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***Chol*: A traditional treatment method in pain therapy used by Baluch tribes in Taftan mountain, Sistan and Baluchestan province, Iran**

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Abstract

Throughout the world, various forms of therapy, based on traditional treatment methods, exist to reduce pain. In Taftan Mountain region in Baluchestan, Iran, one such ancient healing method, *Chol*, is still in use today. In this study, we aim to explore the procedure, application, the plant species used, and its efficacy. In 2020, fifty traditional healers were interviewed using standardized questionnaires, and the results indicate that *Chol* is still an effective and locally accepted method for treating pain, except in cases involving children, pregnant women, and the elderly. 19 plant species from 11 families used to treat 16 different forms of pain were identified. *Apiaceae*, with six species (33%), is the most frequently used plant family. According to traditional healers, most of the plant species mentioned in this method are safe to use, even on multiple occasions, and can be considered for further research, especially in case of heat treatments.

Keywords: *Chol*, pain treatment, skeletal pains, Taftan Mountain, Baluchestan, Iran

Introduction

Pain manifests in various forms, including acute, chronic, visceral, inflammatory, and neuropathic types [27, 39]. It arises not only from tissue damage but also from psychological factors such as attention, anxiety, stress [20], suggestion, past experiences, and potentially significant genetic contributions [51]. Pain is a major global health issue, with estimates suggesting that one in five adults experience pain, and an additional 10% are diagnosed with chronic pain each year [17]. As life expectancy increases and chronic diseases become more common, the prevalence of pain is also expected to rise, especially among the elderly, who require more sensitive treatment approaches [2, 34]. The use of plants for medicinal purposes in traditional pain management is a practice that predates modern medicine, particularly in developing countries [41, 6]. One traditional method of applying essential oils is through herbal steam baths [19]. This practice likely originated during the late Pleistocene era, with early usage in Northeast Asia [50]. From North to South America, various indigenous groups utilize herbal steam baths to alleviate pain, treat rheumatism and respiratory diseases, and support women around childbirth [48, 49]. Similar practices are observed in Southeast Asia [15, 9]. In northern Thailand, different ethnic groups, as well as the Thai in the lowlands, use herbal steam baths to help women recover after childbirth [4, 46]. In Indonesia, these baths are prevalent in Sumatra and Java [35]. In North Sulawesi, the practice is known as Bakera, first detailed by Watuseke based on observations in Tondano in 1962 [47]. Van Eeuwijk provided more detailed descriptions of medicinal plant use in the Minahasa region, highlighting the use of Bakera and other traditional therapies before and after childbirth [43]. Traditional medication techniques remain popular among Indonesian people, especially in rural areas with limited healthcare facilities. Steam baths, a common traditional practice, aim to expel metabolic waste from the body through sweating induced by steaming with traditional herbs [7, 18, 23]. Besides promoting general health and fitness, steam baths are particularly beneficial for postpartum women [36]. Additionally, steam baths help eliminate body odor due to the fragrant aroma of the commonly used plants [28, 33]. The aroma produced during a steam bath also provides an aromatherapy effect, making it a popular method for relaxation [29].

Because steam baths are widely used across various Indonesian communities, their names can vary by region. For instance, the Karo Batak tribe refers to it as "Oukup" [7, 36], the Malay Sintang community calls it "Betangas" [29], and it is known as "Timung" or "Batimung" among the Banjar community and Dayak Kenyah tribe [28, 23]. In Gorontalo, it is called "Molungudu" [18], while the Ternate tribe in West Halmahera refers to it as "Bafufu" [45].

The plant materials used in these steam bath concoctions also vary. According to Silalahi and Nisyawati [36], the main ingredients are plants that produce volatile oil compounds, which have a distinctive aroma. Herbal bathing is a common practice among Thai and other Southeast Asian cultures [14, 21]. Aromatherapy involves the inhalation and external application of essential oils, which are quickly absorbed into the bloodstream and later excreted through the urinary system or breath [25]. These oils are used for recuperation, balance, and relaxation of the body, mind, and soul. They also help stimulate the immune system and address a variety of health issues, including respiratory diseases, gastrointestinal disorders, nervous system disorders, and bacterial and fungal infections [3, 31]. Additionally, aromatherapy can have positive side effects, such as stimulating appetite and acting as a cholagogic and carminative remedy. In Western countries, aromatherapy is often used in gynecology and obstetrics to treat vaginal infections and reduce anxiety, fear, and pain during labor [38, 10]. Many ethnic groups possess unique knowledge about using wild plants and animals in traditional medicine, knowledge that has developed over generations. Much of this information remains undocumented [37] as it is traditionally passed down orally. In the rural areas of Baluchestan, locally sourced medicinal plants are crucial due to the high cost and inaccessibility of urban health services [1]. The residents of the Taftan area heavily depend on traditional medicine because of inadequate healthcare infrastructure. Gastrointestinal disorders, for example, are commonly treated by local therapists at home. For minor injuries, locals visit the sole health service center in Kooshe village. However, these clinics lack the necessary equipment to handle severe conditions such as serious infectious diseases. Consequently, critical cases must be referred to larger hospitals in Khash

city, approximately 50 km south of the study area [26]. An ethnobotanical study by Abadi *et al.* [1] focused on the plant resources of Taftan Mountain in Sistan and Baluchestan, southeastern Iran, frequently mentioned a special treatment method known as "Chol". In Baluchi, "Chol" means "hole." This treatment involves digging a hole, filling it with dry firewood, and burning it to create charcoal. The charcoal is then spread out, medicinal plants are placed on top, and a thin blanket covers them. The patient lies down on this setup and is covered with a thicker blanket. This method was also documented by Maleki and Akhiani [26]. However, detailed data on this method is lacking, prompting us to explore the following questions:

- How many plant species are currently used by the local people in the studied area as medicinal plants in this pain therapy method?
- What are the most crucial factors to consider in the Chol method?
- Is this method widely accepted and trusted among the local people in the studied area?
- Does any other method similar to Chol exist for pain therapy around the world?

Ultimately, our goal is to comprehensively document the plant selection, treatment process, potential limitations, and cultural aspects associated with Chol.

Materials and Methods

Study area

The study was conducted in the Taftan Mountain area, the highest mountain in the Sistan and Baluchestan province in eastern Iran, located at coordinates 32°37'18" S and 26°48'48" E. The summit reaches an altitude of 3,941 meters above sea level. The vegetation in this region is predominantly composed of typical Irano-Turanian elements. "The flat plains surrounding the massif are covered by *Artemisia* steppes with scattered shrubs of *Zygophyllum eurypterum* Boiss. & Buhse, as documented by Maleki and Akhiani" (26). The ethnic group in this area consists of Baluch tribes who speak the Baluchi language.

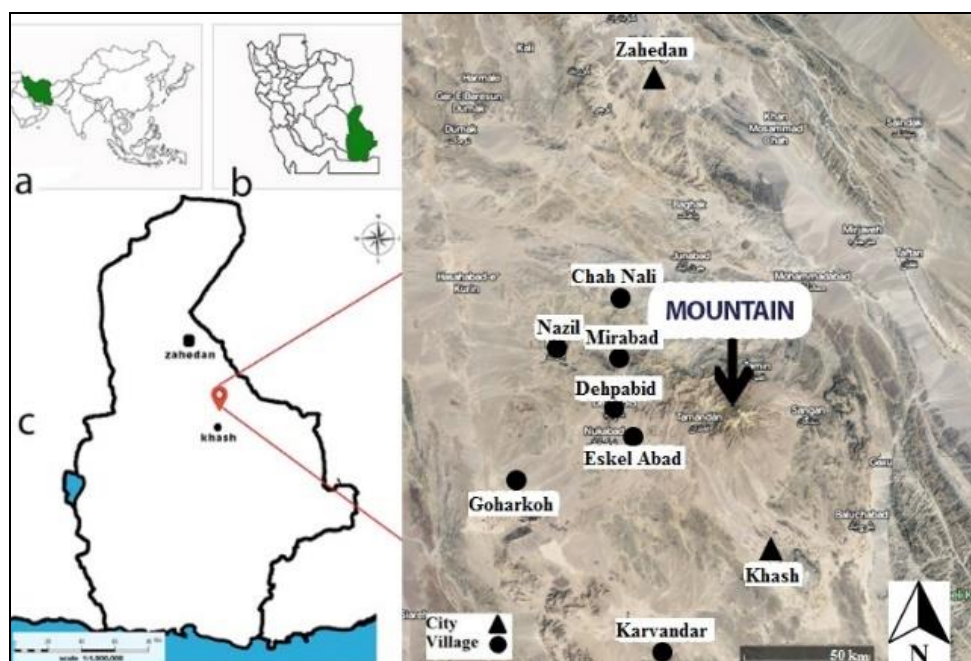


Fig 1: a) Location of Iran in the Asia map, b) Province of Sistan and Baluchestan in Iran, c) Location of the study area in the province, and d) Map of data collection in villages and cities surrounding Taftan Mountain.

Methods

Data collection took place from March to July 2020, visiting 8 villages (Chah nali, Dehpabid, Eskel Abad, Goharkoh, Karvandar, Mirabad, Mirjaveh and Nazil) and 2 cities (Khash and Zahedan) near Taftan Mountain in the Sistan and Baluchestan Province, by using a pre-set data capture questionnaire and open interviews.

The local population in the studied area consists entirely of Sunni Muslims who speak Baluchi, the local language in which the interviews were conducted. Data were collected through semi-structured interviews with knowledgeable and experienced locals, including village elders, traditional doctors, and herbalists. Prior to the interviews, a brief group discussion was conducted with key informants to explain the research objectives and emphasize the importance of the study. This approach was used to acknowledge their cooperation in preserving the traditional knowledge of the area and to build their confidence in providing reliable information.

A total of 50 informants, ranging in age from 35 to 90, were interviewed as shown in Table 1 of these, 33 (66%) were men, and 17 (34%) were women. The interviews were conducted in Baluchi, the native language of Baluchestan.

Table 1: Sex and age variables of interviewed people in the study area.

Age group (years)	Informants		Total interviewees (%)
	M	F	
$X \leq 40$	3	3	6 (12%)
$40 \leq X \leq 65$	11	15	26 (52%)
$65 \leq X$	4	14	18 (36%)
Total	18	32	50

The survey questionnaire form provided in Table 2 as additional file was used to document the local people's

knowledge about *Chol*, particularly focusing on the treatment details, such as the process, the plant species used, and the most commonly used plant parts. Furthermore, staying in the tribal settlements and the independent huts of the local people for several days allowed for observations of how the plants are used in accordance with the *Chol* method. The data from the questionnaires were transferred to a database and analyzed using Excel, version 10. The identification of collected plant specimens was aided by references such as Flora Iranica [30], Flora of Iran [5], and Color Flora of Iran [16]. To confirm the identification, the plant samples were compared with previously identified specimens housed in the herbarium at the University of Tehran, Iran. These collected specimens are now stored in the Herbarium Dresdense (DR) and will be digitized and made accessible online through Virtual Herbaria JACQ.

Results

Chol procedure

The *Chol* procedure typically takes about two to three hours and consists of six steps. Local people do not adhere to specific dimension rules for the hole; rather, they dig it according to the size of the patient's body. Usually, two men (sometimes just one person) dig the hole using a pickaxe and a shovel, while one or two women assist during the treatment. The healer oversees the entire procedure from the first step to the end. This supervision includes checking the details of the hole, the quantity of required medicinal plants, the position and condition of the patient in the hole, the covering blanket, and the duration of their stay in the hole. When selecting a location for digging the hole, the healers choose a suitable area with low wind exposure and moderate soil humidity, avoiding excessively rocky places. All six steps are depicted in Figure 2.



Fig 2: Procedure of the *Chol* treatment. A: Dig the hole. B: Fill the hole with dry firewood. C: Burn the wood to make charcoal and spread it in the hole. D: Fill the hole with the plants listed in Table 4. E: Cover the plants with a thin blanket. F: Lay down the patient on the blanket and cover his/her body with another thick blanket.

The method and the knowledge of local people

In the process of information collection through group discussions with the informants as a result of our survey, knowledge about *Chol* is predominantly found among the older generation. Therefore, we conducted interviews with 50 local informants, comprising 33 (66%) men and 17 (34%) women. Among the 50 selected informants from the study area, approximately 46% of them had experience with *Chol* for treating pain in themselves or one of their family members.

Characteristics of the treatment

Amount of the plants

This study introduces a unique measurement method employed by the local people known as "Baghal", which refers to the volume of the aerial parts of plants that should be used in this method. Approximately 48% of the local people's citations referred to "One Baghal" as the primary measurement method for the volume of aerial plant parts. Filling the whole comprised 46% of the citations, and 6%

referred to the patient's body shape.

Exposure time for patients in *Chol* method

Among the interviewed people, 36% cited that the proper time for the patient to stay in the hole for the best result is when the patient is completely sweated. Moreover, 32% of the local people reported that lying down on the plants for one to two hours led to the best results. Around 24% cited the exposure time depending on the personal condition of patients, and 8% suggested one hour as the proper time of exposure.

Best season for *Chol*

In our study, 42% of the informants reported that the method is applicable during all seasons except winter. They stated that low temperatures during winter can affect the patient's body temperature and can also influence soil temperature, resulting in a lower soil surface temperature. According to 40% of the informants, spring is the suitable season to use *Chol* for pain and ailment treatment (Fig. 3). However, during spring, soil humidity must be low.

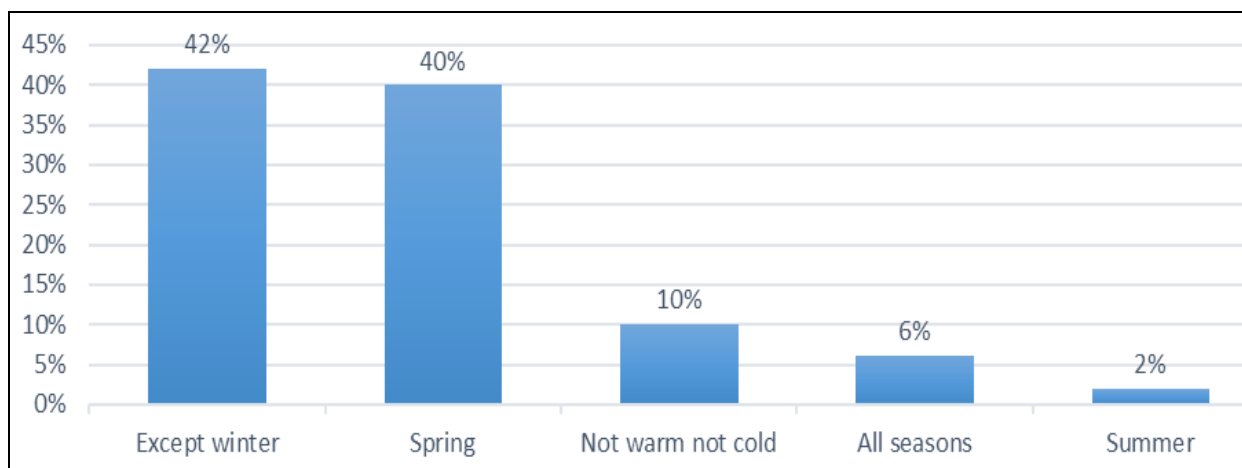


Fig 3: Best season for *Chol*

Proper type of soil for *Chol*

In the present study, 52% of the local interviewed people cited that all kinds of soils are suitable for *Chol*, while approximately 42% and 6% of them considered rocky and sandy textures, respectively, to be unsuitable for *Chol*.

Proper depth for *Chol*

Regarding the depth of the hole for *Chol*, local informants considered several factors. Approximately 40% cited that the surface of the patient's body, when lying down in the hole, should be at the same level as the ground. Another way to determine the depth of the hole, mentioned by 32% of informants, depended on the patient's body shape. For obese and thin patients, the depth of the hole should be considered high or low, respectively. Additionally, 24% and 4% cited the depth of 20 to 30 cm and 50 cm, respectively, as the proper depth for the hole.

Gender limitation for *Chol*

Generally, from the local informants' point of view, *Chol* did not have any gender limitations, but it was not recommended for pregnant women.

Age limitation for *Chol*

Regarding age, 38% of the local informants considered limitations for children and old people together, while 36%

mentioned limitations for children only. They believed that *Chol* could affect the respiratory system of both age groups and may cause breathing problems. Some local informants considered the child's age as a limiting factor and did not recommend *Chol* for children under the age of 10 (14%), under 15 (8%), and under 20 years (2%).

Proper time during a day for *Chol*

Moreover, approximately 60% of the interviewed informants mentioned that the proper time for *Chol* is either in the evening or in the morning, as the weather is moderate during those times. Meanwhile, 38% stated that *Chol* is effective for pain treatment throughout the entire day without any time limitation, and only 2% mentioned that noon is the ideal time for *Chol* during the day for pain treatment.

Quantity of *Chol* for the best result

Approximately 50% of the local interviewed informants mentioned that there is no limitation on how many times *Chol* can be used. Around 42% of them stated that the method could even be used several times, while only 8% mentioned that the repetition of this method more than once depends on its effectiveness. One to three times, with 46% of citations, is the appropriate number of repetitions to consider in the *Chol* method (Figure 4).

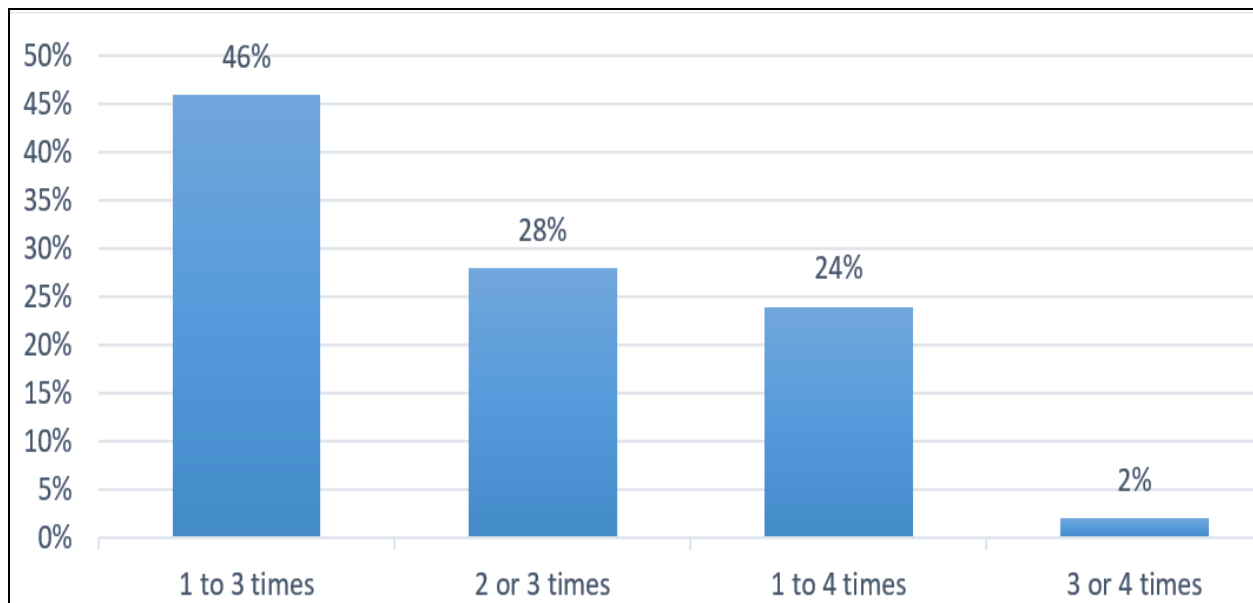


Fig 4: Quantity of using *Chol*

Ailments treated by *Chol*

In the *Chol* survey, we identified and recorded 19 plant

species from 11 plant families (Table 4) that have been used to treat sixteen subcategories of pain (Table 3).

Table 3: List of ailments treated by *Chol* in the studied area "F" denotes female informants, and "M" denotes male informants.

Ailments treated by <i>Chol</i>	Informant		Total citations (%)
	F	M	
After Childbirth	2	0	2 (1%)
Arthritis	8	2	10 (5%)
Back pain	11	6	17 (9%)
Body pain	18	12	30 (16%)
Bones pain	22	14	36 (19%)
Brucellosis	10	4	14 (8%)
Hair loss in women after childbirth	2	0	2 (1%)
Hand and foot pain	16	8	24 (13%)
Joint pain	9	7	16 (8.5%)
Knee pain	5	4	9 (5%)
Muscle aches	1	3	4 (2%)
Rheumatism	5	2	7 (4%)
Severe fever	2	0	2 (1%)
Swelling	3	2	5 (2.5%)
Tooth loss in women after childbirth	2	0	2 (1%)
Urticaria	5	3	8 (4%)
	121	67	188

The plant families most commonly used in *Chol*: The study revealed that *Apiaceae* was the most abundant family, accounting for 6 species (33%), followed by *Fabaceae* and *Lamiaceae*, each with 2 species (11%). *Tamarix mascatensis* Bunge, *Peganum harmala* L., and *Glycyrrhiza glabra* L. were the three plant species most frequently cited, with 21, 20, and 17 citations, respectively (See Table 4).

The plant parts used in *Chol*

Aerial parts were exclusively used for *Chol* because local people do not differentiate between stems, leaves, or flowers; they simply cut the plants above ground and use them in the *Chol* method. The underground plant parts, such as roots, were not utilized by local people in the *Chol* method.

Table 4: List of useful plant species for pain relief according to the local people using the *Chol* method, along with their Baluchi names and herbarium voucher numbers from the Herbarium Dresdense, Germany.

Scientific Name	Family	Local Name	Herbarium Number	Citation
<i>Tamarix mascatensis</i> Bunge	Tamaricaceae	Gaz	DR054934	21
<i>Peganum harmala</i> L.	Nitrariaceae	Espantan/Dodeni	DR054898	20
<i>Glycyrrhiza glabra</i> L.	Fabaceae	Maddoh/Shirin Bayan	DR054894	17
<i>Bromus japonicus</i> Houtt.	Poaceae	Nadag	DR054918	15
<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	Kalkoshtak	DR067636	15
<i>Ferula aucheri</i> (Boiss.) Piwczynski, Spalik, M.Panahi & Puchalka	Apiaceae	Oshterk/Paterk	DR054905	15
<i>Rhazya stricta</i> Decne.				
<i>Apium graveolens</i> L.	Apocynaceae	Harishark	DR054929	12
<i>Artemisia sieberi</i> Besser	Apiaceae	Kharasf	DR054902	10
<i>Ducrosia anethifolia</i> (DC.) Boiss.	Asteraceae	Derannag	DR054895	10
<i>Mentha longifolia</i> (L.) L.	Apiaceae	Shotk/Govatak	DR054917	10

<i>Haloxylon salicornicum</i> (Moq.) Bunge ex Boiss.	Lamiaceae	Porchenk	DR054891	9
<i>Prunus scoparia</i>	Amaranthaceae	Terat	DR054912	8
<i>Medicago sativa</i> L.				
<i>Salvia yangii</i> B.T.Drew	Rosaceae	Govatam	DR054906	8
<i>Withania coagulans</i> (Stocks) Dunal	Fabaceae	Alap		6
<i>Ferula ovina</i> Biess	Lamiaceae	Vek	DR054940	6
<i>Pyncocycla aucherana</i> Dence. ex Boiss. var. <i>aucherana</i>	Solanaceae	Panir bad	DR054949	6
<i>Ferula ammoniacum</i> (D.Don) Spalik, M.Panahi, Piwczynski & Puchalka	Apiaceae	Kamah	DR067380	5
	Apiaceae	Sagi dantan	DR067621	5
	Apiaceae	Poshk	DR067629	4

Customs and Rituals in Chol

During the *Chol* process, no special customs or rituals were observed. However, in 68% of all citations, the patients' relatives read the Quran and prayed for their health. Approximately 58% of local people suggested that patients should be naked during treatment, with the exception of underwear or the use of fabric to cover the genitals. The practice of covering the genitals and being either naked or dressed accounted for 30% and 12% of citations, respectively.

Who, when, why, and how do Chol?

Due to several reasons mentioned before, local people in the area primarily opt for self-curing when they experience muscle and skeletal pains. Initially, they attempt to reduce the pain using ointments and animal oils. If the pain persists for several days or even weeks, *Chol* becomes their final resort in the studied area. Consequently, patients must seek out a knowledgeable person well-versed in the *Chol* procedure. The healer then schedules a *Chol* session and either provides the necessary items for *Chol* themselves or the patient procures them. Most of the time, *Chol* treatment is provided free of charge due to family connections among locals in the studied area. However, occasionally, after the treatment, the patient compensates the healer with money or supplies such as wheat, flour, sugar, vegetables, oil, dry tea, shoes, and clothes.

Discussion

The local people of Sistan and Baluchestan, especially traditional healers of the studied region, still have a good knowledge of the application of this healing method, which is part of their strong religious beliefs and is based on climatic and geographical conditions. The local people in the studied area believe that if God gave them pain, surely, he already placed the drugs to treat it in the surrounding nature. Additionally, they do not have any other option but to trust in nature and learn how to use natural resources due to inadequate health services and a lack of proper access to cities. Many years ago, the previous generations of the studied area, like other local societies around the world, faced the challenge of accessing indigenous remedies. They used trial-and-error methods to discover the potential of native plants. Besides all of these, Taftan Mountain area with numerous plant species is a good source to treat pains and ailments. According to the recorded information, the *Chol* treatment is still a trusted and accepted method against a variety of pains and ailments. Interestingly, local people in the south of Baluchestan use the same name, *Chol*, for covering bodies with sand on the beach to relieve body pains. There are several traditional practices involving heat treatments with plants in various cultures around the world. These treatments may include herbal steam baths, herbal sauna, boiled herbal remedies, herbal compression balls, and aromatherapy. These heat treatments with plants are often part of traditional medicine systems and are used for their potential therapeutic properties. The specific plants and methods can vary widely

depending on the cultural practices and traditions of a given region.

Herbal steam bath

Zumsteg and Weckerle [52] described Bakera as a traditional steam bath in Minahasa (North Sulawesi, Indonesia), commonly used for postpartum recuperation. Through semi-structured interviews with 14 midwives and 166 mothers across different Minahasa villages, they documented the preparation methods and plant ingredients used for Bakera. They recorded the use of 60 different plant species overall. The therapeutic effects of Bakera stem from thermotherapy and aromatherapy. Thermotherapy alleviates symptoms such as muscle strain, limb heaviness, edema, loss of appetite, and constipation, while the essential oils of the plants used have immunostimulant, antiseptic, and anti-inflammatory effects. Zumsteg and Weckerle [52] suggested that Bakera can be an effective and safe method for postpartum recovery under the guidance of an experienced individual. Wakhidah and Silalahi [44] investigated the traditional steam herb bath of the Saibatin sub-tribe in Lampung, reporting a concoction called Betimun. This herb, containing various health benefits, consists of six plant species from three families, all sourced from home gardens. The Betimun herb, made by boiling the leaves of these plants, is placed between the legs of the user, who is then wrapped in a sarong. The study showed that Betimun helps eliminate body odour, fatigue, and aches; prevents and treats vaginal discharge, aids in postpartum recovery, slows down the aging process and accelerates metabolic processes. Tungsukruthai *et al.* [40] assessed the efficacy and safety of herbal steam baths in reducing symptoms of allergic rhinitis. They conducted a single-blind randomized controlled trial involving 64 subjects divided equally into two groups at a Thai traditional and alternative medicine hospital. The treatment group received herbal steam baths, while the control group received steam baths without herbs, three times a week for four consecutive weeks. Although both groups showed reductions in rhinorrhea symptoms like sneezing, nasal itching, and congestion, the treatment group exhibited significantly higher treatment satisfaction. Patients receiving herbal steam baths reported greater satisfaction and improved quality of life, indicating the benefits of both herbal and standard steam baths for allergic rhinitis patients. Li *et al.* [22] documented the use of *Mussaenda* in medicinal baths among Yao communities in southern China. They identified 110 medicinal plant species, spanning 59 families and 93 genera, used by locals to treat various ailments such as rheumatic diseases, skin conditions, and injuries from falls, and gynecopathia. Among these species, 6 (5%) were previously unrecognized for their medicinal properties, while 87 (79%) were newly recorded for their use in medicinal baths. Li *et al.* highlighted that existing literature primarily focused on herbs used in medicinal baths for skin diseases, with limited coverage on rheumatism, injuries from falls, or gynecopathia. Lundh [24] investigated plant use in ante and postpartum

healthcare in central and northern Laos. In Mak Feuang village, informants identified 19 plants used postpartum, with half belonging to the Zingiberaceae family and commonly used in steam baths. During forest walks and interviews in Kaoy village, Lundh identified eleven plants related to childbearing and postpartum healthcare, with eight used in steam baths for postpartum wound healing and overall health recovery. *Curcuma longa* (Zingiberaceae) was reported to address general skin issues and postpartum concerns like loose skin, stretch marks, and bacterial infections. However, Lundh cautioned against steam sauna use during pregnancy or immediately after childbirth due to potential risks like uterine hypotension or toxicity to the baby and mother. *Blumea balsamifera* emerged as a crucial postpartum species in Laos according to Lundh's findings. It was noted for its postpartum benefits in three villages and four steam saunas, aiding in wound healing, alleviating postpartum abdominal pain, and relieving various bodily pains. Its applications extended beyond postpartum care to include pain relief in bones, rheumatism, arthritis, dengue fever, skin ailments, headaches, sore throats, nasal breathing issues, weakness, and fatigue. Rhomadona and Primihastuti [32] conducted a study on the impact of herbal steam baths on postpartum mothers' breast milk production. Among 40 participants, divided into 20 treatment and 20 control groups, the results demonstrated an increase in average milk production following steam bath therapy. This suggests that herbal steam baths offer significant benefits for postpartum mothers' health and can serve as a non-pharmacological alternative treatment. De Boer [13] investigated steam sauna and mother roasting practices in Laos through sixty-five interviews, focusing on confinement rituals and postpartum plant use. Their findings revealed the use of 10 different species by multiple ethnic groups. While all species were utilized in steam saunas and baths, only three were employed in hotbed and mother roasting rituals. Bo Chen *et al.* [12] discussed Chinese herbal bath therapy (CHBT) for treating knee osteoarthritis. They conducted a comprehensive search across English and Chinese databases up to October 2014, selecting randomized trials involving CHBT for at least 2 weeks. Meta-analyses of fifteen studies comprising 1618 subjects indicated positive effects of CHBT on clinical symptoms, including pain levels measured through the visual Analog scale and overall effectiveness rate, assessing pain, physical performance, and well-being. The CHBT regimen typically comprised 13 Chinese herbs, with instructions for steaming and washing around the knee for 20-40 minutes once or twice daily, over a mean treatment duration of 3 weeks. Klooster *et al.* [42] conducted a study on herbal bathing practices in Suriname, focusing on the differences in plant usage between Saramaccan and Aucan Maroon communities. They compiled a comprehensive database from both published and unpublished sources, documenting herbal bath ingredients and creating a presence/absence matrix for each bath type and study location. Their analysis revealed the utilization of 349 plant species across six commonly practiced bath types: baby strength, adult strength, skin diseases, respiratory ailments, genital steam baths, and treatments for spiritual issues. The study findings indicated significant variability in plant ingredients between the Saramaccan and Aucan communities, with minimal overlap even for the same types of baths. Interestingly, baby baths and genital baths shared a higher number of plant species compared to other bath types. Furthermore, within the Saramaccan community, plant usage was more closely associated with geographical location rather

than bath type.

Boiled herbal remedies

Chaniam *et al.* [11] investigated Thai traditional medicine practices at Wat Nong Ya Nang Buddhist temple in Uthai Thani province. They observed that boiled herbal remedies were prepared using either fresh or dried medicinal plants and herbs, boiled in proportionate amounts of water. Various parts of the plants, including stems, bark, seeds, and roots, were boiled according to Wat Nong Ya Nang's herbal formulas. At Wat Nong Ya Nong, there are nine different boiled herbal remedies available. These include five remedies for temporary paralysis, two for nausea and nervous system issues, two for ligament and beriberi treatment, and one each for gout and joint pain, diabetes, stiff tongue symptoms, pustule cancer, rectal bleeding, and heart conditions. The quantity of boiled remedies prescribed to patients is determined by pots or portions. Larger portions are allocated by the supervising examiner for patients with severe symptoms. If a patient does not respond to treatment initially, the portions may be increased until recovery or cure is achieved.

Herbal compression balls

According to Chaniam *et al.* [11], herbal compression balls at Wat Nong Ya Nang are crafted from fresh herbal plants and herbs. The ingredients are carefully proportioned based on Wat Nong Ya Nang's formula, then finely crushed and wrapped in a clean cloth. These compression balls are steamed until they achieve the desired firmness and are then applied to various body parts to alleviate pain. Additionally, they are utilized in massages to relax ligaments and muscles, providing pain relief and aiding in the restoration of respiratory health and enhanced blood circulation throughout the body.

Herbal Sauna and Aromatherapy

Chaniam *et al.* (11) discussed the herbal sauna and aromatherapy practices at Wat Nong Ya Nang, which involve boiling various herbal plants and herbs in a large pot and piping the resulting steam into the sauna room. The sauna at Wat Nong Ya Nang can accommodate up to five individuals simultaneously. The therapy aims to allow the medicinal steam to permeate the skin and body, providing relief from stress and clearing the respiratory system. The herbal mixture is believed to have curative properties for various diseases and symptoms. The design of the Vietnamese village herbal sauna resembles the traditional Southeast Asian village chicken coop, albeit on a larger scale, typically measuring 1.5 meters wide and 1.2 to 1.4 meters in height, with seating for four people. Some saunas feature a bamboo pipe connecting a pot of boiling herbs outside the sauna to the interior, as described in 'The Thai herbal sauna' [8]. Furthermore, Chaniam *et al.* [11] noted that the application of herbal compresses, whether hot or cold, aims to stimulate the nerves and enhance the patient's responsiveness, thereby promoting efficient blood circulation. The alleviation of stress and pain fosters patient confidence and cooperation in their treatment. The results of our study in the treatment of pain, rheumatism, and childbirth are in line with Wolters' studies [48, 49]. The present study results in case of support the recuperation of women after childbirth are in agreement with other findings obtained in Thailand [4, 46], Indonesia [52, 43, 32, 44, 36], and Laos [24]. To treat muscular strain and heaviness in the limbs, our results are in accordance with the findings of studies in Indonesia [52, 32], Laos [24], and Thailand [11]. Our results

regarding the safety of the used plants, even on multiple occasions, and the determination of the time of application, as well as its duration, which must be under the guidance of an experienced person, were in line with those obtained by other researchers in Indonesia^[52]. Concerning rheumatism treatment, our results are in accordance with the study performed by Li *et al.*^[22] among Yao communities in southern China. Regarding the avoidance of using the method during pregnancy or directly after childbirth, our results are in line with findings from Laos^[24] and Thailand^[40]. In the case of treating swellings and pain in bones, our results are in accordance with Lundh's^[24] investigation in Laos, and to treat pain in the body and bone joint pains, our results align with Chaniam *et al.*^[11] findings in Thailand. In the case of using the method several times until effectiveness, our results are in accordance with those obtained in Thailand by Chaniam *et al.*^[11]. Our study documented *Chol* as a useful method against 16 ailments. Investigations into the literature of other countries, especially India and China, with a great background in medicinal plants, also revealed that neighbouring countries do not have the exact same method as *Chol*. Therefore, in comparison with all the mentioned studies above, *Chol* seems to be a unique method used by Baluch tribes in Baluchestan in the southeast of Iran. In contrast, in other heat treatments around the world, the involvement of plants was documented differently.

Conclusions

The present study shows that plants have a special role in the *Chol* method, similar to other heat treatment methods around the globe but with different applications. Since empirical evidence from traditional practice mostly supports the use of *Chol* for body pains, its potential benefits for other illnesses need to be confirmed by further investigations. Traditionally, *Chol* still plays an important role in Baluchestan for a variety of pains, and some information has shown significant functional and pain improvement in patients with other types of illnesses, especially skeletal pains (Table 3). As our study demonstrates, *Chol* may be a safe, effective, and simple alternative treatment method in pain therapy used by Baluch tribes in Taftan Mountain, Sistan and Baluchestan province. However, additional ethnobotanical investigations are required to study the large number of plant species used for treating different kinds of ailments in the area. Finally, young local residents should be encouraged to learn the traditional medicinal knowledge and methods to preserve it from being lost with the older generation in the near future.

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