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Current clinical status of hydrotherapy; an evidence based retrospective six-years (2012-2017) systemic review



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ABSTRACT

Introduction: Hydrotherapy is an approach which uses water and its characteristics to maintain health, prevent and cure diseases. Hydrotherapy has been known throughout history in different regions. Recently it has been incorporated with conventional system of treatment also. The purpose of this literature is to view the current status of hydrotherapy in terms of clinical trials and research and to highlight the positive as well as negative aspects of hydrotherapy as compared to conventional system.

Methods: Various databases were extensively searched for articles consisting of clinical trials in humans using Google Scholar, PubMed, Web of science, and Sci Finder, etc. using the keywords such as hydrotherapy, clinical trials in hydrotherapy, randomized controlled

clinical trials, clinical evidence in hydrotherapy, etc. This review article includes six retrospective years from 2012 to 2017.

Results: A total of nineteen clinical trials met the inclusion criteria. The hydrotherapy was used either alone or as an adjunct with a conventional system for treatment or reducing the symptoms severity as well as the quality of life in many conditions such as multiple sclerosis, fibromyalgia, postpartum pain, migraine, wound healing, musculoskeletal system, Parkinson's disease, osteoarthritis, spastic paraparesis, hemophilia, etc.

Conclusions: People are using hydrotherapy as a treatment for various health conditions and its use in particular with the conventional system makes the outcome more effective and considerable in different diseases.

Keywords: Hydrotherapy; retrospective evidence; musculoskeletal conditions; osteoarthritis; quality of life

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INTRODUCTION

Hydrotherapy is derived from a Greek word "hydrotherapia" which literally means "treatment using water". This approach uses water to maintain health, prevent and cure an ailment by conveying temperature and applying pressure on the body such as utilizing whirlpools, whereby it stimulates the nerve endings and induces a reflex effect. The reflex effect has an impact on blood vessels in terms of producing a change in blood flow and metabolic functions. In addition, water is consumed for its various chemical actions.^{1,2,3} Hydrotherapy has a long history of its use and the oldest reports regarding application of hydrotherapy could be found to be in ancient Egypt where lavish baths were enjoyed by the royalty. A common belief behind its use was that Egyptians comprehends the medicinal importance of water and it was considered as a hygienic and divine element in Egyptian culture. However, some of opinions think its origin from Asia where natural hot spring, a form of hydrotherapy, was used to purify body and soul in India, Japan and China.^{1,4} Particularly since 1550 BC in China, water has been used to relieve pain and treat burns especially with the help of cold water

containing tea extracts. Furthermore, in 129-199 AC cold water compresses were also utilized for many ailments which enhanced the impact and use of hydrotherapy in Chinese community.⁵ Likewise; during Greek era, warm water baths containing minerals were used to ease common illness. Besides health, cold and hot baths were employed in religious ceremonies and entertainment.^{1,4} Later on it was introduced in Rome and got fame for the filling of health and joy desires via communal bathhouses.⁶ During the middle ages, all along the fall of the Rome, the hydrotherapy system had been abandoned, although physicians discovered sulfur and also bromo iodica containing baths at that time.^{2,6,7} At the start of 18th and particularly 19th century, the hydrotherapy system was revived and Vincent Priessnitz and Austrian farmer, added great improvisation to this system. He is considered as the founder of modern hydrotherapy, after the integration of "water, food and air" as an alternative of traditional medicine. The next major factor for hydrotherapy fame in modern system was due to its low-cost and facility. After sometimes, Sebastian Kneipp evolved the term hydrotherapy and utilized

as well as incorporated the hydrotherapy system within conventional approach.^{1,8} From Europe it moved on to United States, where the first clinic was established in 1844 in New York City, and from here on it moved to Massachusetts and expanded to other cities. Hydrotherapy got popularized and created a tourism trade. In the 1940's, the scientific knowledge of hydrotherapy increased by documentation of hydrotherapy benefits.^{1,9} Numerous forms of hydrotherapy have been introduced nowadays. Watsu; is a warm water related massage performed on a floated person. It promotes not only physical but also emotional relaxation.¹⁰ Sitz bath; means 'To sit' in German. It targets hips area which is immersed in water for a therapeutic effect. It handles reproductive and anorectal disorders.¹¹ Contrast hydrotherapy; is the rotation between different water temperatures, hot and cold water soaking. Its benefit is involved in the vascular system as low temperature participates in tuning up vascular muscles which results in vasoconstriction. This slows down blood flow and can limit inflammation and swelling. On the other hand, hot water vasodilation does the reverse. It boosts blood flow and improves peripheral arterial disease. Contrast therapy may also contribute in lymphatic system health.^{12,13} Colon hydrotherapy; a method in which chemical free water has an internal effect. Infused water has a role in colon cleansing and promoting gastrointestinal tract function.¹⁴ Steam inhalation; conducted to relieve respiratory system symptoms, nasal congestion, resulted from infections via delivering scalding water steam directly or indirectly using vaporizer.¹⁵ Wet wrap therapy; a therapeutic technique with a key concept of wet layering. Different fabrics can be utilized such as bandages, gauze and convenient cotton clothing. Hydration, vasoconstriction and protection are effects of these layers when they are put on the skin. It enhances skin healing process.¹⁶ Finnish steam saunas; humid 70 to 100°C (158-212°F) wooden rooms which keep their humidity by steaming. Cardiovascular and respiratory systems; are the ones which gained advantages from this method.¹⁷ Other widely known hydrotherapy approaches encompass baths, showers, hot compresses and cold foot baths.¹⁴ Literatures have reported the use of hydrotherapy for many diseases and different clinical conditions such as osteoarthritis, ulcer, varicose veins, chronic pulmonary emphysema, Rett syndrome etc. Current study evaluates the recent clinical status and acceptance of hydrotherapy in the modern system of conventional system.¹⁸⁻²²

With the advancement in conventional systems and with more mechanistic research in the field of drug actions, the complementary and alternative

medicines (CAMs) are constantly under objections from different reviewers and researchers. Most of the studies have mentioned negative comments and feedbacks from authors in terms of quality of research and clinical trials in CAMs.^{23,24}

This study aims to study, evaluate and assess the current clinical status of hydrotherapy in the view of negative evaluation from different researchers. A retrospective six-year study will be conducted in order to collect recent updates in terms of clinical trials regarding hydrotherapy and to determine its potential in treating various diseases. The current status in comparison to reported questions about CAMs will be viewed and discussed at the end of study.

MATERIALS AND METHODS

Databases, journals and book Explored

PubMed, Google Scholar, Web of Science, Science Direct, International Journal of Sports Medicine, International Journal of Biosciences, Digital library of Imam Abdulrahman Bin Faisal University, Hindawi, SAGE Journals, and books.

Keywords Searched

Hydrotherapy, effects of hydrotherapy, hydrotherapy clinical trials, hydrotherapy history, hydrotherapy in the ancient era, hydrotherapy spasticity, the effect of hydrotherapy on diseases, hydrotherapy as treatment, alternative therapies, hydrotherapy labor, water therapy, water immersion, Aquatic therapy, hydrotherapy in Parkinson, aquatic exercise therapy, postpartum hydrotherapy.

Review period

The literature review consisted of articles retrieved from retrospective six years i.e., from 2012 to 2017.

Inclusion Criteria

This study covers clinical trials related to hydrotherapy which involved human subjects only. Any clinical trial or case related to hydrotherapy directly or indirectly as reported, was considered in the study.

Exclusion Criteria

Any clinical trial with lack of association to hydrotherapy such as chiropractic, homeopathy, magneto therapy etc., was eliminated from the study. Similarly, clinical trials reported in animals, i.e., pre-clinical trials along with any clinical case with no evidence of hydrotherapy was excluded from the study.

Search Results

The study consisted of clinical trials based on the use of hydrotherapy. The search and filtration of

literature and based on relevancy, nineteen clinical trials were observed which are reported here.

LITERATURE REVIEW

The number of clinical trials found in this literature research is categorized as year wise below;

Clinical trials reported in 2012

A total of three clinical trials were observed in the year 2012, reported below:

Influence of Hydrotherapy on Multiple Sclerosis (MS) Pain

A clinical trial with 73 multiple sclerosis patients were subjected to Ai-Chi exercise in a swimming-pool, with water temperature of 36°C and the air temperature range was 20–25°C. Following treatment of 20 weeks, the pain in the treated group was significantly dwindled ($P < 0.028$), as compared to control group. Also, MS-related symptoms such as disability, autonomy, spasms, depression, and fatigue were improved; as shown in [Table 1.25](#)

Hydrotherapy and balance

Hydrotherapy treatment, in 64-year old men with less performance during exercise due to bone concerns and osteoporosis, showed a reduced joint load, increased flexibility and muscle strength with an enhanced overall balance and fewer risks of fall and physical accidents. The treatment was accomplished using aquatic exercise as shown in [Table 1.26](#)

Hydrotherapy as a Treatment in Musculoskeletal Conditions

A systematic literature search evaluated the effect of hydrotherapy exercises in musculoskeletal conditions. The researchers found a notable effect of hydrotherapy exercise in a short period on pain, quality of life and functional ability in patients who were suffering from hip and knee arthritis. Also, exercises in water showed a decrease in pain among patients with low back pain as shown in [Table 1.27](#)

Clinical trials reported in 2013

A total of two clinical trials were observed in the year 2013.

The effectiveness of hydrotherapy in treating multiple sclerosis (MS) and quality of life

Thirty women with MS (control 15; experimental 15) were studied in a randomized controlled trial for ten weeks with 30 sessions of hydrotherapy exercises. An enhanced coordination function with

less pain along with an improved quality of life and mental health was noted in experimental group ($P < 0.05$) as shown in [Table 1.28](#)

The effectiveness of hydrotherapy in treating fibromyalgia pain

In this study the pain associated with fibromyalgia was studied for 12 weeks, using a warm water pool-based training program, recorded on a visual analog scale. A decrease of 15% in pain intensity along with a beneficial effect on fibromyalgia pain was noted for volunteers as shown in [Table 1.29](#)

Clinical trials reported in 2014

A total of six clinical trials were observed in the year 2014 as reported below:

The effectiveness of hydrotherapy in treating range of motion restriction and pain in patients with hemophilia

In a study, a group of 40 patients who have pain and restricted range of motion as consequences of hemophilia were divided into three groups who attended different therapeutic programs for a month: remedial exercise group (13), hydrotherapy group (14) and control group (13). The results indicated that pain level is more reduced in those who experienced hydrotherapy ($P < 0.001$) than the other groups. Range of motion almost equally increased ($P > 0.05$) in both hydrotherapy and therapeutic exercise groups. Hydrotherapy has a good effect on pain and joint flexibility; as shown in [Table 1.30](#)

The effectiveness of hydrotherapy in burn wound recovery

In Switzerland, a study has been done to prove the effect of hydrotherapy on burn recovery. Thirty-one patients (19 male, 12 female) who had various burned sites were subjected to hydrotherapy, like hot spring water, water jets, and hydro-pressure, daily for 2 to 3 weeks. It was observed that the skin was more homogenous in structure, color, and visco-elasticity with diminished pruritus and permanent results if hydrotherapy lasts 3-6 months. This study confirmed the beneficial role of hydrotherapy in burn recovery after the wound has closed; as shown in [Table 1.5](#)

Effectiveness of hydrotherapy in hereditary spastic paraparesis (HSP) patients

Nine patients with hereditary spastic paraparesis (HSP), a neurological disorder in lower limbs which disturb walking, were treated with hydrotherapy to evaluate the impact on gait attributes. The study

stated that kinematics and kinetics of most joints were not affected by hydrotherapy. However, walking speed of people in test group escalated more than 11% in comparison to control group as shown in [Table 1](#).³¹

Hydrotherapy and Physical-functional fitness

In quantitative research designed to investigate the improvement of the physical-functional fitness and perception of the functional capacity and health of an elderly group who participate in hydrotherapy program (water-based Exercise). The results exhibited an improvement in overall physical-functional fitness of as well as the perception they had about their health and ability to perform activity of daily life as shown in [Table 1](#).³²

Hydrotherapy Vs. Conventional therapy in Shoulder Abduction after Mastectomy

A study showed the positive impact of hydrotherapy in 30 female patients with shoulder pain, abduction, and disability after mastectomy. The sample of the study was divided into two groups, the conventional group had traditional exercise, and experimental group had aquatic exercise. There was a notable difference between both groups ($P < 0.05$) as shown in [Table 1](#).³³

Hydrotherapy and improvement of balance in Parkinson patients

A randomized single-blind controlled study in 34 patients (hydrotherapy group and land-based physiotherapy group), was conducted to assess the effect of hydrotherapy exercise and its capability to improve balance in Parkinson's disease patients compared to conventional land-based physiotherapy. Though both groups achieved an improvement in their balance; however, hydrotherapy group surpass the other group in certain scales such as activities-specific balance confidence scale ($P = 0.0001$), berg balance scale ($P = 0.005$), falls efficacy scale ($P = 0.003$) and falls diary ($P = 0.001$). The researchers recommended hydrotherapy for patients who have Parkinson's disease to improve their balance dysfunction as shown in [Table 1](#).³⁴

Clinical trials reported in 2015

A total of two clinical trials were observed in the year 2015 which are reported herein.

Use of Irrigation Pressure in patients with Open Fracture Wounds

In an international study, conducted at 41 clinical centers in US, Canada, Australia, Norway and India, including 2447 patients underwent different

irrigation solutions (normal saline or castile soap) with different pressures (very low pressure, low pressure, high pressure) to see the reoperation rates during a year after the surgery. It was recorded that 14.8% of patients in castile soap group had another operation while this percentage was decreased to 11.6% in normal saline group ($P = 0.01$). Reoperation occurred 13.7%, 12.7%, 13.2% in very-low-pressure group, low-pressure group, and high-pressure group respectively. The irrigation pressure didn't affect the rate of reoperation. However, the reoperation rate was lower in saline group than castile soap group as shown in [Table 1](#).³⁵

Effectiveness of hydrotherapy in reducing fat embolism

Another study was conducted on 30 females patients to evaluate hydrotherapy for decreasing the production of fat embolism throughout total knee arthroplasty (TKA) procedure. Two groups; conventional group (TKA without irrigation) and irrigation group (TKA with marrow cavity irrigation using saline solution) were studied whereby a remarkable reduction in the average grey-scale score ($P = 0.016$) and area ratio ($P = 0.033$) of fat embolism was observed for irrigation group as shown in [Table 1](#).³⁶

Clinical trials reported in 2016

A total of three clinical trials were observed in the year 2016.

Hydrotherapy as a nonpharmacological adjunctive in Migraine

The current study utilized hydrotherapy as a nonpharmacological adjunct in 40 patients (conventional group and conventional plus hydrotherapy) with cardiac autonomic functions in migraine. The role of thermal therapy using hot arm and foot bath (103°F to 110°F for 20 minutes) along with an ice massage to head and scalp (5 minutes) was evaluated. A significant decrease in frequency and intensity of headache in migraine patients was observed as shown in [Table 1](#).³⁷

Influence of Hydrotherapy on Wound Healing

The study suggests the role of wound cleaning and hydration including removal of debilitates tissue, and sore that can interfere with wound healing. A 58 year old-diabetic male with foot ulcer underwent surgical debridement for two weeks with no improvement. Following an application of Hydro-Clean-treatment, the wound was fully debrided and the skin flap fully adhered, and proper healing was observed in 13 days as shown in [Table 1](#).³⁸

Table 1 Hydrotherapy clinical trials from 2012-2017

Years	Number of volunteers	Disease /condition	Observation	P-value	References
2012	73	Multiple sclerosis	Improvement	<0.02	Castro-Sánchez <i>et al.</i> , 2012
	42	Static and dynamic balance among elderly men		<0.001	Alikhajeh <i>et al.</i> , 2012
2013	103	Musculoskeletal condition		-	Verhagen <i>et al.</i> , 2012.
	33	Multiple sclerosis		<0.05	Segura-Jiménez <i>et al.</i> , 2013
2014	30	Fibromyalgia		<0.05	Fathollah <i>et al.</i> , 2013
	40	Hemophilia results in pain and restricted range of motion		<0.001	Mazloun <i>et al.</i> , 2014 ³⁰
2015	31	Burn conditions		-	Moufarrij <i>et al.</i> , 2014 ⁵
	9	Hereditary spastic paraparesis (HSP)		-	Zhang <i>et al.</i> , 2014 ³¹
	26	Physical functional Fitness and Health Perception.		-	Pereira <i>et al.</i> , 2014 ³²
	30	shoulder abduction, shoulder pain and disability in post mastectomy female patients		<0.05	Mohammed <i>et al.</i> , 2014 ³³
	34	Balance dysfunction in Parkinsonian patients		-	Volpe <i>et al.</i> , 2014 ³⁴
2016	2447	Irrigation of open Fracture Wounds	Decrease reoperation rates	0.01	Bhandari <i>et al.</i> , 2015 ³⁵
	30	Fat embolism in total knee arthroplasty (TKA)	Improvement	0.016	Zhao <i>et al.</i> , 2015 ³⁶
2017	40	Migraine		0.01	Sujan <i>et al.</i> , 2016 ³⁷
	39	Wound healing		0.03	Enblom <i>et al.</i> , 2016 ³⁹
	1	Musculoskeletal disorders		-	Atkin and Ousey, 2016 ³⁸
2017	45	Postpartum pain		<0.001	Batten <i>et al.</i> , 2017 ⁴⁰
	21	Parkinson disease		<0.01	Carroll <i>et al.</i> , 2017 ⁴¹
	40	Heart failure		0.005	Hägglund <i>et al.</i> , 2017 ⁴²

Hydrotherapy and musculoskeletal disorders

This study demonstrated the health-related-quality of life in patients with musculoskeletal disorder (back, neck and shoulder pain with general myalgia) in 39 patients using aqua-based exercise. The patients improved after 8 weeks of aqua-exercising compared to before exercise as shown in [Table 1](#).³⁹

Clinical trials reported in 2017

A total of three clinical trials were observed in the year 2017 reported below:

Hydrotherapy in Management of Postpartum Pain

Immersion hydrotherapy is good for early postpartum pain management. Studies were conducted to find 45 women who used the bath and their pain scores were reduced ($P < 0.001$). Women self-reported that postpartum hydrotherapy improved their birth experience and 100% they

would use it again in another birth as shown in [Table 1](#).⁴⁰

Use of Hydrotherapy in Patient with Parkinson's Disease

Gait variability and disability in Parkinson's patients was improved by treatment with Aquatic exercise. A small improvement in gait variability was observed for 21 participants (14 male, 7 female) divided into two groups. While the aquatic therapy group showed greater improvements in disability ($P < 0.01$), however, aquatic therapy sessions were more enjoyable and safe with no adverse event as shown in [Table 1](#).⁴¹

Hydrotherapy Vs. Yoga in heart failure patients

In American Congress of Rehabilitation Medicine, a study was conducted in 40 patients with heart failure for 12 weeks, divided into two groups (yoga or with hydrotherapy). The quality of life improvement,

anxiety and depression symptoms were evaluated whereby exercise capacity significantly improved with hydrotherapy training ($P=0.02$), symptoms of anxiety and depression improved more with hydrotherapy ($P = 0.03$) as shown in Table 1.⁴²

DISCUSSION

Hydrotherapy is the use of water in any of its forms (water, ice, steam) externally or internally for health promotion or treatment of numerous diseases with different temperatures, pressure, duration, and sites. It is considered as one of the therapies that were universally used in many ancient civilizations such as Greek, Romanian, Indian, Egyptian, and Chinese.⁴³ Both Vincent Priessnitz and Sebastian Kneipp have a great role in establishing and developing modern hydrotherapy.⁸ With the advancement in science and research and particularly during 20th century the development in conventional system widely affected the hydrotherapy system. More resistance, objections, and criticism was observed from researchers and authors. Some of the negative criticism and negative investigation as reported in literature are presented as below;

High risk of infections

Different diseases such as otitis externa, folliculitis, mastitis, urinary tract infections and pneumonia, principally linked to *Pseudomonas aeruginosa* organism found in swimming pools and whirlpools, have been reported with the use of hydrotherapy. Despite attaining disinfectant (chlorine) at recommended levels, *P. aeruginosa* was resident in such pools.^{44,45} According to Penny, 1991, six weeks is the period needed for *Pseudomonas* spp. to start spread in a pool and filters. Skin can be infected by constant wetting which has a role in replacing Gram-positive commensals on the skin surface with Gram-negative organisms like *Pseudomonas aeruginosa*.⁴⁶

Potential electrolyte imbalance (Hyponatremia)

Electrolyte imbalance occurs particularly in colonic irrigation, hydrotherapy enemas and sometimes in burns in which water is absorbed. As a consequence, tissue edema arises by alteration of plasma electrolyte concentration.^{47,48} People with either colonic diseases such as constipation and dilation or non-colonic diseases like congestive heart failure and cirrhosis are prone to electrolyte changes as the amount of absorbed water is massively increased. In 1994, irreversibly injured brain was reported as a result of acute hyponatremia in a patient with an impaired spinal cord.⁴⁹ Temporary memory loss

and confusion can also be a potential neurologic side effect of hydrotherapy.⁵⁰ However, mild hyponatremia leads to less serious effects such as nausea, malaise, and lethargy. Thus, electrolytes should constantly be monitored, and oral supplements should be provided before treatment to avoid such consequences.^{48,51}

The negative impact of high-temperature degree

To have the benefits of hydrotherapy and to avoid the potential side effects, the water temperature should be maintained in an acceptable range. Aird *et al.*, 1997 mentioned that too warm water could harm the mother as well as her child during delivery underwater. High water temperature can lead to excessive vasodilation, sweating & dehydration and subsequently an increased viscosity of blood, and all these will participate in decreasing the blood supply to the uterus and placenta which at the end could affect child's health.⁵²

Regardless of the above disadvantages, the current literature review observed the recent status of clinical trials (2012-2017) in hydrotherapy and we found that hydrotherapy is increasing and it is covering more areas of illness and conditions like static and dynamic balance, fibromyalgia, pain and restricted range of motion in Hemophilia patients, burn conditions, gait characteristics of hereditary spastic paraparesis patients, pain and other related symptoms of multiple sclerosis, initial management of open fracture wounds, fat emboli in total knee arthroplasty patients, migraine, musculoskeletal disorders, wound healing, postpartum pain, Parkinson disease and exercise tolerance of heart failure patients.^{5,26,29,30,31,35-42} A more widespread application for hydrotherapy with more effective goals and reduced or lack of side effects as compared to conventional systems were observed in the study. The expansion of hydrotherapy and its current clinical status with more effectiveness may be supported with the help of some factors as below;

Safety and effectiveness of hydrotherapy

Besides the effectiveness of hydrotherapy in treating many medical conditions such as brain injuries and stroke, relieving muscle pain, back pain and inflammation in arthritis, hydrotherapy is a safe alternative system of treatment. Hydrotherapy works by improving blood circulation and quality of blood that reaches different tissue and organs in the body, and enhances delivery of nutrients and oxygen to these organs, hence improve its function. Hydrotherapy, unlike conventional treatment, does not have side effects. However, the only caution is

to avoid very hot water that could cause skin burn. Hydrotherapy is being used in a variety of rehabilitation clinical trials including postoperative fractures and muscle wastage and some neurological conditions.⁵³ For example, hydrotherapy can be used for treatment and rehabilitation of cerebral palsy for both adult and children patients along with other conventional therapy. It was shown to have a positive impact among these patients.⁵⁴

Availability and feasibility of using hydrotherapy and cost-saving impact

Water is almost always available everywhere. It is easy to learn different hydrotherapy techniques such as cold foot bath and hydro-massage, steam bath, hot bath and shower which are also common and anyone can perform easily. All of these techniques are external hydrotherapy which involves application of cold or hot water on the skin and body and the treatment is based on temperature. Hot water helps to relax muscle tension whereas cold water can help to stimulate blood, flow under skin. There is a significant cost saving when hydrotherapy is used in wound healing as compared to standard wound care cost (273.51£) in addition to preventing costs of limbs amputation.⁵⁵

Hydrotherapy is Cost-effective compare to other intervention

In 2018 Teng studied patients with musculoskeletal disorders in Singapore in order to evaluate the cost-effectiveness of hydrotherapy versus land-based therapy. The outcome reported that hydrotherapy was a cost-effective rehabilitation compared to land-based.⁵⁶ Another similar study was done in Dutch to evaluate cost-effectiveness and cost-utility in ankylosing spondylitis patients and the outcome showed that the combined spa-exercise therapy with standard treatment drugs it more effective than standard treatment alone regarding to cost effectiveness and cost utility ratios.⁵⁷

Hydrotherapy as an alternative or adjunct to medication

Hydrotherapy has been used as an adjunct to conventional systems for alleviating the symptoms or pain associated with different problems. For example, women seek non-pharmacologic hydrotherapy as an alternative to medication for management of early postpartum pain which significantly reduced pain with hydrotherapy.⁵⁸ Another study has reported that complementary and alternative therapies can have positive effects against pain in multiple sclerosis patients. An Ai-Chi aquatic exercise program improves pain, disability, spasms,

depression, and fatigue in multiple sclerosis patients.²⁵ Thus hydrotherapy along with conventional system may improve the outcomes.

Hydrotherapy as first-line interventions

Hydrotherapy and non-drug interventions were used as first line in management in patient with hip and knee osteoarthritis. It appears that people with knee osteoarthritis are more likely to try conservative non-drug treatments than those with hip osteoarthritis.⁵⁹ Another study showed that a superficial heat or cold is one of the first line interventions and was an effective way to manage knee osteoarthritis pain.⁶⁰

Randomized clinical trials

The level and number of clinical trials in hydrotherapy are now evolving and more effective clinical trials with practically applicable outcomes are now available.^{23,61}

Quality of research

The research in hydrotherapy is focusing more on mega trails now. Also most of the cases reported regarding clinical trials involves multi-center, multi-model and huge sample size. Thus the researchers now believe that the effects of hydrotherapy may be considered as an integrative system for better patient care plan.^{24,62}

Quality of life and functional outcomes treated with hydrotherapy

The life-quality and parameters related to better lifestyle in most of the diseases have been improved or enhanced with the alternative system of hydrotherapy. Thus it may be suitable to state that hydrotherapy has been an important role in the overall health and general well-being of the patients.^{31,32}

Transition in hydrotherapy education

The hydrotherapy has been linked to conventional medicines along with alternative medicines in terms of courses and graduate schools. Many colleges for conventional systems have now adopted the course for hydrotherapy and are taught since last few decades. In addition, the hydrotherapy students undergo residency programs and training in hospitals where conventional is the mainstream education system. This may enhance the interaction and mutual respect among graduate in order to collaborate and work together for the only goal i.e. to achieve "pharmaceutical care model."

To conclude; the quality of research in clinical trials as well as mega trails conducted in hydrotherapy along with the evolvement regarding curricula

and residency programs have led to the development and recognition of hydrotherapy as a proper alternative system of treatment. Furthermore, the number of clinical trials conducted in patients with different diseases involving migraine, Parkinson diseases, osteoarthritis, musculoskeletal disorders, fibromyalgia and many other diseases, as reported herein the study, have proved the potential of hydrotherapy as a better approach towards a drug-free, non-invasive and cost-effective system. Also, the use of hydrotherapy as an adjunct with conventional systems have proved far better outcomes in treating patients rather than using conventional system alone. This evidence provide sufficient proof for the authors and researchers to consider hydrotherapy as a practical approach to treating various diseases. Though most of the studies didn't mention the mechanism involved in these clinical trials and it is the area where the hydrotherapist or researcher associated with hydrotherapy research may focus in order to have clinical trials applicable in practice with proper mechanism. However, despite the loophole, it is also a fact that the quality, number of groups involved, sample size, randomization procedures, blinding in the research studies as well as the decision making process and insertion of research and clinical rotations in academic courses at undergraduate level are the mechanisms which prefer hydrotherapy a proper and best alternative technique in most of the above-mentioned diseases.

CONCLUSION

Overall, this evidence-based study suggests that hydrotherapy is an emerging technique and the coverage of new areas in terms of advanced and systemic clinical trials have led to treatment or at least alleviation of symptoms and improving the quality of life in new diseases. The purpose of this review article is to help the researchers to evaluate and assess that hydrotherapy is an effective therapy, and it may help improve and treat many diseases. Further research is needed to cover the loophole in research and education in order to properly integrate the alternative system of hydrotherapy with conventional system.

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