

Research article

Sustainability of balneal tourism in pre- and post-pandemic period

Oprea Carmen ^{1,†,*}, Ionescu Elena Valentina ^{1,†}, Matei Raluca ^{2,†}, Sorici Costin Octavian ^{3,†}, Salceanu Claudia ^{2,†}, Jeflea Victor ^{3,†}, Pazara Loredana ^{1,†}, Ungureanu Adelina Elena ⁴, Petcu Lucian ^{5,†}, Tucmeanu Elena-Roxana ¹, Iliescu Mădălina Gabriela ^{1,*}

1. Faculty of Medicine, „Ovidius” University of Constanta, 1 University Alley, 900470, Constanta, Romania : carmen_oprea_cta@yahoo.com (CO); elena_valentina_ionescu@yahoo.com (EVI); loredanapazara@yahoo.com(LP); Roxana.elena.tucmeanu@gmail.com(ERT); iliescumadalina@gmail.com
2. Faculty of Psychology and Educational Sciences, Ovidius University of Constanta, 1 University Alley, Constanta, Romania: raluca.matei@365.univ-ovidius.ro (RM); claudia.salceanu@365.univ-ovidius.ro (CS)
3. Faculty of Economics Sciences, Ovidius University of Constanta, 1 University Alley, 900470, Constanta, Romania: costin.sorici@365.univ-ovidius.ro (CS); jefleavf@univ-ovidius.ro (VJ)
4. Medical Doctoral School, „Ovidius” University of Constanta, 1 University Alley, 900470, Constanta, Romania; adelinaelena.aeu@gmail (AEU), iliescumadalina@gmail.com (MGI)
5. Faculty of Dental Medicine, Ovidius University of Constanta, 7 Ilarie Voronca street, 900178, Constanta, Romania; crilucpetcu@gmail.com (LCP)

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[†]These authors contributed equally to this work

* Correspondence: carmen_oprea_cta@yahoo.com (CO); iliescumadalina@gmail.com (MGI)

Abstract: The scope of the present study was to evaluate the results obtained from implementing the integrated programme of sustainable entrepreneurship specific to balneal tourism in the pre- and post-pandemic period at the Balneal and Rehabilitation Sanatorium of Techirghiol (SBRT), with the identification of current trends and preferences of the population regarding healthcare services in the Techirghiol area. **Methods:** The retrospective longitudinal study, conducted from 2018 to 2022, used data gathered in SBRT services on a number of patients grouped by condition, the quality of therapeutic water accessed by patients and of waste water discharged into the lake, books and documents specific to the proposed topic. **Results:** Starting with the pandemic year 2020, patients are also referred to SBRT for treatment of post covid after-effects (restrictive/obstructive respiratory diseases). Water waste discharged into Lake Techirghiol in 2020 exceeds the legal limits for the arithmetic mean values of nitrogen ammonia, returning to normal in 2021 (2.88 mg/l), reaching 0.24mg/l in 2022. Considering the 2020 pandemic year as the reference year, the number of tourists in 2020 decreased by 58% compared to 2018 and by 37% compared to 2019, with an increase of 42% and 43% in 2021 and 2022 respectively. **Conclusions:** The number of patients accessing natural factor therapies in the time period analysed has seen a steady post-pandemic increase. The sustainable development of spa tourism in the Techirghiol area requires an integrative approach that ensures environmental protection.

Keywords: Techirghiol Area (Romania); Techirghiol lake; balneal tourism; patients.

1. Introduction

Balneal tourism offers a wide array of services, from medical tourism to wellness spa tourism, and as a result of the latest profound global events (Covid-19 pandemic, increasing percentage of elderly population) [1], but also the already existing ones (sedentary lifestyle and its associated risks), balneotherapy establishments are preferred. The abundance of natural resources and the long tradition of using them for curative purposes make balneal tourism a complex field of activity that is becoming a specific phenomenon of contemporary civilization. The variety of natural resources is reflected in the complexity of Romanian balneal tourism: spa resorts, spa centres catering to all beneficiaries for prophylactic or curative treatment [2] (athletes, retirees, people with disabilities, etc.). They mainly access complex cures comprising natural climatic factors and spa treatments with therapeutic potential: lakes, muds, therapeutic gases and mineral waters, used for therapies under highly competent medical supervision [3].

Tourism as an activity must be directly involved in sustainable development, as a resource industry, dependent on the natural endowment and cultural heritage of each society. The dynamics of tourism industry require organisation and sustainable development, defined by the World Commission on Environment and Development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [4].

The concept began to be treated in a broader context with the release of the "Our Common Future" report by the World Commission on Environment and Development, which established sustainable development principles on the conservation of the natural environment, the protection of bio-diversity and human heritage [4].

Adequate management of the development of balneal tourism in the Techirghiol area also implies the adoption of sustainable planning policies and strategies. Co-ordination between authorities, the local community and tour operators is essential to ensure balanced and sustainable development [5]. Clear strategies and measures to conserve natural and cultural resources, protect the environment and promote equitable socio-economic development are included as objectives. These involve consultation and participation of all stakeholders, including the local community. Rules and regulations are included on the protection of natural and cultural areas, as well as the promotion of traditional architecture and sustainable building designs [6].

On these principles is operating the first establishment in Romania with a balneal purpose, the Balneal and Rehabilitation Sanatorium of Techirghiol (SBRT), whose increased exposure is given by the uniqueness of the local therapeutic resource: chloride-sodium, iodide, bromide, sulphate water and sapropelic mud from the reservoir at the bottom of Lake Techirghiol [7], natural factors with scientifically proven therapeutic action, known and used for over 124 years [8].

Current trends and population preferences regarding health services require the sustainable development of health and balneal tourism in the Techirghiol area by attracting young university graduates who can provide the highest quality of services [9].

We intend to implement an integrated sustainable entrepreneurship programme specific to health and wellness tourism. Within the medical unit we developed a marketing strategy accessible to young graduates, phased by identifying opportunities in the health and spa tourism market [5], analyzing the current perspectives and needs of the beneficiaries so that it is economically, socially and environmentally sustainable with the identification of market gaps [9]. To successfully implement this strategy and succeed in the long term, we collaborate with experts in the field, educational institutions, non-governmental organisations, government institutions, constantly access new innovations and monitor customer feedback.

One of the objectives of balneal tourism in Techirghiol is the preservation of the ecosystem and the promotion of the traditions, habits and cultural heritage of the area, which can contribute to the maintenance of the locals' identity and the authentic experiences of the visitors [10].

In order to specifically assess the sustainability of balneal tourism in Techirghiol [10] we proposed to follow how, in its way to performance, in the context of the globalization phenomena but especially how in the exceptional circumstances caused by the Covid-19 pandemic, the medical facility operates in the same conscious and responsible manner towards the environment, economically and socially.

2. Results

A collective yet finite resource, the lake water requires sustainable management for its viable use. To this extent, a regular analysis is needed to ensure the optimal balance of use and distribution of this key resource [11].

Within the framework of this concept it is necessary to monitor the resources involved to ensure their sustainability. From the analysis of the data included in the figures below (Figure 1-5), we see that the mean values of Ph, biochemical oxygen consumption at 5 days, total phosphorus and anionic surfactants of both the water captured from Techirghiol lake and the waste water discharged into the same lake are within the legal limits during the period of time allocated to our research. The exception is nitro-gen ammonia (Figure 5).

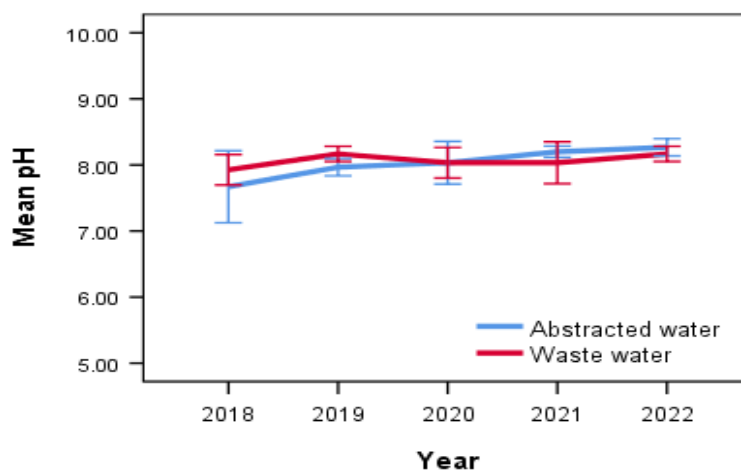


Figure 1. Ph -value of the captured water and water waste from Techirghiol Lake. Accepted values = minimum 6,5/ maximum 8,5

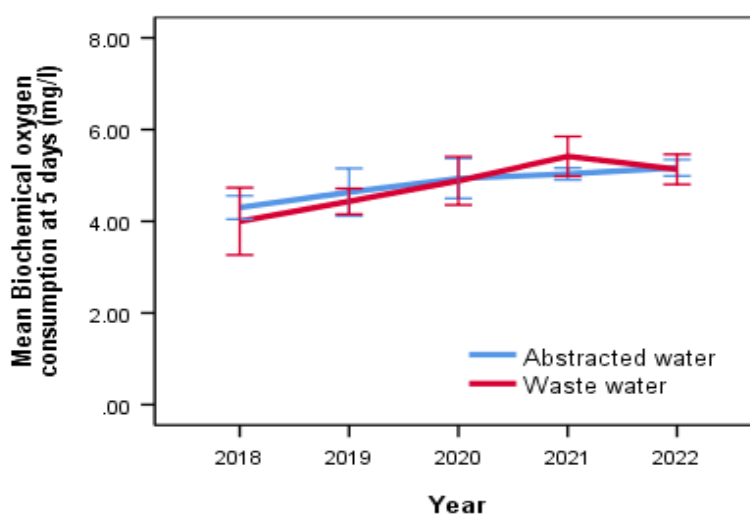


Figure 2. Biochemical oxygen consumption at 5 days of captured water and water waste from Lake Techirghiol. Accepted value = maximum 25 mg/l

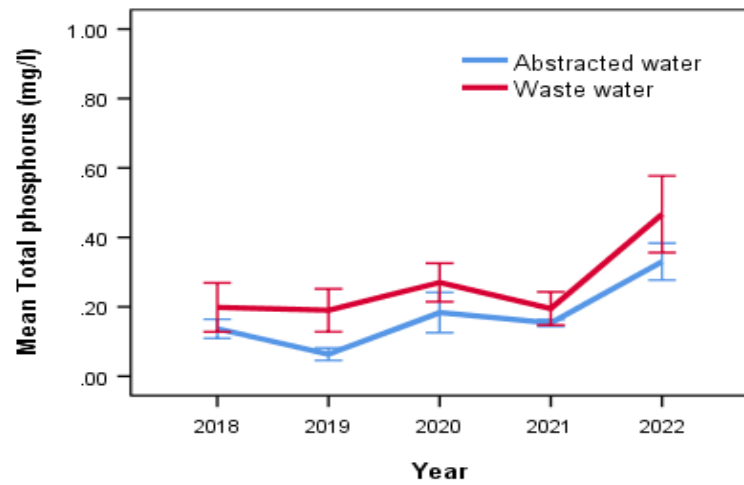


Figure 3. Total phosphorus value of water abstracted from Techirghiol lake and waste. Accepted value = 1,0 – 2,0 mg/l

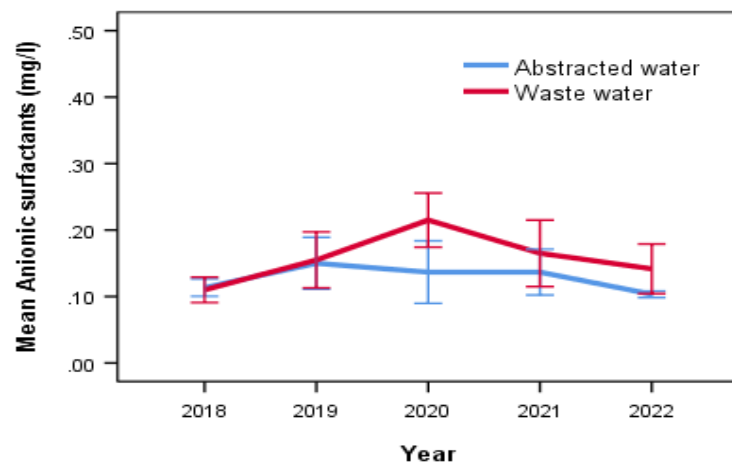


Figure 4. Anionic surfactants value of water abstracted from Techirghiol Lake and waste. Accepted value = maximum 0,5 mg/l

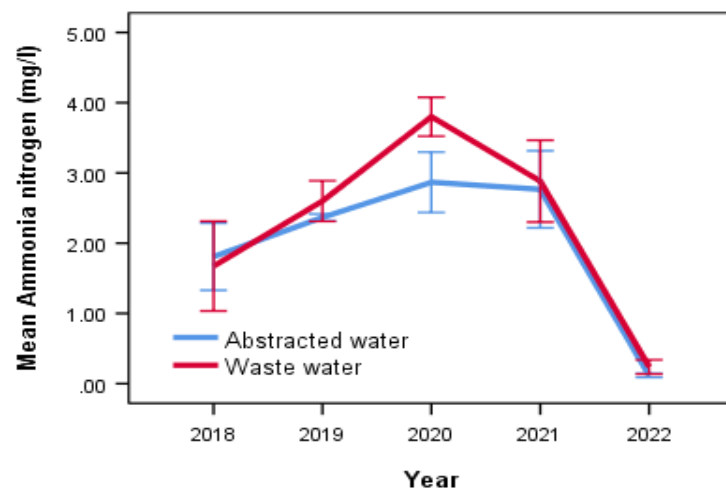


Figure 5. Value Ammonia nitrogen a abstracted water și waste in Techirghiol Lake. Accepted value = 2,0 – 3,0 mg/l

The results of the statistical analysis for water waste discharged into lake Techirghiol (Figure 5.) show changes in the arithmetic mean value of ammonia nitrogen =3.80mg/l and standard deviation=0.28 for the pandemic year 2020, exceeding the legal limits.

In 2021 the arithmetic mean value of ammonia nitrogen =2.88 mg/l and standard deviation=0.58 returns to normal, and in 2022 reaches the arithmetic mean value=0.24 mg/l and standard deviation=0.10.

To obtain more complex information in our analysis, we applied the One-way ANOVA Test.

Table 1. One-way ANOVA test

Type		F(4,55)	p
Abstracted water	pH	7.40	0.000
	Biochemical oxygen	12.57	0.000
	Total phosphorus	78.34	0.000
	Ammonia nitrogen	105.99	0.000
	Anionic surfactants	4.28	0.004
Waste water	pH	2.68	0.041
	Biochemical oxygen	16.00	0.000
	Total phosphorus	31.68	0.000
	Ammonia nitrogen	119.41	0.000
	Anionic surfactants	11.45	0.000

The results of our research (Table 1.) show that there are significant differences between the mean values of the analysed samples recorded for each year, in the form that at least two of them differ from each other for the respective year (statistical value of the F(4,55) test) with statistical significance, ($p < 0.05$), for both collected and waste water.

Post Hoc Tests Multiple Comparisons (Tamhane) is used to see which mean values differ from one another. From the analysis by comparison between years we found that the mean value for water Ph in year 2018 differs from that in the year 2022 for abstracted water ($p_{\text{abstracted water}} = 0.30$) but also for waste water ($p_{\text{waste water}} = 0.42$), $p > 0.05$, so it has no statistical significance. The mean value for biochemical oxygen consumption at 5 days shows differences for comparison between years 2020, 2021, 2022 with 2018 when $p < 0.05$ for abstracted water and waste water with statistical significance. For total phosphorus and ammonia nitrogen the mean values of abstracted water and waste water of year 2022 differ from the other years, $p = 0.001$ ($p < 0.05$), not statistically significant. There are no differences between years for mean values of anionic surfactants.

By bringing to the fore the level of addressability of the population regarding therapies including the use of natural resources, we will consider the year 2020 as the reference year, from the timeframe 2018-2022 (Table 2, Table 4), which also includes the period of the last pandemic (Covid-19).

Table 2. Number of patients admitted to SBRT/year

Year	No. of people treated SBRT
2018	14187
2019	14771
2020	6244
2021	10166
2022	12819

Source: SBRT Statistical Service

As seen from Table 2, the number of those who received treatment with natural cure factors during the period of time analysed has shown a steady increase post-pandemic.

Considering that the entire spa medical activity is patient-centred and wellness-oriented, from the statistical analysis of the data collected by groups of conditions (Table

3), we observe that from the pandemic year 2020 onwards, patients also turn to SBRT for the treatment of restrictive/obstructive respiratory diseases (post Covid sequelae).

Table 3. Number of patients discharged by disease group at SBRT

Disease name	Year				
	2018	2019	2020	2021	2022
Inflammatory rheumatological diseases	347	384	131	203	265
Degenerative rheumatological diseases	6014	7103	2.782	5227	6415
Central neurological diseases	2269	1407	670	597	178
Peripheral neurological diseases	2791	3478	1.664	2304	2758
Diseases of the striated muscles	35	41	41	22	56
Growth disorders	325	256	80	180	204
Restrictive respiratory diseases				61	9
Obstructive respiratory diseases				5	
Bone diseases	165	195	73	120	151
Post-traumatic and post-operative sequelae of the locomotor system	765	1213	511	814	926
Neurotic disorders		16	12	18	33

From the data collected regarding the number of tourists accessing local services in Techirghiol town, taking as a reference year the pandemic year 2020, we can observe a decline in the number of tourists by 58% compared to 2018 and by 37% compared to 2019, with an increase of 42% in 2021 and 43% in 2022.

Table 4. Number of tourists at locality level

Year 2018	Year 2019	Year 2020	Year 2021	Year 2022
15611	10386	6474	10543	11601

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From the analysis of the previous data (Table 4), we notice a numerical decline in the number of tourists in Techirghiol in 2019 compared to 2018, probably due to the execution of extensive infrastructure construction work, with a recovery from 2021 onwards.

3. Discussion

Techirghiol Lake was declared a protected site in 2000, under a special protection and conservation regime (H.G. 1266/2000), thus becoming an area dedicated to the protection and conservation of biological diversity, with natural and cultural resources, in terms of achieving specific conservation objectives [12]. In 2006 it was classified as a wetland of international importance (H. D. 1586/2006), becoming a Ramsar site, which aims to

maintain the ecological character of the areas concerned by implementing an ecosystem approach in the context of sustainable development [13], and in 2007 it became part of the European Natura 2000 network of protected areas, established to protect nature and maintain natural wealth in the long term [10].

Lake water, due to its characteristics (sodium chloride, sulphate, with average concentrations of 60 g mineral salts/l reaching even 85 g/l) is intensively studied and therapeutically valued [7].

The greenish colour is due to the numerous microorganisms and algae found in the lake, the main growing algae being *Cladophora Vagabunda* which feeds on microplankton formed by *Artemia Salina* and contributes to the mud formation, settling to the bottom of the lake after completing its life cycle [14].

The resulting mud is found in sedimented form in certain areas at the bottom of the lake, on an approximate area of 98 ha, in a layer with a thickness of about 0.6 m being a 100% natural product, without additives, coming from a clean, ecological area near the Black Sea [15].

The association of the sapropelic mud with the other natural factors of the resort: the climate and the salt water of the lake, represent the specific treatment carried out during the balneal cure at Lake Techirghiol. The benefits of the therapeutic action of mud in terms of health improvement and prophylactic effects are widely discussed in the literature [16], [17].

The sapropelic haven mud formed is rich in mineral and organic estrogen-like materials and enzymes with tissue-activating and regenerating effects. It contains vitamins C, F, B2, B12 and biologically active substances, so it has become famous for its curative properties [18], being recognized in 2011 by the World Federation of Hydrotherapy and Climatotherapy as the best mud in the world.

The Balneal and Rehabilitation Sanatorium of Techirghiol holds the exclusive license for mud exploitation from lake Techirghiol in compliance with all the stipulations of H.G. 930/2005 for the approval of the special rules on the character and size of the sanitary and hydrogeological protection zones [19], maintaining a safety buffer of 50 m inland from the shore. The areas for extraction are marked and the mud is fully exploited, the perimeter of sanitary protection, the zone with severe regime, is marked in the field, according to the water management authorization BIBLIOGRAF no/year.

The mud delivery to the treatment centres is done only on a contract basis, with a firm clause that the mud used for the treatments is returned to the lake, with strict environmental supervision of the whole process [20], so that the state of the reservoir remains constant from year to year.

From the statistical analysis of lab data we find that from a qualitative point of view, abstracted water from lake Techirghiol end water waste disposed in the same lake in the time period 2018-2022 presents optimal values for their use in the therapeutic plan applied to patients. The waste water (Figure 1-5) complies with the limit values approved by the water management permit no. 138/6.10.2022, concerning the limits of pollutant loads of waste water in natural receptors.

There is an exception for ammonia nitrogen/2020 (Figure 5) when the accepted average values regulated by NTPA 001/2005 (HG 352/2005) are exceeded, which required the development and implementation of working procedures resulting in the correction of this shortcoming, confirmed by the subsequent normalisation of these values.

The aim of the elaboration of the working procedures is to ensure the optimal quality of the water in the lake, regeneration of the reservoir of natural factors, facilitating the sustainability of the resources of lake Techirghiol [21] by using and expanding them without leading to depletion and environmental degradation.

The conditions for the intake of salt water for spa treatments and for its discharge into the lake after its use in medical therapies are based on the "Study on the quality of therapeutic waste water discharged from The Balneal and Rehabilitation Sanatorium of Techirghiol" conducted in 2017, based on which the quality indicators for waste water

were subsequently established. These were also included in the water management authorisation No 138/6.10.2022.

As a result of the study performed on the quality of therapeutic waste water discharged by the The Balneal and Rehabilitation Sanatorium of Techirghiol, improvements have been made to the system of installations that evacuate saline water back into the receiver from which it was collected. The salt water used from the treatment pools is pre-purified by the salt water and mud decanter and then discharged into Lake Techirghiol.

However, the results of our research (Table 1.) show that there are significant differences between the mean values of the water samples recorded for each year, in terms of at least two of them differing from each other for the respective year (statistical value of the F-test (4.55) with statistical significance ($p < 0.05$) for both collected and used water. This is due to the fluctuation of water composition under the influence of external factors.

The minimisation of environmental impact is constantly monitored through the rational use of polluting material resources such as utilities (electricity, plant fuel, water), equipment. With regard to measures to protect natural resources [22] and reduce pollution in the context of local spa tourism, recycling and proper management of plastic, paper and glass waste is promoted. Protection measures aim to prevent the lake water or therapeutic mud from being polluted with substances that could alter their natural properties, and maintaining the protection zone around the lake is important and mandatory for ecosystem conservation [23].

As a solution for a future with sustainable structure and clean energy, to contribute to the reduction of greenhouse gas emissions and the conservation of energy resources, the sanatorium has started the installation of solar energy systems in addition to conventional energy sources, in response to the increased interest in environmental conservation and protection [24].

The ever increasing popularity of the population for spa treatments is reflected in the increasing number of admissions, with summer months being the peak. In the summer season, heliotherapy, mud baths and lake immersions are recommended from a medical point of view [25, 26].

Looking at the reference year 2020 in the time frame 2018-2022 (Table 2, Table 4), which also includes the period of the last pandemic (Covid-19), we find that the number of those accessing natural cure factor therapies in the time frame analysed has shown a steady post-pandemic increase.

While in previous years we have talked about the speed of change in healthcare and the efforts that stakeholders need to make to keep up with inevitable shifts, 2020 will make previous developments seem frozen in time. The lockdown is causing dramatic effects, with the impact of COVID-19 pandemic outbreak on spa tourism represented in the case of the sanatorium by the lowest number of tourists in recent years.

For a time period during 2020, medical activity in the The Balneal and Rehabilitation Sanatorium of Techirghiol is restricted to limit the spread of the virus, the circumstances being unprecedented. With the removal of certain restrictions imposed by the Covid pandemic, a wide-ranging programme is being set in motion to restart spa tourism in Techirghiol with an impact on local entrepreneurship. Tourist numbers are likely to return to normal in 2021 and 2022, a fact also highlighted in this study.

We remark that from pandemic year 2020 onwards, patients are also seeking SBRT to treat restrictive/obstructive respiratory diseases (post Covid sequelae). This was also possible due to the identification of new requirements from the health tourism market by developing new work procedures based on customer feedback and market changes. In this context, in the clinical picture of the associated diseases we observe an increasing frequency of respiratory diseases to which the specialists of the The Balneal and Rehabilitation Sanatorium of Techirghiol have developed special pulmonary rehabilitation programs [27, 28] that also involve the use of natural environmental factors, with extensive benefits, the ultimate goal being the improvement of physical condition and quality of life, with reintegration into the family and socio-professional environment.

Through the sustainable use of natural resources available to the institution [29] and in the context of the period involved, treatment plans are being developed to strengthen the body, increase immunity, mental and physical recovery of those left with sequelae of Sars-Cov 2 infection. Rehabilitation goals are set in relation to the functional impact of COVID-19 infection on the patient's systems/organs, taking into account personal, environmental factors and pre-existing comorbidities, the treatment plan being adapted to each stage of the disease and rehabilitation phase [10], according to the implemented therapeutic protocols with strict protection of environmental factors.

We note that the revival of balneal tourism in the post-pandemic period is difficult, probably influenced by the current socio-political-economic situation.

During 2018-2022 the integration of young university graduates at local level was achieved through the development of internship programmes. Medical tourism and spa employers have developed internship programmes allowing young graduates to gain practical experience in the field. Partnerships have been established (framework agreement no. 10229/08.07.2019 with "Ovidius" University of Constanta, internship contract no. 14141/16.09.2022 with "Tomis" Technological High School of Constanta, collaboration contract no. 15132/04.10.2022 with F.E.G. post-secondary school of Constanta), between educational institutions as well as employers in the Techirghiol area (hotels, clinics and wellness centres). These collaborations facilitate the placement of young graduates in internship programmes or jobs, offering them opportunities for learning and professional development. Local authorities and relevant organisations support young graduates by providing information and resources on starting a business in the field of medical tourism and spa.

Compared to classic tourism, balneal tourism offers incomparably better prospects, contributing from a social point of view to the improvement of the population's health and quality of life [24]. The use of local natural therapeutic factors ensures the promotion of local involvement, job creation and infrastructure development to ensure sustainability and support the sustainable development of the local community.

4. Materials and Methods

To perform this longitudinal retrospective study we used data provided by the statistical service and the SBRT database from 2018 to 2022, represented by: statistical processing of annual statistical reports, data collected within the SBRT services, as well as documents specific to the topic of our research existing on-line or in books (according to the bibliography).

Sampling of salt water taken from lake Techirghiol, for laboratory analysis required by the legislation in place, is done from the point of abstraction, right of the source, from the existing floating platform and the waste water is collected from the return outlet into the lake.

The data collected from the services of the The Balneal and Rehabilitation Sanatorium of Techirghiol were coded and processed using Excel and IBM SPSS Statistics 23. The procedures used were: tabulation, charts, One-way ANOVA test that shows us if there are significant differences between the mean values recorded for each year in the sense that at least two of them differ from each other ($p < 0.050$).

To also see which mean values differed between them we used Post Hoc Tests Multiple Comparisons (Tamhane), and to compare two proportions we used the Z-Test.

5. Conclusions

The sustainable development of balneal tourism in the Techirghiol area requires an integrative approach, ensuring environmental protection, promoting cultural and social values and meeting the needs of the present without compromising future resources and possibilities.

During the current study, the parameters measured for the water collected from Lake Techirghiol and the water used in the therapies discharged into lake Techirghiol are within the legal limits. The sustainable management of this resource is conducted in

accordance with the results of our research, focusing on special measures that minimize the negative impact on lake Techirghiol.

During the pandemic period there is a decline in the number of tourists and measures are required to restore spa tourism.

The medical balneary activity at the The Balneal and Rehabilitation Sanatorium of Techirghiol has an important role in providing patients' well-being and is considered a viable option for treating post-Covid sequelae.

The institution continues to focus on the sustainable development of the activity and environmental protection.

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