, maintaining a healthy body weight, adopting nutritious eating habits, and engaging in regular physical activity help reduce the risk of diseases commonly associated with menopause.

There is no conclusive evidence that menopause is directly associated with an increased prevalence of excess body weight. However, some studies have indicated that the decline in estrogen levels contributes to changes in body composition, including an increase in visceral fat and central obesity in postmenopausal women [4,7]. Based on body composition analysis by Pachocka, menopausal women were found to have a higher fat mass and lower muscle mass compared to premenopausal women [2]. Another study showed that hormonal changes during menopause resulted in a 32% increase in gynoid fat and a 44% increase in visceral fat [8].

It is important to note that hormonal changes alone do not fully account for shifts in body composition and the development of related diseases. Modifiable factors such as lifestyle and diet also play a significant role. Research shows that the development of obesity with age is influenced by reduced physical activity, sedentary behavior, excessive intake of dietary fats, sucrose, and fructose, irregular eating patterns, and socioeconomic factors [9,10].

In the present study, obese women in the Femi Therapy group experienced an average fat mass reduction of 3 kg over one month. For comparison, another study involving perimenopausal women on a low-calorie Mediterranean diet reported an average fat mass reduction of 2.3 kg over eight weeks [8]. This suggests that sulphide water consumption – one of the key distinguishing factors in the Femi Therapy – may have contributed significantly to greater fat loss. However, one should be cautious when comparing the results of these studies because they also differed in other elements, such as physical activity.

Studies have also shown that the diets of menopausal women are often high in calories, irregular, and dominated by animal fats and red meat. This results in low carbohydrate intake and high intake of protein, total fat, and saturated fatty acids [2, 11].

In a study by Friedrich, the effect of dietary modification on the quantity and distribution of body fat in obese menopausal women was examined. Nutritional education led to a reduction in dietary energy intake and improved nutritional quality. These changes were associated with weight loss and reductions in both subcutaneous and visceral fat [12]. Similarly, the present study demonstrated the positive effect of nutrition education, which contributed to more regular meal patterns, increased consumption of fruits, vegetables, whole grains, and dietary fiber, and a

reduction in fatty meats in favor of lean meats and fish.

Lifestyle also plays a key role in maintaining health, improving well-being, and alleviating menopausal symptoms. Physical activity is particularly important. Exercise improves balance, enhances cognitive function, and significantly reduces the severity of menopausal symptoms [13,14].

Studies have confirmed that postmenopausal physical activity contributes to reductions in BMI and waist-to-hip ratio [15]. Physical exercise of at least moderate intensity has also been shown to improve bone density [16,17]. Other authors observed that physical activity reduced body weight, improved motor coordination and physical fitness, enhanced motivation among postmenopausal women [18], and positively impacted mental health [19].

However, another study found that nearly 90% of menopausal women report reduced quality of life and a reluctance to engage in physical activity due to climacteric symptoms [20]. Following Femi Therapy, an increase in daily physical activity duration was observed, and nearly one-third of participants maintained this higher level of activity after the project concluded. Additionally, a follow-up study conducted three months after the therapy showed that over 54% of the women reported improved quality of life.

Based on the discussed findings, it is evident that nearly every study evaluates the effects of different training protocols, making direct comparison difficult. Furthermore, in our study, physical activity was assessed using a diary and self-assessment. Nonetheless, the results clearly support recommending physical activity as a fundamental component of women's preventive healthcare.

CONCLUSIONS

In summary, the results of the analyses conducted are promising and show that Femi Therapy, an important element of which is crenotherapy with sulphide water, can help improve body weight and composition, as well as lifestyle.

In addition, it has also been shown that the studied therapy may have an impact on reducing menopausal symptoms, hormonal changes and other aspects of menopause related to bone demineralization or slowing down metabolic processes, as well as changes in body temperature – helping to reduce the occurrence of hot flashes. However, further studies are needed to confirm the effectiveness of Femi Therapy. They should include greater control of confounding factors such as physical activity and diet.

The results of the study have been implemented on the commercial market and have garnered significant interest among health tourists. Moreover, as part of the project, a patent application was submitted under the number P.445939, entitled: *"Use of crenotherapy in alleviating menopausal symptoms."*

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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