SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2025
ORGANIZATION AND MANAGEMENT SERIES NO. 222

FEMI – THERAPY FOR THE ALLEVIATION OF MENOPAUSAL SYMPTOMS - SHAPING NEW DIRECTIONS IN HEALTH TOURISM DEVELOPMENT THROUGH THE IMPLEMENTATION OF RESEARCH AND DEVELOPMENT ACTIVITIES AND MARKET LAUNCH

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Purpose: The aim of this article is to present the concept and outcomes of completed research and development (R&D) activities, as well as the market implementation, as part of the smart specialisation strategy in the field of health tourism. The research was undertaken to define new therapeutic directions in the health resort of Busko-Zdrój, through the development of novel methods for the use of sulphur-rich medicinal waters and the introduction of innovative health tourism products to the market.
Design/methodology/approach: The study was conducted on a group of 100 female patients under the supervision of a Bioethics Committee, using a comparative research methodology. The research encompassed both theoretical and practical aspects within the field of innovation management.
Findings: The research confirmed the effectiveness of crenotherapy using medicinal water. As a result, new treatments were developed, forming the foundation of a therapy aimed at alleviating menopausal symptoms. This therapy has been given the marketing name *FEMI THERAPY*, abbreviated as *FEMI*.
Research limitations/implications: Limitations of the study include the sample size, the scope of conducted research, and the lack of long-term patient follow-up. Additional constraints stem from the slow pace of societal change in attitudes towards menopause, which still remains a culturally sensitive and often overlooked topic.
Practical implications: The outcomes of the research, particularly the development of new treatment procedures, have been implemented in practice as part of a therapeutic programme. This programme has been introduced to the market as an innovative health tourism product. The commercialisation of the research results enables the implementing entity, FONTIA Sp z o.o., to derive economic benefits by incorporating FEMI THERAPY into its permanent offer. Conducting in-house research also strengthens the company's competitive position and distinguishes its offer in the marketplace.

Social implications: The societal impact of the research is multidimensional. The most significant aspect is the challenge it poses to the taboo surrounding menopause in society. Although public awareness of the issue is increasing, it remains a topic that is often avoided. Another key dimension is the response to a real societal need — the development of a dedicated therapy for alleviating menopausal symptoms. Furthermore, the advancement of health tourism through innovative therapies contributes to the creation of new jobs and enhances employees' competences not only in therapeutic skills but also in research capabilities. This, in turn, increases job satisfaction and motivation for continued professional development.
Originality/value: The authors aimed to explore the subject of innovation management and entrepreneurial discovery as a means of shaping new directions in the development of health tourism, recognised as a smart specialisation of the Świętokrzyskie region. The target audience of this publication includes participants in the innovation ecosystem, serving as a showcase of good practices for entrepreneurs, academia, and public administration alike.
Keywords: innovation management, commercialization of R&D results, health tourism, menopause.
Category of the paper: Research and development work involving a medical experiment and market implementation.

1. Introduction

The implementation of innovation policy within the framework of smart specialisations enables the co-financing of the entrepreneurial discovery process aimed at identifying new development directions in industries designated as drivers of regional growth. In the Świętokrzyskie Voivodeship, due to the endogenous potential of sulphur-rich medicinal waters, entrepreneurs operating in the health tourism sector, in collaboration with research institutions, are able to carry out research and development (R&D) projects, thereby expanding their fields of activity.

This article describes activities undertaken as part of Project No. RPSW.01.02.00-26-0020/21 entitled "Use of Crenotherapy with Sulphur-Rich Medicinal Water in Alleviating Menopausal Symptoms," implemented under the Regional Operational Programme of the Świętokrzyskie Voivodeship 2014-2020, co-financed by the European Union through the European Regional Development Fund. The project was carried out in Busko-Zdrój between June 2022 and November 2023.

The research was one of the strategic components of the beneficiary's long-term objectives, which included:

- defining new therapeutic directions in Busko-Zdrój,
- developing new methods for utilising sulphur-rich medicinal waters,
- protecting and efficiently exploiting valuable deposits of medicinal waters,
- enhancing staff knowledge and competences related to R&D implementation,
- distinguishing the facility's offer and strengthening its competitive position by improving service quality.

Moreover, social goals played a key role, particularly in breaking the taboo surrounding menopause. There was also a strong motivation to address menopausal symptoms by researching and developing a set of treatments forming a dedicated therapy. The involvement of staff in the research process contributed to increased job satisfaction and motivation for continued professional development. Additionally, it supported the creation of new jobs, thus fostering innovative growth within the health tourism sector.

2. Health tourism as a platform for innovative menopausal therapies

The main research area of the project focused on issues associated with the menopausal period in women and the potential for alleviating its burdensome symptoms. The study included both biological sample analyses (laboratory tests) and physical measurements related to temperature variability, conducted under the supervision of the Kielce University of Technology as part of commissioned research.

The solution was developed based on a model for creating innovative approaches in health tourism. This model involves innovation management through the identification of needs, existing solutions, and resulting problems. A detailed analysis of these identified problems enables the selection of an interdisciplinary expert team that generates creative ideas and solutions based on specialist knowledge (Knefel et al., 2024).

Primary industrial research was carried out to acquire new knowledge about the beneficial impact of crenotherapy with sulphur-rich water on menopausal symptom relief and hormonal regulation during menopause. The study group consisted of women aged 45-60 who reported experiencing at least 9 symptoms from a predefined list of clinical indicators (outlined in section 3).

The medical experiment was conducted under the supervision of the Bioethics Committee of the Collegium Medicum at Jan Kochanowski University in Kielce. It was based on a patented technology developed by the Beneficiary for masking the unpleasant taste and smell of sulphur-rich water (Invention No. P.430598: “Method for masking the salty taste and hydrogen sulphide odour of sulphur-rich medicinal water and its application in crenotherapy”).

In conventional medicine, the most common approach to managing menopause is hormone replacement therapy (HRT). Recently, various preparations based on natural compounds—used as dietary supplements—have also gained popularity. Since HRT affects both symptom intensity and hormone levels, the study sample was divided into groups using and not using HRT.

The study was conducted according to the methodology of comparative research on a total sample of 100 menopausal women in 4 groups, depending on the use of hormone replacement therapy:

- Study group using sulfide water crenotherapy - 70 women:
  a) Study sample 1 - women not using HTZ - 57 women.
  b) Study sample 2 - women using HTZ - 13 women.
- Control group using plain water crenotherapy - 30 women:
  a) Control sample 3 - women not using HTZ - 26 women.
  b) Control sample 4 - women using HTZ - 4 women.

The research group consumed a mixture of sulphur-rich medicinal water sourced from the Las Winiarski intake, combined in a 100 ml medicinal water to 200 ml fresh juice ratio. The juices comprised approximately 150 ml of vegetable and 50 ml of fruit juice, including about 10 ml of lemon juice to reduce the hydrogen sulphide aftertaste.

The control group consumed regular mineral water mixed with the same juices. Apart from this difference, all other elements of the therapy—exercises, treatments, and diet—were implemented identically. To ensure the reliability and comparability of the results, it should be noted that the participants were not given sulphur baths and were instructed to avoid them for three months during the study period.

In each group, the impact of crenotherapy (sulphur-rich vs mineral water mixes) was analysed across various measurement parameters. A series of biological tests were conducted before, during, one month after completing the therapy, and up to three months post-treatment.

Participants using HRT were defined as those taking exogenous oestrogens (either in combination with progestogens or alone) and their derivatives in doses used for hormone replacement therapy or combined oral contraceptives. Women using only progestogens were excluded from the HRT category. Assignment to research or control groups was carried out by physicians in consultation with dietitians, based on interviews and contraindications for crenotherapy.

In all groups, the effect of crenotherapy was evaluated based on both objective (measurable) and subjective (self-reported) parameters. The primary research tool was a patient diary, in which participants recorded details of their therapy, menopausal symptoms, medications, emotional wellbeing, and more.

The following parameters were analysed:

- Menopausal symptoms based on the 30-day diary (10 days in the research facility + 20 days at home).
- Bone density scans (before, after one month, and three months post-treatment).
- Laboratory blood and urine tests, including hormone levels (before, after one month, and three months post-treatment).
- Body temperature monitoring via thermographic imaging (before, after 10 days, after one month, and after three months).
- Dietary assessments of body composition and circumferences (before, after 10 days, after one month, and after three months).

Due to space constraints, this article focuses particularly on the results related to the alleviation of menopausal symptoms.

The primary aim of the industrial research was to acquire new knowledge on the impact of sulphur-rich water on menopausal symptom relief, which was confirmed by the validation of the main hypothesis:

- **H.0:** Sulphur-rich water crenotherapy contributes to the reduction of menopausal symptoms.
- **H.1 (supplementary hypothesis):** Sulphur-rich water crenotherapy regulates hormonal changes during menopause.

The main objective of the development phase was to verify the hypothesis:

- **H.2:** Body weight reduction positively correlates with the frequency of vasomotor symptoms.

The development stage combined the outcomes of the industrial research with secondary data and existing knowledge. As a result, a structured therapy for alleviating menopausal symptoms was developed and prepared for commercial implementation in the health tourism services market. This enabled the achievement of the project's defined milestones.

3. Menopause as a Health and Social Challenge

Menopause, also referred to as the climacteric or the perimenopausal period, is a stage in a woman's life marked by the permanent cessation of menstruation and a decline in ovarian hormonal activity. This phase typically occurs around the age of 50 (Rumianowski et al., 2012). The intensity and frequency of menopausal symptoms vary between individuals. Hormonal changes, poor diet, and an unhealthy lifestyle can lead to numerous physiological processes that may result in various ailments and conditions negatively affecting quality of life.

The age at which menopause occurs can significantly influence the risk of certain diseases. Studies have shown that late-onset menopause is associated with an increased risk of endometrial and breast cancer, while early menopause increases the risk of osteoporosis and cardiovascular diseases (Sapre, Thakur, 2014). Research also indicates that multiple factors may affect the age of onset, including parity, body weight, weight gain after the age of 20, dietary habits, intake of specific nutrients, and the use of stimulants or substances (Rumianowski et al., 2012; Piotrowska, Majchrzycki, 2013).

Menopausal symptoms are a common concern, affecting approximately 80% of women aged 45-60, with an average duration of more than seven years (Avis et al., 2015). The following symptoms were considered in the study:

- palpitations (rapid or forceful heartbeat),
- tension or nervousness,
- a feeling of pressure or tightness in the head,
- difficulty breathing,
- hot flushes,
- episodes of anxiety or panic attacks,
- irritability,
- numbness in parts of the body,
- muscle and joint pain,
- loss of interest in sexual activity,
- crying for trivial reasons or without cause,
- dizziness or fainting,
- difficulty falling asleep or insomnia,
- loss of interest in most activities,
- trouble concentrating,
- headaches,
- hyperactivity,
- fatigue or lack of energy,
- feelings of sadness or depression,
- numbness in the hands or feet,
- night sweats.

During menopause, attention to one's health becomes crucial. Studies have shown that lifestyle changes—such as improved eating habits, increased physical activity, and avoidance of stimulants—can help alleviate menopausal symptoms and reduce the risk of associated diseases (Pachocka, 2010; Iwanowicz-Palus et al., 2013; Dunneram et al., 2014). This formed the basis of the researchers' motivation to create a therapeutic programme aimed at mitigating menopausal symptoms, as part of the innovative development of health tourism.

4. Results of the Study on Menopausal Symptoms

For a period of 30 days, patients completed a diary (research tool) in which they recorded, among other things, the presence of menopausal symptoms on a daily basis, using a scale from 1 to 3 (where 1 indicated a mild level and 3 a severe level). The analysis followed a methodology based on comparing the intensity and frequency of each symptom over three 10-day periods.

As shown in Figure 1, symptom intensity was clearly higher in the groups not using hormone replacement therapy (HRT), which is consistent with the expected outcomes of HRT application. Moreover, in the research subgroups, the reduction in symptom severity persisted during the final 10-day period (days 21-30), while in the control subgroups, an increase in symptom intensity was observed.

The period covering days 1-10 was considered the baseline (100%). For each symptom, percentage changes were calculated in the subsequent periods, and an average was determined.

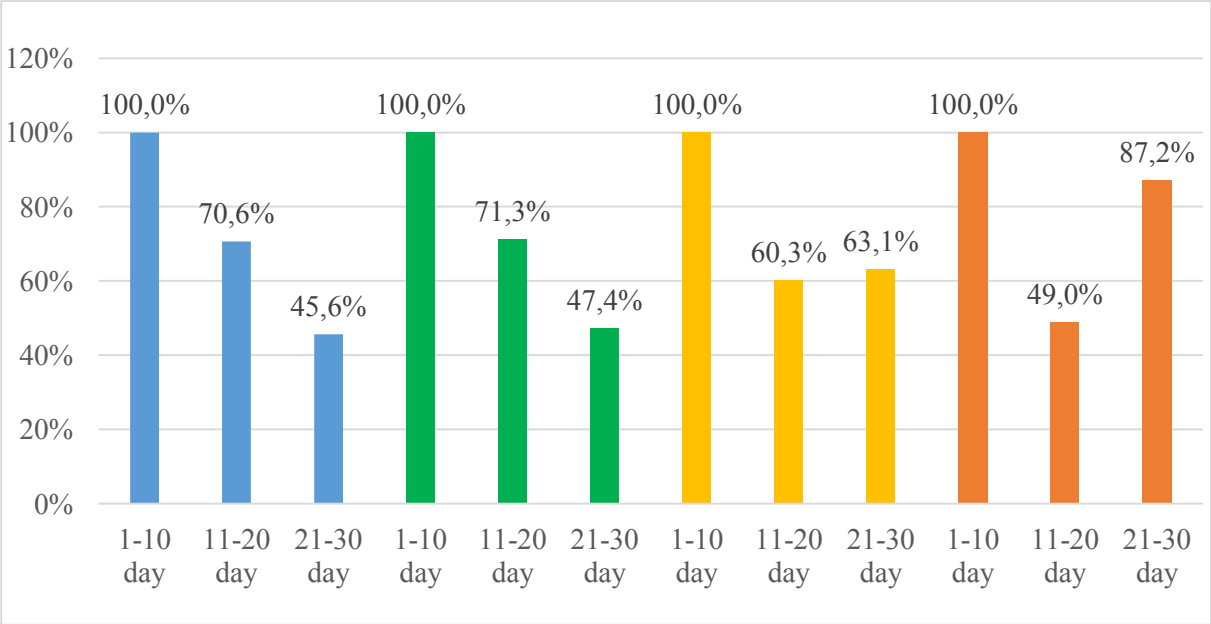

Figure 1. Menopausal Symptoms Over Three 10-Day Therapy Periods (Percentage-Based Analysis). Source: own elaboration.

The most frequently reported symptoms included fatigue and lack of energy, loss of interest in most activities, feelings of sadness or depression, crying for trivial reasons or without clear cause, headaches, numbness in the hands and feet, and difficulty concentrating.

Given that a review of the relevant literature indicates a link between diet, the timing of menopause onset, and the associated manifestation of menopausal symptoms (Dunneram et al., 2014), an in-depth analysis was conducted to examine symptom intensity in relation to BMI (Body Mass Index), using a comparative approach.

The BMI categories applied were as follows:

- **BMI Group A – Underweight:** below 18.5 kg/m².
- **BMI Group B – Normal weight:** 18.5–24.9 kg/m².
- **BMI Group C – Overweight:** 25–29.9 kg/m².
- **BMI Group D – Obesity:** over 30 kg/m².

The data analysis confirmed the effectiveness of HRT in reducing menopausal symptoms. At the same time, in the research subgroups (undergoing sulphur water therapy), each BMI group showed a decrease in both intensity and frequency of symptoms. In contrast, the control subgroups (receiving standard mineral water) experienced an increase in symptom severity—

particularly among women in the obese category (BMI Group D). These findings are illustrated in **Figure 2** (Note: No participants were classified as underweight; therefore, BMI Group A is not included in the chart.)

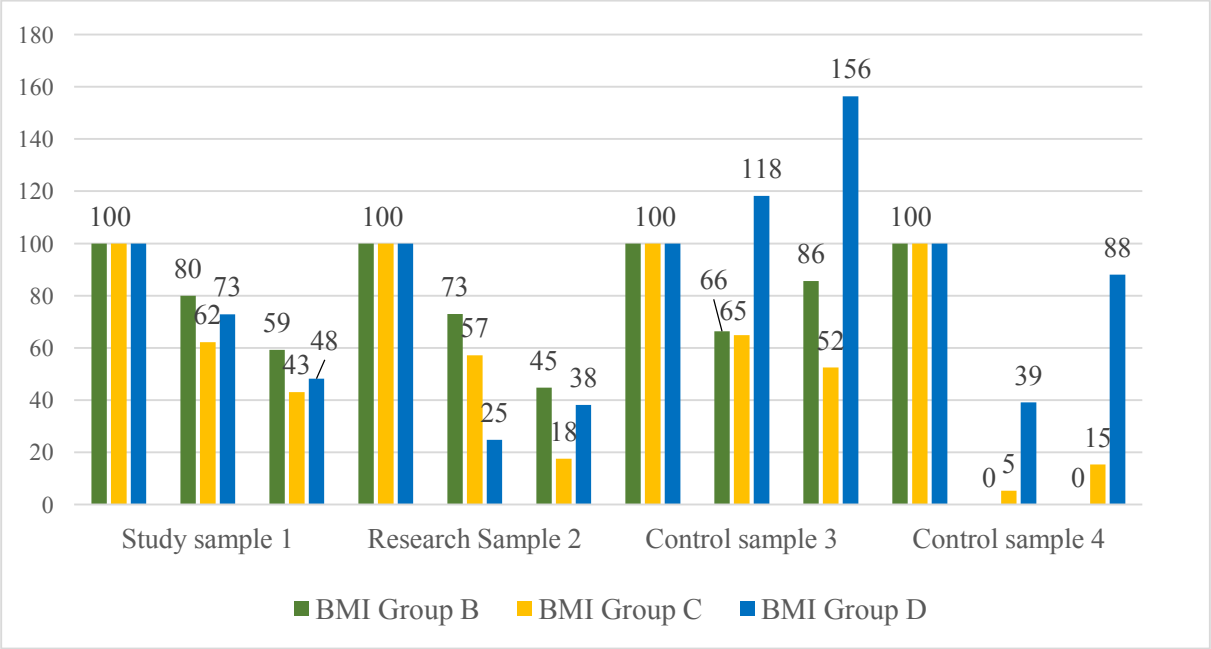

Figure 2. Analysis of Menopausal Symptoms Over Three 10-Day Therapy Periods by BMI Group (Percentage-Based Comparison).

Source: own elaboration.

In the research subgroups, where patients consumed sulphur-rich water, a significant reduction in menopausal symptoms was observed. Conversely, in the control subgroups—particularly among obese participants—there was a marked increase in symptoms. In the control group without HRT, symptom severity increased by as much as 56%. Furthermore, among participants not receiving HRT, the highest levels of menopausal symptoms were recorded in women with obesity. For clarity, all values presented in the charts have been rounded.

One of the most troublesome manifestations of menopause is the set of **vasomotor symptoms**, which include hot flushes, excessive sweating (especially at night), palpitations, and faintness. An analysis of vasomotor symptom occurrence by BMI group, expressed as a percentage, is presented in Figure 3.

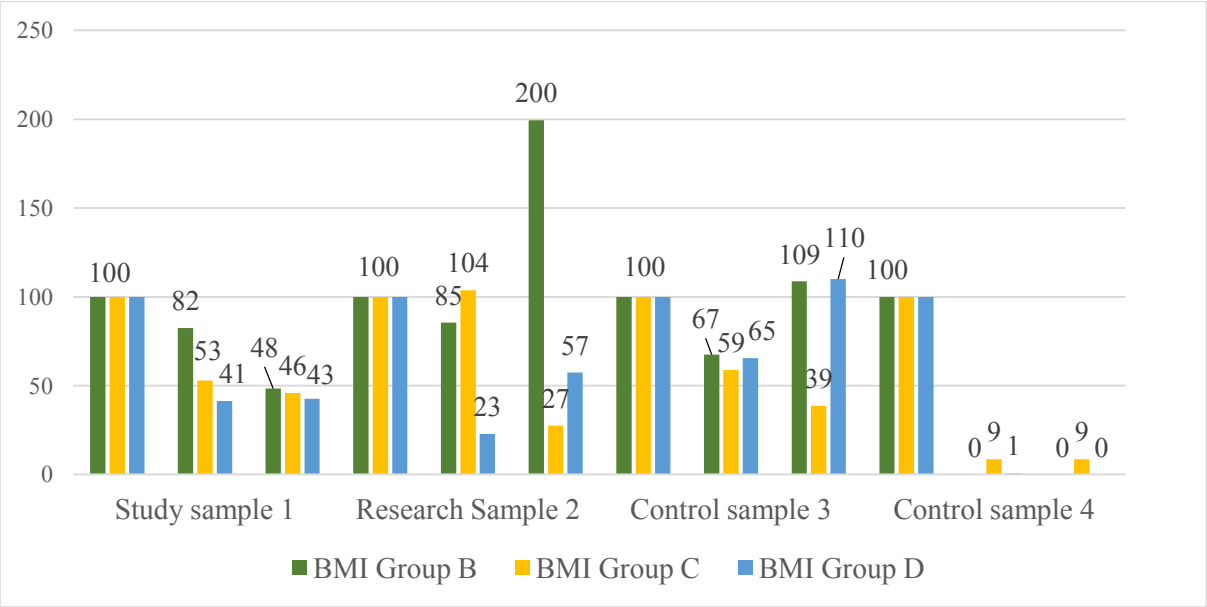

Figure 3. Analysis of Menopausal Vasomotor Symptoms Over Three 10-Day Therapy Periods by BMI Group (Percentage-Based Comparison).

Source: own elaboration.

The analysis of vasomotor symptoms revealed that among patients with a normal body weight (BMI Group B) and those classified as overweight (BMI Group C), symptom reduction was sustained throughout the entire study period in Research Subgroup 1. In contrast, an increase in symptoms was observed in the obesity group (BMI Group D). Most other subgroups also showed an increase in symptom intensity; however, it should be noted that the sample sizes were relatively small—particularly in Control Subgroup 4.

It is important to highlight that among patients using HRT, vasomotor symptoms were minimal. Therefore, percentage-based analysis was not applied in this context due to the incidental nature of observations in these subgroups.

To summarise the analysis of menopausal symptoms—particularly vasomotor symptoms—it can be concluded that patients in Research Subgroup 1 (receiving sulphur-rich medicinal water and not undergoing HRT) experienced the most significant symptom reduction, especially among those with a normal BMI (Group B). On the other hand, increases in vasomotor symptoms were observed primarily among obese patients (BMI Group D) and, to a lesser extent, among overweight patients (BMI Group C).

The results obtained allowed for the positive verification of the hypotheses and the achievement of the defined project milestones.

5. Market Implementation of the Research Results

An analysis of trends in the health tourism services market indicates a growing emphasis on holistic and comprehensive approaches to women's health, incorporating both medical and natural methods for alleviating menopausal symptoms. In recent years, numerous research projects have focused on the effectiveness of integrative medicine therapies, which combine elements of spa treatment, physical activity, dietary strategies, mindfulness, and conscious self-development, in alignment with broader demographic changes in society.

A strong emphasis was placed on **product personalisation**, including a range of specialised examinations and consultations, as well as health education for patients.

As a result of the research and development work, the following elements were developed:

- the structure of the therapeutic programme,
- an analysis of scientific literature on menopause, leading to the creation of new treatments such as:
  - pelvic floor muscle exercises,
  - breathing training based on Schultz autogenic training,
  - hormonal yoga,
  - psychosomatic training,
  - activating and relaxation sessions – including dance-based activities such as bachata,
  - sage-infused herbal baths,
  - personalised exercise sets for each type of session, led by a personal trainer,
- educational materials, instructions, and guidelines for participants on how to prepare for procedures and examinations,
- internal documentation related to participant services, including menu sets and dietary recipes with nutritional recommendations.

Another milestone in the project was the development of a **trademark** and the registration of the therapy's name with the Polish Patent Office. The application for the name *FEMI TERAPIA* was submitted under registration number **Z.563212**.

Figure 3. FEMI TERAPIA trademark.

Source: own elaboration.

Marketing activities were also planned, focusing on social media, influencer marketing, and endorsements from health and wellness experts. Alongside the implementation of successive stages of Technology Readiness Level (TRL) validation, a structured therapeutic stay programme was developed. This programme constitutes both a **product innovation** and a **new offering within the health tourism sector**.

6. Summary and conclusions

One of the phenomena accompanying population ageing is the growing number of women entering menopause, along with increasing health awareness, which supports the development of health tourism aimed at alleviating menopausal symptoms. It is worth noting that the therapy is also recommended during the perimenopausal period, as well as a **preventive measure** that promotes general wellbeing, improves bone density, and contributes to overall health.

The therapeutic programme based on **crenotherapy with sulphur-rich medicinal water**, developed through research and development activities, responds to current market trends and demand. A holistic approach to women's health during menopause contributes not only to enhancing their quality of life but also to the development of the health tourism sector.

The limitations of the study, which stemmed from formal conditions of the support programme for entrepreneurial discovery within the smart specialisation of health tourism, indicate significant potential for further research—particularly in the area of **sustainable and resource-efficient use of valuable medicinal raw materials**. Future studies should focus on the **effectiveness of individual therapeutic methods** used in health tourism, as well as their impact on women's long-term health. It is also worth noting that men experience a comparable stage in the ageing process—**andropause**—which represents another interesting and relevant area for future research.

Collaboration within an **interdisciplinary research team**—including physicians, dietitians, physiotherapists, trainers, and innovation management experts—enabled the development of effective treatments that form a comprehensive therapeutic programme. The innovative approach to collaboration within the **innovation ecosystem**, combining representatives of academia and business, not only allowed for the achievement of the intended goals, such as the positive verification of hypotheses and the completion of key milestones, but also served as a valuable source of new insights and inspiration for further collaborative research and development initiatives.

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