Hydrotherapy and crenotherapy in the treatment of pain: integrative review

Hidroterapia e crenoterapia no tratamento da dor: revisão integrativa

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ABSTRACT

BACKGROUND AND OBJECTIVES: The Integrative and Complementary Practices were implemented in the Unified Health System as adjunctive modalities in the treatment of pain. This article focuses on crenotherapy and hydrotherapy, whose agents are the natural mineral waters and common for the rehabilitation of functional alterations. The scarcity of these practices for the treatment of pain in the literature justifies this review. This study aimed to check the scientific productions about the efficacy of balneology/balneotherapy/crenotherapy and hydrotherapy in the treatment of pain.

CONTENTS: It is an integrative review, carried out in May 2018, searching in the electronically available scientific articles, in full, in the LILACS, Pubmed, BVS and CINAHL database in periodicals published in the last 10 years focusing on crenotherapy and hydrotherapy for pain relief, in the Portuguese, English and Spanish language. The descriptors used were: "Pain", "Balneology", "Crenotherapy", "Hydrotherapy" "Efficacy"; "Effectiveness" in the three languages, combined with the Boolean expressions AND/Y/E and OR/O/U/OU, finding 2306 articles, of which 111 were identified, and only 27 met the inclusion criteria, analyzed and incorporated the evidence that emerged in pain relief.

CONCLUSION: This study showed that most of the evidence emerged from the studies analyzed regarding the efficacy of hydrotherapy and balneology in pain pictures focused on levels 1 to 3. Of the 27 studies, 18 showed the efficacy of hydrotherapy and eight of balneology in the pain symptomatology and one in relation to the lack of knowledge of the use of these complementary therapies in pain relief.

Keywords: Balneology, Balneotherapy, Crenotherapy, Efficacy, Hydrotherapy, Pain.

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RESUMO

JUSTIFICATIVA E OBJETIVOS: As Práticas Integrativas e Complementares foram institucionalizadas no Sistema Único de Saúde como modalidades coadjuvantes no tratamento da dor. Este artigo focalizou a utilização de crenoterapia e hidroterapia, cujos agentes são as águas minerais naturais, comum para a reabilitação de alterações funcionais. A escassez da literatura dessas práticas no tratamento da dor, justifica esta revisão. O objetivo deste estudo foi verificar a produção cientifica sobre a eficácia da balneologia/balneoterapia/crenoterapia e da hidroterapia no tratamento da dor.

CONTEÚDO: Revisão integrativa, realizada em maio de 2018, cuja busca de artigos científicos disponíveis eletronicamente e na íntegra, na base de dados, LILACS, Pubmed, BVS e CINAHL em periódicos publicados nos últimos 10 anos enfocaram a crenoterapia e hidroterapia para o alívio da dor nos idiomas Português, Inglês e Espanhol. Os descritores utilizados foram: Dor, Balneologia, Crenoterapia, Hidroterapia, Eficácia; nos três idiomas, combinados com as expressões booleanas *AND*/*Y*/E e *OR*/O/U/OU encontrando 2306 artigos, identificados 111 e destes, apenas 27 atenderam aos critérios de inclusão, analisados e incorporadas as evidências emergidas no alívio da dor.

CONCLUSÃO: Este estudo mostrou que a maioria das evidências emergidas dos trabalhos analisados quanto à eficácia da hidroterapia e crenoterapia em processos álgicos concentraram-se nos níveis 1 a 3. Dos 27 estudos, 18 mostraram a eficácia da hidroterapia e oito da balneoterapia e crenoterapia nos sintomas dolorosos, e um em relação ao desconhecimento do uso dessas práticas integrativas no alívio da dor.

Descritores: Balneologia, Balneoterapia. Crenoterapia, Dor, Eficácia, Hidroterapia.

INTRODUCTION

In 2002, the World Health Organization (WHO)[1] established the Pain Management Protocol for the relief of pain and in the document "WHO Traditional Medicine Strategy 2002-2005" recognizing the importance, efficacy, and quality of Complementary Medicine, encouraging the integration of their knowledge to those of the Western Medicine in health systems. The text of this Strategy continues with the encouragement of the use of Integrative and Complementary Practices (PICS) for the development of access policies, for rational, responsible, safe practice and at the same time, recommending the development of studies that validate them[1].

The PICS were institutionalized in the Unified Health System (SUS) by the National Policy on Integrative and Complementary Practices (PNPIC), approved by Ordinance GM/MS No. 971/5/3/2006[2].

The purpose of the Ministry of Health (MS)[2] is to offer the Brazilian population access to PICS by standardizing them to meet the demands of the public health network, being transversal in its actions in the Unified Health System (SUS), and present at all levels of health care, making available to the population modalities to follow: aromatherapy, art therapy, ayurveda, biodance, bioenergetics, family constellation, chromotherapy, circular dance, geotherapy, hypnotherapy, homeopathy, imposition of hands, anthroposophic medicine/anthroposophy, applied to health, Traditional Chinese Medicine – acupuncture, auriculotherapy, meditation, music therapy, naturopathy, osteopathy, ozone therapy, phytotherapy, chiropractic, reflexotherapy, reiki, shantala, integrative community therapy, floral therapy, social thermalism/cryotherapy and yoga[2]. Except for acupuncture, that is minimally invasive; the others are characterized by non-invasive interventions and an important rebalancing of the physical, mental, and emotional energies.

These PICS help the pharmacological treatment and alleviate the suffering caused by pain, considered one of the great public health problems, improving the quality of life (QoL)[3,4]. Pain is a symptom frequently present in the patient and requires physical, psychosocial, and psychoemotional evaluation determining the agent of his/her suffering by the multiprofessional team[3-5].

This article will specifically focus on the use of hydrotherapy (HT) (common water) and crenotherapy (CT) (thermal water) for pain relief, which have water as an essential element. The different modes of therapeutical application of water receive the names of social thermalism, balneotherapy (BT), thalassotherapy, CT, and HT[2].

The BT/CT designation refers to the therapeutic use of natural mineral waters whose chemical composition can be classified as sulphurated, radioactive, bicarbonate, ferruginous, among others, for the prevention, treatment, and rehabilitation of various diseases. It is a millenary practice introduced in Brazil by the Portuguese empire for the treatment of several organic signs and symptoms of patients, as a complementary therapy to other treatments[2,5].

HT consists of the external and therapeutic use of common water with different application and temperature forms. It is an important resource for the rehabilitation of functional alterations, having as a principle the physical, chemical, physiological, and kinesiological effects obtained by immersion of the body in swimming pool[6,7], usually heated. Exercises in the heated water improve joint movement, relaxation, reduction of muscle tension, muscular spasms, an increase of muscle strength and endurance[6], besides benefiting the venous return, improving peripheral circulation and favoring the decrease of pain[6,7].

HT and CT do not present associated risks, being a convenient method, but they must be used with discretion, responsibility, and performed by trained professionals[2,6,7]. HT and CT, although they are millenarian therapeutic methods, like PICS used for the treatment of pain, seem to have been little contemplated in scientific studies in the national and international literature. This study aimed to evaluate the efficacy of CT and HT in the treatment of pain through an integrative review of the literature.

CONTENTS

It is an integrative review that allows the search, the critical evaluation, the synthesis, analysis, and incorporation of the evidence of the national and international scientific productions emerged from the subject investigated[8,9], with a retrospective temporal cut, respecting the copyright of the literature used, according to Law No. 9610/1998 of the Ministry of Education and Culture (MEC)[10].

After, the following steps were followed: 1. establishment of the guiding question; 2. objective; 3. criteria for inclusion and exclusion of articles; 4. information extracted from selected articles; 5. analysis and presentation of the studies[8,9]. The guiding question was: "How does national and international scientific production evaluate the efficacy of HT and BT/CT in pain therapy"?

The databases used were: Latin American and Caribbean Health Sciences Literature (LILACS), Virtual Health Library (VHL); Cumulative Index to Nursing and Allied Health Literature (CINAHL) and National Library of Medicine (Pubmed) using controlled descriptors from the Health Sciences Descriptors (DeCS) and the Medical Subject Headings (MeSH), "dor (pain,) (dolor); eficácia (efficacy/effectiveness), (eficácia); BT/CT (balneology) (crenotherapy) and (hydrotherapy) (HT). Also used an uncontrolled descriptor: hidrotherapy (crenotherapy) two or more DeCS/MeSH among those mentioned were combined and the Boolean expressions E/AND/Y/ and OU/OR/O/U (Table 1)

Table 1. Combination of descriptors with Boolean expressions used in the search strategy (EB)

EB	Combination of the descriptors with the Boolean expressions E/AND/Y/ and OU/OR/O/U
1a	Balneoterapia e dor (balneology, balneologia and/y pain/dolor)
2a	Crenoterapia e dor (crenotherapy/and/y pain/dolor)
3a	Hidroterapia e dor (hydrotherapy/and/y pain/dolor)
4a	Balneoterapia e dor ou crenoterapia e dor; (balneology balneologia and/y pain or crenotherapy and/y pain, dolor)
5a	Balneoterapia e dor e eficácia ou crenoterapia e dor e eficácia (balneology and pain, dolor and efficacy or effectiveness or crenotherapy and/y efficacy or effectiveness, or eficácia, efetividade and/y pain, dolor.
6a	Hidroterapia e dor (hydrotherapy, and pain, hidroterapia dolor)
7a	Hidroterapia e dor e eficácia ou terapia aquática, dor e eficácia ou (hydrotherapy and pain, dolor and efficacy or effectiveness, eficácia, efetividade).

The review period was from May 2008 to May 2018, seeking to cover more recent studies of CT and HT and its efficacy in pain relief. The inclusion criteria were: scientific papers in English, Spanish and Portuguese available electronically and excluded editorials, letters, theses, dissertations, monographs, manuals, abstracts of congresses; articles duplicated in more than one database, counting only one; or that did not address the research question, the objective and descriptors.

After the critical and careful reading of the abstracts and, a posteriori, of the complete articles, the information was organized and recorded in a specially structured form, composed to identify title, author, year of publication, objectives, methods and

results of articles analyzed, including or excluding them for the analysis, presentation of the main results and classification of the emerging evidence.

The precepts of the PRISMA checklist, 2009[11] were considered to analyze meta-analyzes and systematic reviews that guide the eligibility, inclusion of articles, and the level of scientific evidence (LE), favoring the preparation of figure 1.

The search was carried out independently by 2 reviewers who after the refinement of the searches, classified the quality, scientific validity, and reliability of the articles by the Level of Evidence (LE)[12,13], that is, **level 1**: the evidence from systematic review or meta-analysis of relevant randomized controlled trials or from clinical guidelines based on systematic reviews of randomized controlled trials; **level 2**, evidence derived from at least one well-delineated randomized controlled trial; **level 3**, evidence obtained from well-delineated non-randomized controlled trials; **level 4**, evidence from well-delineated cohort and case-control studies; **level 5**, evidence originating from a systematic review of descriptive and qualitative studies; **level 6**, evidence derived from a single descriptive or qualitative study; **level 7**, evidence from the opinion of authorities and/or report of expert committees"[12,13].

The analysis of table 2 shows that of the 1,160 articles screened in the databases, 1,049 were excluded because they did not meet the inclusion criteria, with 111 articles remaining eligible. After the evaluation of the full text, 84 were excluded, of which only 27 were included. One article (3.7%) was found in VHL (IBEC), and five articles (18.5%) were found in LILACS, none in CINAHL database and 21 (77.8%) in Pubmed from a total of 27 analyzed.

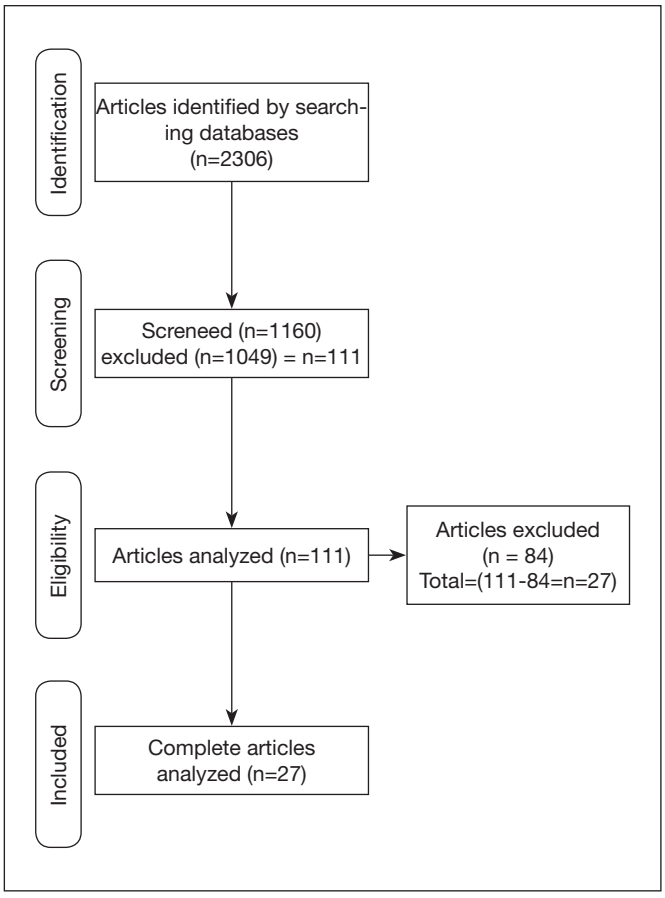

Figure 1. Flowchart with eligibility representation and inclusion of articles

Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A1	Ceylan e Bollşlk[14] Pubmed	Crossover design, experimental, randomized controlled trial. n=35	35 socio-demographically homogeneous premature infants with 33-37 weeks' gestation with a birth weight <1,500 g in the NICU were selected from a public hospital in Denizli, Turkey. Two bath methods: 20 babies of the Experimental Group wrapped with tissue (EG) and 15 wrapped with a sponge of the Control Group (CG) were applied at intervals of 3 days. Vital signs and oxygen saturation levels were measured before and at minutes 1, 5, 15, 30 after bathing. The mean water temperature was 37.76±0.16°C for CG and 37.58±0.8°C for EG. Video-recorded baths evaluated pain and stress behaviors by independent observers. p<0.05 was used for all statistical analysis; excluded babies with signs of infection, neurological problems, skin integrity, congenital defects, deterioration, use of analgesic drugs, sedatives or muscle relaxants. The bath application sequence was computer-randomized (Predictive Analytics Software, SPSS Inc., Chicago, IL, USA).	The baby's bath wrapped with fabric has a positive effect on the baby's vital signs, oxygen saturation levels, cry time, and level of stress and pain compared to the condition of the common bath. The pain scores of the babies during and after the tissue baths were smaller (p = 0.001) than the standard baths. Baby bath wrapped in fabric is a harmless and safe nursing practice	2

Continue...

Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results – continuation

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A2	Avila et al.[15] Pubmed	Experimental before and after, non-randomized. n=20	20 women with fibromyalgia syndrome with pain and restriction of three-dimensional scapular movement underwent 3 evaluation sessions, one before, one after 8 weeks and at the end of 16 weeks of a hydrotherapy treatment program with 2 sessions of 45min/weekly/16 weeks. Data were analyzed by ANOVA for pain and quality of life variables. The effect on the scapular movement evaluated by Cohen's coefficient d. The pain intensity by VAS=8 at the time before compared with evaluations 2 and 3 at the time after, evolved to zero intensity.	The proposed HT program was effective in improving quality of life, pain intensity ($p<0.05$), reflecting the improvement of the scapular movement from -1.93 to 1.61 and the impact of fibromyalgia in women with this disease.	3
A3	Batten et al.[16] Pubmed	Experimental, non-randomized, before and after. n=43	The normal postpartum HT protocol without drug use was aimed at relieving the pain of 45 women who were immersed in hot water for 30 minutes and 1 hour postpartum. The pain scores were evaluated before the bath, 15 and 30 minutes later. There was a significant reduction in scores.	This treatment significantly reduced VAS pain = 8 between the onset of the bath and 2 ($p<0.001$) at 15 and 30 minutes and ($p=0.97$) between the two times. It offered a non-pharmacological alternative, in which there are traditionally limited options.	3
A4	Cipriano and Oliveira[17] LILACS	Experimental, prospective, non-randomized controlled trial. n=20	The authors verified the influence of elastic bandaging in the treatment of posterior pelvic pain and functionality in the activities of the daily life of pregnant women. It is a controlled and prospective clinical trial with 20 pregnant women, 10 in each group, aged between 18 and 39 years old: experimental group (EG) (elastic bandage and HT) and control group (CG) (HT). The pain was evaluated by the numerical visual scale (NVS) and the functionality through the Rolland-Morris disability questionnaire.	They concluded that there was no statistical difference between the two groups ($p<0.05$) with these two evaluation instruments for the treatment of posterior pelvic pain and the improvement of functionality in daily activities in pregnant women. An elastic bandage can be used to treat low back pain during pregnancy safely.	3
A5	Matsumoto et al.[18] Pubmed	Meta-analysis n=102	Meta-analysis performed in the databases: Medline, Embase, Cochrane Library and in the database of the Japan Medical Abstracts Society using two approaches, MeSH terms (Medical Subject Headings) and free words published from 2004 to 12/31/2016 in the English or Japanese languages of randomized controlled trials of 102 publications involving 734 patients(359 EG and 375 CG), analyzing the effect of balneotherapy/crenotherapy (BT/CT) for the treatment of pain, stiffness and improvement of physical function compared to patients with osteoarthritis of the knee lasting ≥2 weeks. The Osteoarthritis Index (WOMAC) and VAS for pain were used. They analyzed the improvement in the WOMAC score in the final follow-up ranging from 2 to 12 months postintervention.	This meta-analysis indicated that BT/CT was clinically effective in relieving pain, stiffness, and improvement of function, as evaluated by the WOMAC score, compared to controls with high heterogeneity (88 to 93%).	1
A6	Vanderlaan[19] Pubmed	Retrospective cohort study, n= 164	The use of HT for pain management in labor in 268 participants. Of these, 80 were excluded by medical decision, and 24 evolved to pharmacological treatment. The mean duration of immersion use was 156.3min±122.7 at T ±37ºC.	The induction of labor was associated with a decline in the supply of HT during labor provided comfort, besides being a non-pharmacological strategy, low cost, safe and effective, promotes normal delivery.	4

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Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results – continuation

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A7	Koyuncu et al.[20] Pubmed	Experimental randomized controlled trial. n=60	The authors investigated the efficacy of BTCT in relieving chronic neck pain of 60 patients, randomized into two groups: experimental (EG) (n=30) and control (CG) (n=30). All patients in both groups were treated with a physiotherapy program (FT) of 15 standard sessions consisting of hot pack, ultrasound and TENS. The EG patients were also treated by the BT/CT program of 15 sessions lasting 20 minutes/day. VAS, modified neck disability index (mNDI) and Nottingham health profile score (NHT) were used for all patients, being evaluated at three different times as pretreatment, posttreatment and the third week after treatment. The 2 groups were homogeneous both socioeconomically and clinically. Intergroup analysis revealed the superiority of EG in all parameter.	The authors conclude that combined therapy of BT/CT and FT provided clear clinical improvement and remains long-term. All EG parameters were superior to FT alone in reducing pain and improving the quality of life of patients with chronic neck pain.	2
A8	Branco et al.[21] PubMed	Experimental, blinded, randomized controlled trial. n=140	140 adult patients of both genders were evaluated for the efficacy of hot sulfurous (AS) and non-sulfurous waters (ANS) in the treatment of knee osteoarthritis (OAK). Randomized in three groups: AS group (n=47), ANS (n=50) and control group pharmacological treatment (n=43). The AS group received 30 individual thermal baths (three baths/20min/week for 10 weeks) at 37-39 ° C. The pain was measured by the VAS, physical function Index WOMAC; Lequesne Algo functional Index, LAFI; Stanford Health Evaluation Questionnaire (SHAQ) and analgesic drug use. The patients were evaluated before treatment (T1), at the endpoint of treatment (T2) and two months after intervention (T3). The significance level ($p<0.05$) for intra and intergroup comparisons.	Pain intensity decreased significantly during movement, at rest and at night, as well as analgesic use, with even better WOMAC, LAFI and HAQ scores from baseline to T2 and T3 ($p<0.001$). Both AS and TM methods were effective in the treatment of OAK. AS baths produced a good impact of clinical rehabilitation in reducing pain and improving physical function in OAK patients.	2
A9	Kümpel et al.[22] LILACS	Before and after experimental, non-randomized controlled trial. n=26	A prospective study, in which 26 patients with knee osteoarthritis (OAK) received hydrokinesitherapy treatment, 2 times/week with a duration of 50 minutes each session in 4 phases: warm-up, stretching, strengthening and relaxation. They were evaluated before and after treatment, using goniometric evaluation, pain=VAS, and Six-Minute Walk Test.	There was an improvement in the ability to perform ADL and physical capacity, as well as a decrease in pain with a mean pre-treatment of 8.9±1.2 and 5.1±1.7 ($p<0.0001$) and significant improvement in capacity to increase range of movement.	3
A10	Fonseca et al.[23] Pubmed	Before and after, non-randomized controlled trial n=4	Four athletes with age = 24.0±3.6 years old, mass=78.4±2.4kg, body fat =13.1%±3.6%) were randomly selected for post-training recovery using HT (6.0°C±0.5°C) for 19 min; the control group received a passive recovery. All completed the study. Serum levels of lactate dehydrogenase, creatine phosphokinase, LDH, aspartate aminotransferase, and alanine aminotransferase were measured; muscle pain and recovery perceived by VAS and muscular power of the upper and lower limbs in the pre-workout, post-recovery, 24 and 48 hours. Significance level $p <0.005$).	HT decreased muscle pain (3.1±1.0 versus 1.5±1.1 ($p=0.004$) and improved post-workout recovery, increased muscle strength compared to passive recovery ($p=0.0058$), LDH levels were lower than those in the control group ($p=0.03$). Higher perceived muscle power in HT than in control for both upper limbs $p=0.001$, HT has been widely applied as a recovery method; however, there are few publications demonstrating the evidence of its efficacy.	3

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Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results – continuation

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A11	Forestier, Erol Forestier and Francon [24] Pubmed	Systematic review of randomized experimental studies n=36	Systematic review of 421 randomized controlled trials in the Medline databases via Pubmed, PEDRO, and Cochrane Central Register of controlled clinical trials. Of these, only 36 were included up to September 2015. Inclusion: articles from experimental randomized controlled trials on knee osteoarthritis (OAK) with separate data from hot mineral water baths, mud therapy, hot showers, and supervised massage and water exercises (EG), compared with any other intervention or no treatment (CG); follow-up> 3 months, pain measurement and/or function and/or overall evaluation of the patient and quality of life at 3, 6 and 9 months.	A review of 36 randomized controlled trials covering 2833 patients with high heterogeneity (88 to 93%) showed that HT and CT treatment performed in SPA centers in Europe and the Middle East seem to improve pain and the function of patients with OAK. When CT is associated with exercise program demonstrates superiority to home exercise only for pain and function at 3, 6 and 9 months with no difference in the quality of life and drug consumption.	1
A12	Chen et al.[25] Pubmed	Meta-analysis n=15	Seven databases were searched: PubMed, the Cochrane Library, Springer; China National Knowledge Infrastructure, Chongqing VIP, Chinese Biomedical, and Wanfang by October 2014. Randomized controlled trials evaluating 2 weeks of Chinese Herbal Bath Therapy (CHBT) for OAK were selected. The effects of CHBT on clinical symptoms and pain level (VAS). The meta-analysis of 15 studies with 1618 individuals who met the eligibility criteria was performed. The bath prescription included, on average, 13 Chinese herbs with instructions for using steam and washing around the knee for 20 to 40 minutes, once or twice a day. The mean duration of treatment was 3 weeks.	Chinese herbal bath therapy may be effective in reducing OAK pain (mean difference -0.59 points, p<0.00001), when compared to standard Western treatment. No serious adverse events have been reported.	1
A13	Ezheltha Suji and Sharmila Jansi Rani[26] Pubmed	Before and after experimental, non-randomized controlled trial. n=60	To evaluate the efficacy of foot bath versus exercises in reducing pain among patients with OAK. Sixty patients with OAK and ankle were selected by intentional sampling at Issac Bone & Joint Specialty Hospital, Marthandam in Kanyakumari district. Demographic, clinical, and VAS variables of group I and group II were collected before and after the administration of the foot bath versus exercises on the first, third, and fifth days of treatment. The analysis was done using descriptive and inferential statistics.	There was a significant association between age, disease duration, family history of osteoarthritis, physical mobility, and any condition associated with osteoarthritis and the level of pre-test pain among patients. The results showed that foot bath (0.52) had a better effect on reducing joint pain in knees and ankles than in exercises (1,20) (p <0.001). (1.20) (p<0.001).	3
A14	Ibarra Cornejo et al.[27] BVS (IBECS)	Systematic review of experimental, randomized controlled trials n=6	Systematic review of randomized controlled trials (RCTs) on the efficacy of HT in the pain therapy of OAK patients in the databases of: PEDro and Medline of 01/01/2004 and 07/31/2014 in the Spanish and English languages, with selection of independent studies by two reviewers and a classification of studies with a score ≥ 5 on the PEDro scale. We found 119 eligible articles, selected based on title and abstract, of which only 6 primary documents were examined. All used VAS to measure pain.	The authors inferred that the primary studies included showed strong evidence that HT was effective in reducing pain in all (mean p<0.003) and improved quality of life and physical function in patients with osteoarthritis of the knee at 6 to 12 weeks of follow-up	1

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Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results – continuation

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A15	Karagülle and Karagülle[28] Pubmed	Systematic review of randomized controlled trials n=8	The objective was to evaluate the recent evidence on the efficacy of BT and SPA therapy for patients with low back pain. The databases for RCT published in Pubmed and Cochrane Central Register between 07/2005 and 12/2013. The Jadad scale was used to classify the methodological quality of eligibility, and of the total of 114, left 8, being three with scores> 3, indicating good quality. All trials tested the efficacy of BT/CT versus common water in SPA for low back pain. Of the 8 RCTs: 2 in BT and 6 in SPA therapy.	Evidence from all RCTs indicates that the efficacy of BT/CT in low back pain is encouraging and reflects the consistency of previous evidence. All reported that BT/CT was superior in long-term therapy with tap water in pain reliever. Although when SPA therapy is combined with CT, geotherapy and/or exercises, and/or education is effective in the treatment of low back pain, it is superior or equally effective to short- and long-term control treatments.	1
A16	Liu et al.[29] Pubmed	Experimental, non-randomized controlled trial. n=108	108 healthy primiparous women with single gestations in labor in China were studied. Of these, 80 progressed to normal delivery, 38 (EG) (mean of 28.66 ± 3.08 years old) were immersed in water maintained at 35-38°C and 70 (CG) (mean of 27.89 ± 2.99 years old) underwent conventional labor. Pain scores were evaluated (VAS) when cervical dilatation was 3 cm before entering the bathtub, and 30 and 60 min after.	The authors concluded that immersion of water during labor reduces pain with lower scores than in the control group at 30 min and 60 min after cervical dilatation of 3 cm respectively in both, p <0.001). The symptoms of stress urinary incontinence (SUI) at 42 days postpartum were also higher in the CG (25.5% to 6.1% (EG) p = 0.035 and the rate of cesarean section was lower (p=0.026). There was no significant difference (p>0.05) in the duration of labor and postpartum bleeding and Apgar Index.	3
A17	Baena-Beato et al.[30] Pubmed	Experimental, randomized controlled trial n=49	To understand the physical and psychological factors and reduction of disability after the aquatic/HT exercise of 49 patients of both genders sedentary with chronic low back pain. The patients were randomized: in EG-E1 (n=24, two months, five times/week) CG (n=25) according to the aquatic space program.	The authors concluded that the two-month intensive program of high-frequency (five times/week) HT significantly decreased levels of chronic low back pain and increased the mobilization of sedentary people; there were no changes in the standardized mental component (p<0.114); increased quality of life (p<0.001) and improved body composition and physical fitness of p<0.01 of EG. The CG did not present a significant change in any parameter.	2
A18	Baena-Beato et al[31] Pubmed	Before and after, experimental, non-randomized controlled trial n=60	Sixty patients were included 30 of each gender; between 50 and 60 years old; body mass index, between 21 and 27 kg/m² with chronic low back pain. The 8-week aquatic/HT therapy program was conducted in a 25×6m indoor pool, 140cm deep and 30/31°C of T of water, and patients exercised 2 to 5 days/week. Each session lasted from 55 to 60 minutes, (10 minutes of warm-up, 20 to 25 minutes of aerobic exercises, 15 to 20 minutes of resistance exercises, and 10 minutes of recharge).	Significant correlations were found between change in disability and VAS (resting, flexion and extension), curl-up and ranged from -0.353 to 0.582, all other parameters p <0.01. Significant predictors of change in disability after treatment were improvement of resting pain, flexion and extension and abdominal muscle resistance with HT.	3

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Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results – continuation

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A19	Bender et al.[32] Pubmed	Meta-analysis n=18	Meta-analysis of randomized controlled trials with Hungarian hot springs, published between 1989 and 2012 in the Pubmed, Web of Science, Scopus, PEDro and Web of Knowledge databases. A total of 122 studies were identified, and 18 clinical trials were included. Of these, 5 evaluated the effect of HT and CT on chronic low back pain, 4 on OAK and 2 on hand osteoarthritis and 1 evaluated BT/CT on chronic pelvic inflammatory diseases, the others 6) verified its effect on several laboratory parameters.	CT significantly reduces pain caused by different musculoskeletal diseases, regardless of the qualitative and quantitative composition of mineral water, evidencing the beneficial effect of CT in pain with weight support and at rest in patients with joint and degenerative spinal diseases, as well as, in chronic pelvic inflammatory disease and antioxidant states.	1
A20	Larmer et al.[33] Pubmed	Systematic review of randomized controlled trials. n=24	A systematic review was conducted at databases: EBSCO Health Databases (including Medline, CINAHL and SPORT Discus and Ovid), AMED Aliado and Complementary Medicine, Scopus, Cochrane Library and PEDro including only randomized controlled trials in English that investigated the effect of HT on adult pain in any form of arthritis who had not undergone joint replacement surgery and that all had at least one patient-reported outcome (PRO) or VAS, published up to 08/2012 for a total of 375 intervention studies, systematic reviews and critical reviews.149 studies were excluded, 122 documents of these were identified, only 24 were included.	Exercise in water has been shown to be effective in reducing pain by improving the function and performance of ADL in people with arthritis. Few studies have demonstrated that HT is superior to other forms of exercise. More research is needed to develop a valid and reliable and reproducible method. Inadequate outcome measures may have affected HT research, possibly explaining the lack of high-quality evidence for this intervention.	1
A21	Lee et al.[34] Pubmed	Experimental, randomized controlled trial n=80	In order to verify the efficacy of hot HT in labor pain and delivery experiences during the first stage of labor, 80 women were randomized: 41 in the CG and 39 in the EG in the teaching maternity hospital of Taipei City. The EG was showered at a controlled temperature of 37 ° C for 20 minutes. After a full 5-minute bath, in the sitting or standing position, the women spent 15 minutes directing the shower water to any region of the body they desired. The CG received standard care. The pain and the delivery experience were evaluated using the VAS and the Labour Agentry Scale (LAS), respectively.	HT with hot water is economical, convenient, easy to implement, and the authors further stated that this PIC reduced pain ($p<0.001$). This non-pharmacological intervention has helped women in labor to participate fully in this process, with the continued support of health professionals, to feel comforted and to have a more positive overall delivery experience.	2
A22	Cechetti, Fabro and Martini[35] LILACS	Systematic review of clinical trials n=8	They analyzed the efficacy of HT in patients with hip and knee osteoarthrosis (OAQJ) by reviewing clinical studies, with data collection in the Scielo, Medline, LILACS and Pubmed systems, listing articles in full, from 2003 to 2011. 8 articles were found, of these, 3 address HT in treatment for OAQJ, and 5 only for OAK. From the collected articles, the tests that served as parameters for analysis were the WOMAC, Lequesne Index, VAS-pain, physical function, and muscle strength.	The authors showed that the studies analyzed show that HT in osteoarthrosis is effective when used to alleviate discomfort and pain, reflecting on the improvement of the quality of life of patients with this disease. The lack of studies related to HT makes it difficult the approach of the professional.	1

Continue...

Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results – continuation

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A23	Marques et al.[36] LILACS	Descriptive qualitative and quantitative cross-sectional study, n=35	In order to investigate the knowledge and acceptance of PICS by physicians and SUS users. Three physicians and 35 SUS users were investigated for future implantation of PICS in the Basic Health Units (BHU).	This study demonstrated that. 100% did not know the PICS in general, and after a clear explanation of the researcher, 31.42% knew and would accept the use of phytotherapy, 51.42% acupuncture, 37.1% homeopathy, and none knew and would use CT. The 3 BHU physicians showed indifference, not acceptance, and acceptance, respectively. the implementation of outreach programs for patients and especially for physicians prescribing PICS.	5
A24	Stark and Miller[37] Pubmed	Before and after, experimental, non-randomized controlled trial n=24	They explored the effects of bathing during labor using a single post-test pre-test group design at a small community hospital in Michigan. 24 women were observed for pain and comfort level. They used vital signs, VAS for pain, and the Gagge thermal comfort scale. The contractions were palpated in the shower by the physician.	There were significant differences in cervical dilatation (p=0.001), tension and pain (p=0.003) and fetal heart rate (p=0.001) after HT, although effective in relieving pain, reducing anxiety, inducing relaxation, HT is rarely used during labor.	3
A25	Ferreira et al.[38] Pubmed	Before and after, experimental, non-randomized controlled trial n=8	To evaluate the effect of HT on pain and quality of life of patients with rheumatoid arthritis (RA), nine patients were selected, aged 56.4 ± 5.2 years old, but only 8 were included, excluding those that were contraindicated, after physical therapy evaluation, also performed before and after treatment, including the application of the Short-Form-36 Questionnaire (SF-36) and evaluation of morning stiffness, pain and sleep quality by VAS. The treatment consisted of 10 HT sessions of 45min each, 2 times/week. The data were treated statistically, with $p<0.05$.	They concluded that HT is a very used resource in the rehabilitation of these patients with RA due to the physical properties and physiological effects of water and the proposal made possible an improvement in health-related quality of life ($p<0.05$), reduction of pain symptoms (p=0.004), morning stiffness (p=0.003), and improvement in sleep quality (p=0.006). After the treatment, it was possible to verify the reduction of morning stiffness and pain besides the improvement in sleep quality.	3
A26	Silva et al.[39] Pubmed	Experimental, blinded, randomized clinical trial n=57	They aimed to evaluate the efficacy of HT in 64 individuals of both genders with OAK compared to individuals with OAK in floor exercises. Randomized homogeneously from the Rheumatology Outpatient Clinic of the Hospital São Paulo (UNIFESP/EPM), performing exercises for 18 weeks. Patients with clinical and radiographic diagnosis of OAK were included with the American College of Rheumatology criteria in Western Ontario and WOMAC with 3 subscales: pain, stiffness and physical function and pain ranging from 30 to 90mm in VAS the previous week. They were evaluated during walking, by VAS at rest and immediately after a walking test (50FWT) 50 feet (15.24m), walking time measured in quick and comfortable steps during and the Lequesne Index. Measurements recorded by a blinded investigator at the beginning and at the 9 and 18 weeks after the intervention commenced. 57 patients concluded the study.	HT was superior to ground exercise in pain relief ($p <0.001$) before and after walking during the last follow-up. The authors concluded that both types of exercises (HT and terrestrial) reduced knee pain and increased their function in participants with OAK. Water-based exercises are a suitable and effective alternative for pain reduction and improvements in WOMAC and Lequesne scores. Pain before and after 50FWT decreased significantly in both groups, but there was no significant difference in pain in the previous week between groups.	2

Continue...

Table 2. Summarized registry of titles, author, periodical, year, database, objectives, method, and results – continuation

Articles	Authors and database	Type of studies and n	Synthesis	Conclusion	Level of evidence
A 27	Silva et al.[40] BVS (LILACS)	Experimental, non-randomized controlled trial. n=10	The authors compared the efficacy of HT and TENS in improving the symptoms of 10 patients with fibromyalgia (48.8±9.8 years old) divided into 2 groups: one treated with HT (EG) and one with TENS (CG). All subjects were evaluated before and after treatment for flexibility (by third finger-soil index), pain (by VAS) health-related quality of life (using the SF-36 and Nottingham Health Profile (NHP) questionnaires and depression (by the Beck's inventory). The data were treated statistically, with a significance level set at p <0.05.	Both treatments were effective in improving physical fitness, but TENS (p≤0.007) provided better pain scores and in a greater number of analyzed variables than HT (p≤0.076), suggesting to be more effective in the treatment of fibromyalgia. However, patients treated with HT could present better results if the treatment time was longer, since the therapeutic pool may have greater effect on conditioning and long-term functional capacity.	3

VAS = visual analog scale; NICU = neonatal intensive care unit; ADL = activities of daily living; TENS = transcutaneous electrical nerve stimulation; HT = hydrotherapy; HB=BT/CT = balneotherapy/cryotherapy; WOMAC = Western Ontario and McMaster Universities Osteoarthritis.

The critical analysis of the results (Table 2) showed that LEs ranged from 1 to 5, with 8 (29.6%) three meta-analyzes[18,25,32], five systematic reviews of RCTs (SRRCT)[24,27,28,33,35] and 6 (22.2%) randomized clinical trials (RCT)[14,20,21,30,34,39] were found in LE 1 and 2 respectively; non-randomized controlled trials (NRCT)[15-17,22,23,26,29,31,37-38,40] 11 (40.7%) (LE 3); a Cohort[19] (3,7%) in LE 4; in LE 5 only one (3.7%) qualitative and quantitative descriptive study was identified[36] and none in the LE 6 and 7. Therefore, the studies focused on the hierarchical levels of evidence 1 to 3[12,13] considered high and moderate and when related to the quality of strong and sufficient evidence levels[13], respectively, demonstrating that the PICS studied appear to be effective in pain control. However, they should be further explored and studied scientifically to validate them academically.

Regarding the type of study, adding the meta-analysis[18,25,32] (11.1%) and SRRCT[24,27,28,33,35] (18.5%) and RCT[14,20,21,30,34,39] (22.2%) had a total of (51.8%) higher than the number of non-randomized clinical trials (NRCT)[15-17,22-23,26,29,31,37-38,40] (40.7%), ratifying the quality of evidence raised regarding the efficacy of BT/CT and HT in relieving pain of various symptoms. This study showed that the focus of 18 (66.66%) articles focused on the efficacy of HT in the pain of several etiologies and eight (29.6%) in CT in pain. Among these 18 articles, 11 (61.1%) are NRCT [15-17,22-23,26,29,31,37-38,40]; six (33.3%) of RCT[14,20,21,30,34,39] and one of SRRCT[24,27,28,33,35] (5.6%) predominating those of osteoarticular origin, being (62.5%) of LE 1 and three (37.5%) of LE 2 of musculoskeletal origin, confirming the scientific rigor of the studies and the PICS are recommended for the treatment of these types of pain problem. An SRRCT[28] has shown that evidence from RCTs on the efficacy of BT/CT in chronic low back pain is encouraging and reflects the consistency of previous evidence. Moreover, the authors[28] suggest that well-designed, conducted and reported RCTs are needed to test short- and long-term effects to control pain and to demonstrate broader beneficial effects.

The PICS in question were included in PNPIC[1] in 2006 in Brazil, whose scientific studies in the country are still incipient. However, "therapies are present in 9,350 establishments in 3,173 municipalities, of which 88% are offered in basic care. In 2017, 1.4 million individual visits were recorded in PIC. In addition to the collective activities, the estimate is that about 5 million people per year participate in these practices in the SUS. Scientific evidence has shown the benefits of integrated treatment between conventional medicine and PICS"[13].

The three meta-analyzes[18,25,32] analyzed (LE1) evidenced the efficacy and beneficial results of CT(2) and HT(1) for pain control in knee osteoarthritis (OAK) and hand (OAH), chronic low back pain, chronic pelvic pain, degenerative joint and spinal diseases, antioxidant occurrences, metabolic and inflammatory parameters, increasing blood flow and muscle relaxation. Also, HT with Chinese herbs[25] may be effective in reducing OAK pain when compared to standard western treatment. Similarly, the five (27.7%) SRRCT[24,27,28,33,35] solidly demonstrated the efficacy of CT(2) and HT(5), when combined or even isolated, in labor pain, in the low back pain, arthritis and OAK, and in the hip and ankle.

Regarding the RCTs[14,20,21,30,34,39] of LE2, the six (22.2%) analyzed the efficacy of CT(2) and HT(4) concerning pain in labor, as in of the newborn (NB), musculoskeletal and osteoarticular. All showed a significantly better effect not only on the intensity of pain and stress but also on other parameters evaluated in comparison to the baseline condition of each one, demonstrating that these PICS are economical, harmless, effective and safe.

Analyzing the 11 NRCT[15-17,22,23,26,29,31,37,38,40] all investigated HT in several painful situations, as in pain in fibromyalgic women[15,40]; in puerperae[16]; in the pelvic pain of pregnant women[17]; in osteoarticular and musculoskeletal pain[22,23,26,38,40], pain during labor[29,37], all of which are effective in improving painful symptoms.

This review also included a qualitative and quantitative cross-sectional study[36] that investigated the knowledge and acceptance of PICs by SUS physicians and users to show the lack of knowledge of users and professionals, and also considering that such article could stimulate further research since 100% of the respondents ignored the existence of most PICS. This study finds resonance in another, eight years later, that verified the knowledge, and the use of PICS for pain control by the population of the larger cities of Vale do Paraíba Paulista[41] with similar results, since of 100 respondents, only 17.5% knew and 82.5% did not know them. The population still does not know the PICs that the SUS offers, using in greater number the older therapy, acupuncture, which was already part of the SUS, which shows the importance of studying, explaining, disseminating and presenting the PICS and its advantages the community. Therefore, systematic, randomized and controlled studies are needed that result in high, strong and sufficient evidence[13] of PICS in the treatment of pain, which render people partially or totally disabled, transiently or permanently, triggering stress, suffering, and loss of quality of life (QoL)[4],

The limiting factors for the actual realization of the use of PICS are the scarce scientific evidence of a strong and sufficient level[13] and the lack of knowledge about their use by health professionals. However, even limited, it seems correct to say that this study showed the efficacy of CT and HT in the treatment of pain in organic changes such as the knee, hand and ankle osteoarthritis; the musculoskeletal; those of obstetric origin. It also warns of the need for further research on how PICS may contribute to pain relief and reiterates that it is now mandatory to measure, control and record it by EAS health professionals as the Fifth Vital Sign. Given the above, including PICs in the treatment of pain, is an important issue to ensure comprehensive health care.

CONCLUSION

Most of the evidence emerged from the studies analyzed focused on levels 1 to 3 regarding the effective use of PICS, CT, and HT. Of the 18 articles on the efficacy of HT, eight on CT in the pain charts of knee, hand and ankle and musculoskeletal osteoarthritis and one in obstetric pain.

In most studies, evidence for the efficacy of PICS, CT, and HT was focused on levels 1 to 3. The efficacy of HT was demonstrated in 18 articles: five in labor pains, two in fibromyalgia, ten musculoskeletal and pain caused by osteoarthritis of the knee, hand, hip and ankle, and in an article concerning the pain of newborns. The efficacy of CT was evidenced in eight articles of musculoskeletal pain due to knee, hand, hip and ankle osteoarthritis; and a qualitative article that shows the lack of knowledge of users and professionals about the use of PICS in SUS. It also showed that there are few scientific subsidies to scientifically substantiate the use of HT and CT in the treatment of pain, needing to increase the knowledge of these PICs with actions of permanent education, and at the same time, stimulate the increase of the scientific production by the health professionals for the effective use of these PICS.

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