

DUZDAGH

NAKHCHIVAN'S HEALTH PARADISE - INTEGRATION OF NATURAL THERAPY AND TOURISM

DUZDAGH, EL PARAÍSO DE LA SALUD DE NAJICHEVÁN: INTEGRACIÓN DE LA TERAPIA NATURAL Y EL TURISMO

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ABSTRACT

In the field of health tourism, the therapeutic use of salt caves for respiratory conditions such as asthma and chronic bronchitis has gained relevance amid growing interest in natural and noninvasive health interventions. Despite evidence of improved lung function and reduced medication use after treatment, a gap remains in the evaluation of these benefits alongside regional development metrics and sustainability practices. Therefore, the objective of this study is to analyze the potential of the Duzdag Physiotherapy Center as an interesting alternative for integrating speleotherapy into a sustainable health tourism model. A documentary analysis was conducted, concluding that this health tourism model in Duzdag offers several benefits, both for health and for the diversification of the local economy through job creation in the service sector and/or the strengthening of tourism infrastructure. However, this must be done while promoting practices that conserve the mine's microclimate and the responsible use of resources. Furthermore, while we have observed increases in the number of visitors interested in natural treatments, we believe this is not due to a lack of awareness of this option. Therefore, this study also seeks to disseminate the characteristics and benefits of the site. Our results suggest that Duzdag can serve as a replicable model for other regions with similar resources, encouraging health authorities and professionals to foster interdisciplinary approaches that balance clinical benefits, economic impact, and environmental protection. However, we emphasize the need for future studies on the long-term effects and scalability of the model.

Keywords: Duzdagh, Nakhchivan, Health, Natural therapy, Tourism, Integration.

RESUMEN

En el ámbito del turismo de salud, el uso terapéutico de cuevas de sal para afecciones respiratorias como el asma y la bronquitis crónica ha cobrado relevancia ante el creciente interés en las intervenciones de salud naturales y no invasivas. A pesar de la evidencia de una mejor función pulmonar y una reducción del uso de medicamentos tras el tratamiento, persiste una brecha en la evaluación de estos beneficios, junto con las métricas de desarrollo regional y las prácticas de sostenibilidad. Por lo tanto, el objetivo de este estudio es analizar el potencial del Centro de Fisioterapia de Duzdag como una alternativa interesante para integrar la espeleoterapia en un modelo de turismo de salud sostenible.

Se realizó un análisis documental, concluyendo que este modelo de turismo de salud en Duzdag ofrece diversos beneficios, tanto para la salud como para la diversificación de la economía local mediante la creación de empleo en el sector servicios y/o el fortalecimiento de la infraestructura turística. Sin embargo, esto debe hacerse promoviendo prácticas que conserven el microclima de la mina y el uso responsable de los recursos. Además, si bien se ha observado un aumento en el número de visitantes interesados en tratamientos naturales, se cree que esto no se debe a un desconocimiento de esta opción. Por lo tanto, este estudio también busca difundir las características y beneficios del sitio. Los resultados sugieren que Duzdag puede servir como modelo replicable para otras regiones con recursos similares, incentivando a las autoridades sanitarias y a los profesionales a promover enfoques interdisciplinarios que equilibren los beneficios clínicos, el impacto económico y la protección del medio ambiente. Sin embargo, se enfatiza en la necesidad de futuros estudios sobre los efectos a largo plazo y la escalabilidad del modelo.

Palabras clave: Duzdag, Nakhchivan, Salud, Terapia natural, Turismo, Integración.

Introduction

Health tourism involves the voluntary travel of people outside their usual environment—whether within national borders or abroad—with the primary purpose of receiving healthcare-related services. This category includes three frequently overlapping subcomponents: medical tourism, wellness tourism, and therapeutic tourism. Medical tourism refers to travel motivated by the need for specific clinical interventions or treatments—such as surgeries, cancer treatments, or dental procedures—where the visitor seeks quality, lower costs, or access to advanced technology. Wellness tourism encompasses experiences aimed at maintaining or improving health through preventative, generally noninvasive practices, including spas, meditation retreats, nutrition and exercise programs, among others. Finally, therapeutic tourism focuses on natural environments and traditional or alternative methods, where visitors receive therapies that utilize natural resources such as hot springs, mud baths, essential oils, salt caves, and so on. Thus, the concept of health tourism not only reflects medical motivations, but also an interest in holistic health, self-care, and the pursuit of experiences of relaxation and physical and mental renewal (Jalali et al., 2025; Zhong et al., 2021).

Within the framework of health tourism, natural therapy encompasses a set of therapeutic practices that use

resources derived directly or indirectly from nature itself to achieve curative, preventative, or well-being-enhancing effects. These practices are often inspired by traditional medical systems (such as Ayurvedic medicine, traditional Chinese medicine, or indigenous healing practices) and are based on the concept that factors such as exposure to certain environmental conditions or interaction with natural elements (water, air, salt, mud, plants) can induce positive physiological responses. In the specific context of salt (NaCl) and its mines or caves, natural therapy adopts the modality of speleotherapy, a technique that consists of spending a prolonged period of time in underground environments rich in microelements and with a particular microclimatic regime, with the aim of improving respiratory function, promoting anti-inflammatory effects and strengthening the immune system (Li et al., 2023).

To understand speleotherapy and its theoretical foundations, it is necessary to delve deeper into the microclimate characteristics of salt caves. In these underground chambers, the air has a high concentration of negative ions and suspended sodium chloride particles due to the slow and continuous evaporation of the salt walls (Peddibhotla et al., 2025). These micrometer- or submicrometer-sized particles can penetrate the deepest parts of the respiratory tract, exerting a mucolytic effect that facilitates expectoration. Furthermore, the environment is characterized by stable relative humidity—usually around 40-60%—and constant temperatures typically between 12°C and 15°C, conditions considered ideal for reducing airway irritation and improving breathing in patients with chronic conditions such as asthma, chronic bronchitis, or chronic obstructive pulmonary disease (COPD). The low allergen content, the absence of common pollutants in outdoor air, and the presence of beneficial microelements (magnesium, potassium, calcium, trace elements) contribute to speleotherapy being valued as a non-pharmacological strategy to support respiratory treatment (Şimşek, 2020).

In this sense, Duzdag represents one of the oldest and most relevant manifestations of speleotherapy in the Caucasus and Central Asia. Its origins date back to ancient salt mines dating back more than 5,000 years, although its formalized therapeutic use was consolidated in the 1970s with the opening of a specialized physiotherapy center located inside the mine (Duzdag Physiotherapy Center). Geographically, Duzdag is located in the Nakhchivan Autonomous Republic, an exclave of Azerbaijan separated from the mainland by Armenia. Its capital, the city of Nakhchivan, is located approximately 16 km from the resort. The word “Duzdag” comes from the Azerbaijani language and can be translated as “salt mountain,” referring to the geological formation that houses vast reserves

of halite. Historically, the region was already recognized in ancient times for its healing properties; local legends and records mention its use for respiratory and rheumatic ailments.

However, Duzdagh's relevance is not limited just to the medical benefits provided by speleotherapy. In recent years, Duzdagh has increasingly become an important health tourism destination for those seeking to benefit from alternative or holistic methods, as it welcomes visitors from within the country and abroad. This has further established its attractiveness as a therapeutic retreat through the strategic integration of natural therapy within the modern wellness infrastructure. But aside from its medical importance, Duzdagh is also a place of cultural and historical significance; Nakhchivan is among the oldest inhabited areas in the world, filled with ancient heritage sites, scenic landscapes, and traditional Azerbaijani hospitality (Embassy of the Republic of Azerbaijan in the Islamic Republic of Iran, 2016). Medical tourism has proven to be a significant driver of local and regional economic development, and Duzdagh is no exception. First, the influx of patients and tourists has motivated the creation of direct jobs in the provision of medical, hospitality, and gastronomy services, as well as indirect jobs in supporting sectors such as transportation, local crafts, and retail. The economic impact is also evident in infrastructure investment: the need for good roads, stable supplies of drinking water and electricity, and telecommunications services have been driven by the growing demand from visitors. As a result, Nakhchivan's economy has diversified, moving away from a model traditionally focused on agricultural and manufacturing production toward a tertiary sector geared toward specialized tourism.

These institutions have gradually evolved to the industry of health tourism, which has been developing around the world, and the consumption patterns of the society have been changing towards using natural and non-invasive treatment methods. An example of this phenomenon is the Duzdagh facility which merges centuries-old natural classical treatment forms with 21st-century tourism services for the dual benefit of the regional economy and the sustainable development of a health-centered tourism industry (Huseynzade, 2024). This increasing interest in alternative medicine, and specifically respiratory therapy, boosts Duzdagh's hotspot status as a healing very different to what we know it to be. However, although natural therapy tourism integration models are used in other analysis, this paper also expands its application in the analysis of the impact of the integration of nature therapy and tourism on health and economic development, and assesses the future potential within the global health market through

a case study of the Duzdagh region (Nakhchivan News, 2023).

Furthermore, Duzdagh represents an interesting intersection between health and cultural tourism. Nakhchivan, considered one of the oldest continuously inhabited regions in the world, is home to a number of archaeological sites, religious monuments, and natural landscapes of heritage value. These include the mausoleum of the poet Nizami, ancient medieval fortresses, and the unique beauty of the Lesser Caucasus Mountains. The cultural offering is complemented by local festivals, traditional Azerbaijani cuisine, and displays of local crafts, attracting not only patients seeking treatment but also companions and visitors interested in cultural experiences. In this way, a multipurpose model is created, where health tourists can enjoy a comprehensive package that combines therapeutic elements, immersion in the local culture, and an understanding of a landscape with deep historical roots. Therefore, the objective of this study is to evaluate the potential of the Duzdagh Physiotherapy Center to integrate speleotherapy into a sustainable health tourism model that combines clinical benefits, local economic development, and environmental preservation.

DEVELOPMENT

Health Tourism, as the fastest growing sector within the universal tourism category, comprises medical, wellness, and therapeutic tourism. Health tourism is defined by the World Health Organization (WHO) as the movement of people for medical, wellness, or treatment services in another country away from their home country. Throughout the tourism industry, drivers such as affordability, quality healthcare services, availability of specialty treatment, and holistic healing experiences have been noted as motivating factors for health tourism. Destinations are increasingly using their natural resources to merge with both traditional and alternative medicine within this evolving industry (Kasalak & Baliyov, 2020).

Within health tourism, natural therapy, especially the use of salt caves (speleotherapy), has shown promising study data on respiratory disease treatment. Speleotherapy utilizes the special microclimate of salt caves, which are thought to have anti-inflammatory, antibacterial, and mucolytic effects on the respiratory system (Crisan-Dabija et al., 2021). The salt-rich air has been known to relieve symptoms caused by asthma, chronic bronchitis, and allergic respiratory diseases. In the case of Duzdagh, it has been found that air composition is stable and naturally ionized, providing a therapeutic environment that has made it one of the centers for natural treatment of respiratory diseases (Şimşek, 2020). Established in the 1970s,

the Duzdagh Physiotherapy Center (Figure 1) has been the focus of multiple studies investigating its effects on respiratory health. The region's salt mines, which are more than 5,000 years old, have a microclimate rich in negative ions and low humidity, both of which help lungs function better (Duzdag Hotel, 2025).

Fig 1. Physiotherapy Center.



Source. Taken from Duzdag Hotel (2025).

A key aspect of the sustainability of this speleotherapy-based health tourism model is that overexploitation of natural resources (Pessot et al., 2021), especially in fragile sites such as salt caves, can lead to a change in the interior microclimate and a loss of the beneficial properties of the underground air. Therefore, Duzdagh management has implemented measures to regulate the number of daily visitors to the mine, strict regulations on humidity and temperature levels in the galleries, and protocols to preserve the structural integrity of the salt flats. These eco-friendly practices respond to a vision of sustainable tourism that aims to preserve natural assets over the long term, ensuring that future generations can continue to access the same therapeutic benefits.

In parallel, we believe that economic and social sustainability may be strengthened through collaboration with universities and research centers (Khayatzadeh-Mahani et al., 2019). Long-term clinical follow-up projects allow for a more accurate quantification of the effectiveness of speleotherapy on respiratory parameters—such as forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), and inflammatory markers in sputum. Preliminary results indicate that patients who complete a course of treatment at Duzdagh experience significant improvements in lung function, a reduced need for bronchodilators, and a decrease in exacerbations during the six months following the intervention. These data support, from a scientific perspective, the promotion of Duzdagh as an international health tourism destination, moving the practice away from the purely empirical or anecdotal sphere.

In this context, the hotel takes on a central role not only as a provider of quality accommodation but also as a facilitator of comprehensive wellness programs. The Duzdagh Hotel combines leisure services—swimming pools, a gym, sports courts, and conference rooms—with spaces specially designed to complement the underground phase of therapy. For example, the spa offers relaxing massages that help relax muscles stiffened by the subterranean cold; the hydrotherapy rooms, with bubble baths and sauna circuits, promote bronchial decongestion through steam inhalation; while the restaurant's culinary offerings are based on balanced menus rich in antioxidants, aimed at strengthening the immune system. This synergy between the natural saline environment and modern amenities reinforces the idea of a holistic health retreat, where every component—from the air breathed in the cavern to the diet eaten—is geared toward physiological balance.

A topic of particular importance for scholars interested in the economics of health tourism is how national and local governments can promote policies that strengthen the competitiveness of destinations like Duzdagh. In this regard, Azerbaijani legislation has provided tax incentives for hotel investments and facilitated the formation of public-private partnerships for the development of healthcare and tourism infrastructure in Nakhchivan (Tahir & Rafiq, 2021). Furthermore, the establishment of agreements with international tourism and health agencies has enabled the promotion of tourist packages targeted at markets in Eastern Europe, the Middle East, and Central Asia. These agreements not only increase the flow of visitors but also guarantee the transfer of knowledge and international quality standards in healthcare, hotel management, and sustainability practices.

Within the health tourism value chain, the relationship between Duzdagh and other similar destinations, both in Azerbaijan and neighboring countries (Iran, Turkey, Russia), highlights the sector's growing competitiveness. The Caucasus region boasts several salt mines with therapeutic potential, but Duzdagh stands out due to the size of the galleries, the age-old stability of the microclimate, and the installed capacity to serve a considerable number of visiting patients (Hamon, 2016). Even so, the challenge lies in maintaining high standards of quality and medical accreditation so that user perceptions are not eroded by negative experiences in terms of overcrowded facilities or reduced service times. In this regard, Duzdagh management has incorporated advance booking systems and continuous evaluation of user satisfaction, tools that have made it possible to adjust the service offering to the real needs of the market. From a cultural tourism perspective, Nakhchivan's proximity to historic routes—such as the ancient Silk Road—and its Islamic and medieval architectural heritage give the region added value. Tourists traveling to Duzdagh can, on the one hand, benefit from speleotherapy and, on the other, explore sites such as the Khan's Palace, the remains of city walls, and centuries-old mosques. This creates a complementary tourism model in which health-related demand feeds cultural demand. This requires municipal authorities to plan integrated routes that include transportation from hotels to heritage sites, specialized tour guides, and cultural events that extend visitors' average stays. The result is higher per capita income and an appreciation of local heritage, resulting in a virtuous cycle of conservation and economic development.

The sociocultural dimension also deserves attention. The development of health tourism in Duzdagh has encouraged local communities to engage in complementary income-generating activities, such as the production of

salt-based handicrafts (e.g., salt-based lamps or handmade soaps), traditional meals for visitors in private homes, and the creation of hiking trails that pass through nearby rural villages. These initiatives have redistributed part of the economic benefits to rural areas, reducing migration to the capital and fostering social cohesion. However, it is also necessary to recognize that mass tourism can generate cultural tensions. Therefore, strategic planning should include mechanisms for community consultation and participation, so that tourism projects are designed jointly by authorities, private operators, and village representatives.

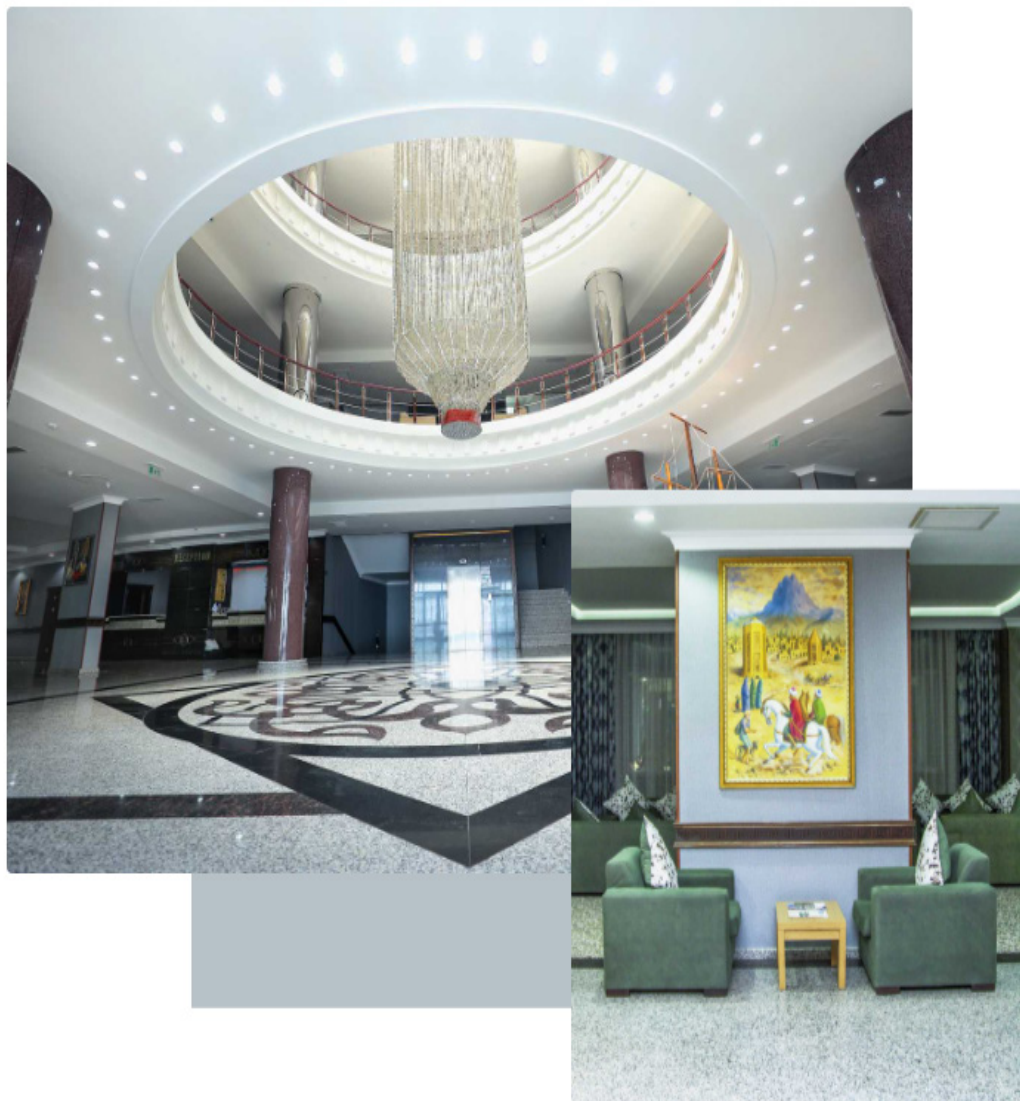
Furthermore, it is well known that the environmental dimension has become a central trend within sustainable health tourism, where the conservation of natural environments and the mitigation of ecological impacts set the standard for destinations offering treatments based on geological or biological resources (Figueiredo et al., 2024). In this sense, Duzdagh exemplifies how to integrate environmental sustainability with traditional therapeutic practices and advanced technology. Although salt caves provide a stable microclimate, external factors such as air pollution, climate change, or sudden increases in summer temperature can alter their internal conditions over the long term. To counteract these risks, Duzdagh's management collaborates with geoengineering institutes to monitor temperature and humidity in real time using sensors strategically placed throughout the mine. It has also installed controlled forced-air circulation systems that correct deviations in negative ion concentrations or humidity, thus ensuring that therapeutic parameters remain within optimal ranges. At the same time, on the ground floor, the Duzdagh Hotel adopts sustainable practices in the use of energy and water: it installs solar panels to cover part of its electricity demand, recycles greywater in its spa and laundry facilities, and supports local producers through agreements for the supply of agricultural inputs, reducing its ecological footprint and strengthening its corporate social responsibility—an aspect increasingly valued by international tourists. These actions complement the global trend of sustainable health tourism, which promotes the regulation of visits to natural treatment sites, ongoing environmental conservation, and the incorporation of digital solutions such as teleconsultations and personalized wellness plans to improve operational sustainability and expand its international reach (Kasalak & Baliyov, 2020).

Duzdagh hotel

Based on the above, Nakhchivan's 5 Star Resort Duzdagh Hotel (Figure 2) is an exquisite destination that is excellent for both leisure and health-minded travelers. Established in 2008, this upscale getaway hosts the unique marriage between contemporary conveniences and wellness

amenities, offering natural restorative experiences through its proximity to the famed Duzdagh Salt Mines. With its modern facilities and wide range of services, Duzdagh Hotel is an attractive option for those who want to undergo rest, treatment, and recreation in a calm environment (Duzdagh Hotel, 2025).

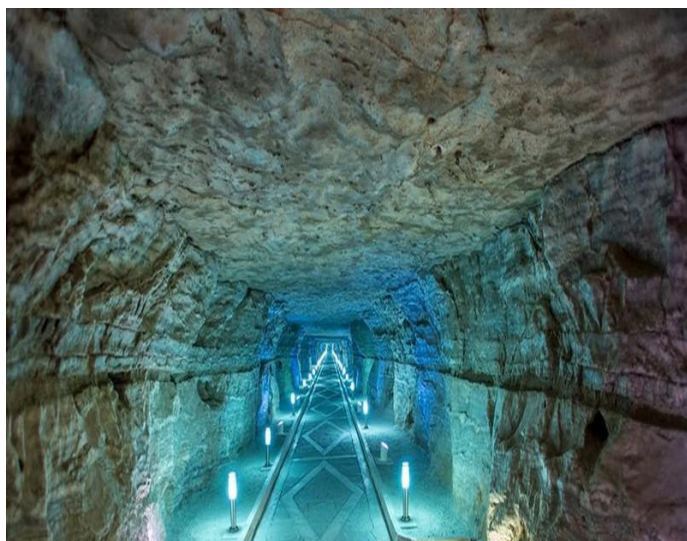
Fig 2. Duzdagh Hotel.



Source. Taken from Duzdag Hotel (2025).

The hotel offers luxurious and comfortable rooms with a variety of options for guests' stays. Rooms are well appointed with all the modern conveniences needed, such as air-conditioning, free Wi-Fi, flat-screen TVs, an in-room safe, as well as a private bathroom. The interior design of the hotel itself conveys a sense of modern elegance that makes it easy for visitors to feel at home. Beyond its accommodations, the hotel features exclusive facilities such as a spa, a wellness center, and indoor and outdoor swimming pools. The fitness center, sauna, and massage services available to guests enhance their overall stay experience. However, what makes Duzdagh Hotel unique is its physiotherapy center, situated inside the famous Duzdagh Salt Mines (Figure 3), which is renowned for its natural healing capabilities, particularly in treating respiratory illnesses (Kasalak & Baliyev, 2020).

Fig 3. Duzdagh Hotel Cave.



Source: Taken from Duzdag Hotel (2025).

The Duzdagh Hotel serves as a space for both relaxation and sports recreation. The resort includes basketball and tennis courts, a football field, a game room, and a children's play area. This makes it an excellent option for families and recreational travelers who want to stay active while traveling. For business personnel, the hotel provides a fully-equipped business center and conference hall, which makes it an ideal venue for holding corporate events, meetings, and conferences. Visitors can also enjoy the hotel's restaurant, which offers various local and international dishes. The hotel is located 16.7 km from Nakhchivan International Airport (22-minute drive). Visitors are advised to use private means of transport due to its somewhat remote location. While the remoteness of the hotel provides a peaceful environment, it is necessary to travel a certain distance to reach the city's tourist attractions and other facilities (Duzdag Hotel, 2025).

Numerous travelers have lauded the hotel's cleanliness, staff friendliness, and high-quality wellness services. The Duzdagh Salt Therapy Center has been especially popular with guests seeking to relax and heal with the help of nature. Travelers have noted that Duzdagh Hotel offers both Azerbaijani national cuisine and some dishes of European cuisine. Overall, the hotel has earned a good reputation among international and domestic guests alike, especially for those whose travel goals include luxury, wellbeing, and unique exposure to nature. Thus, Duzdagh Hotel stands as one of the most unique resorts in Azerbaijan, combining luxury, wellness, and leisure. Whether guests come for relaxation, sport, business, or medical therapy, they can enjoy an extraordinary stay complete with world-class

facilities at this first-class hotel. For those seeking a special place for natural healing and hospitality, Duzdagh Hotel represents one of the finest destinations.

As noted, Duzdagh serves as an excellent example of health tourism based on natural therapy and, at the same time, sustainable tourism development with significant economic effects. Previous studies confirm the effectiveness of speleotherapy as it relates to respiratory health, while economic research suggests that regional growth from health tourism efforts shows promising potential. With increasing interest in health tourism regarding complementary and alternative medicine and wellness travel, Duzdagh's position in the global health tourism market is anticipated to strengthen further, creating opportunities for additional medical research and economic development simultaneously. Recommendations have been made for future studies to examine the long-term health benefits of salt cave therapy and the influence of digital innovation on personalized health tourism experiences (Quluyeva, 2016).

Regarding the challenges and/or opportunities Duzdagh faces in the near future, one of the most relevant is the integration of information and communication technologies (ICT) into the healthcare experience. The global trend points toward the personalization of healthcare services through telemedicine, artificial intelligence, and remote monitoring devices (Mi et al., 2024; Rathee et al., 2025). The collection of biomedical data obtained throughout the stays could be injected into predictive analytics systems based on artificial intelligence, with the aim of identifying response patterns to saline treatment and suggesting optimized protocols. This would not only improve clinical efficiency but would also make Duzdagh a leading research center for speleotherapy and respiratory wellness. Furthermore, the offer of personalized plans could be extended to complementary services, such as nutritional programs tailored to blood biomarkers, respiratory exercise routines with augmented reality, or guided meditation sessions using mobile apps. In this way, the health tourism experience would transcend the physical realm to include virtual environments that maximize therapeutic benefits.

But the most important challenge, closely linked to sustainability of the place, is managing tourist flows during peak seasons. High demand during the winter months, when respiratory conditions tend to worsen in cold climates, clashes with the need to preserve the integrity of the salt galleries. To address this, a more rigorous shift system has been proposed, establishing specific time slots and limiting the number of people in the underground room at one time. Likewise, information dissemination measures are being considered to encourage visits during less

crowded periods, for example through discounts or special packages during spring or summer months. This type of seasonal management allows for an extended tourist season while simultaneously balancing the burden on natural resources.

CONCLUSIONS

In Nakhchivan, Duzdagh hotel incorporates natural therapy with tourism, providing the treatment of respiratory diseases in a cost-effective, non-invasive way and thus making a great contribution to regional economic and tourism development. As a combined salt cave therapy and physiotherapy center, Duzdagh has turned into a leading health tourism destination for global visitors. Multiple scientific studies have confirmed the therapeutic benefits of spelotherapy and the evidence of salt microclimates' effects on respiratory health, especially for patients suffering from bronchitis, asthma, and chronic pulmonary disease.

The literature review shows that health tourism is a growing sector worldwide, and demand is increasingly focused on natural and alternative healing methods. The Duzdagh case is a prime example of the potential for sustainable economic growth through the medical utilization of natural resources. The historical and cultural heritage of the Nakhchivan region also increases the attractiveness of the area, allowing patients to receive a comprehensive experience in this region beyond medical treatment. Furthermore, the economic benefits associated with health tourism, such as job creation, infrastructure development, and enhanced international visibility, contribute to the region's overall growth.

For Duzdagh, as a health tourism destination, sustainability of success is certainly a primary concern. It requires a balance between tourist influx and environmental preservation so that the therapeutic qualities of the salt caves do not suffer. Strategies like managed tourist access, scientific funding of projects related to spelotherapy, and green tourism initiatives have proven effective in ensuring the site's long-term viability. Moreover, the incorporation of contemporary technological innovations like telehealth services, tailored wellness plans, and electronic medical documentation could improve the user experience and support data-driven healing practices.

With the growing popularity of alternative medicine and wellness tourism around the world, there is an opportunity for Duzdagh to gain prominence. Partnerships with global healthcare institutions, wellness companies, and tourism boards could cement its position as a leading global health destination. Promoting Duzdagh's potential to the

wider world will also require government support and well-targeted marketing efforts.

To sum up, Duzdagh is a stunning example of how natural healing can be integrated into tourism to establish a sustainable health tourism destination. It represents not only a resource for treating respiratory conditions but also economic and cultural significance that constitutes a valuable asset for the tourism industry of the Azerbaijan Republic. Future research should comprehensively examine the clinical therapeutic outcomes of spelotherapy, quantify the economic impacts of health tourism on the region, and explore the potential of wellness travel innovations. Duzdagh must continue to take a leading role in natural health tourism globally, remaining committed to providing high-quality healthcare services, promoting sustainable tourism practices, and supporting scientific research.

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