EFFECT OF HYDROTHERAPY IN MANAGEMENT OF LOW BACK PAIN: A NARRATIVE REVIEW

1Ranjini Murthy P, 2Vineetha AN, 3Nithesh MK, 4Shrish prabhakar, 5Sachin Gowda BS

Abstract- Back pain is a significant global public health issue that affects individuals, society, and healthcare systems worldwide. Over the past three decades, it has consistently ranked as primary cause of disability globally. The term “low back pain” refers to pain, muscle tension, or stiffness localized below ribcage and above buttocks, sometimes accompanied by leg pain. This condition holds the highest position in terms of disability and is the sixth most burdensome health condition overall, resulting in approximate annual cost of $135 billion. This study aims to conduct a narrative review to explore the effects of hydrotherapy as potential approach to managing low back pain.

We searched Google Scholar, PubMed & PubMed Central citations for keywords non-specific low back pain, acute & chronic low back pain, and herniated disc. Articles were selected from period spanning 1992 to 2021. The search yielded total of 453 references: Randomized controlled trials (RCTs), cross-sectional studies, systematic reviews, clinical trials, comparative studies, meta-analyses, and retrospective studies in English, revealing effects of hydrotherapy on low back pain around 19 papers were included in review. Additionally, review incorporates articles that specifically examine the use of different hydrotherapy modalities, including aquatic exercise and balneotherapy, for the treatment of low back pain.

Key Words- Acute and Chronic low back pain, lumbar pain, Hydrotherapy, Balneotherapy, aquatic exercises.

1.0 INTRODUCTION:
Back pain is a prominent global public health issue that places a burden on individuals, healthcare systems, and society. It has consistently ranked as the leading cause of disability worldwide (1). In the United States, low back pain has been associated with the highest healthcare expenditure, as observed in 2016 (2). General practitioners commonly encounter patients seeking treatment for low back pain, often prescribing analgesics to manage symptoms (3)(4)(5). Low back pain is characterized by pain, muscle tension, or stiffness localized below the ribcage and above the buttocks, sometimes accompanied by leg pain. Acute low back pain is defined as pain lasting less than 12 weeks, while non-specific low back pain is not attributed to a specific identifiable pathology or symptom pattern (6). The prevalence of low back pain is particularly high among females and individuals aged 40-80 years, affecting 15% to 45% of adults annually (7). Chronic low back pain, often caused by mechanical factors and repetitive trauma, affects a considerable proportion of the global population and is known to have high recurrence rates (9)(10)(11). Nociceptors, which are specialized sensory neurons, play a role in transmitting pain signals from the skin to the brain. Central sensitization can occur, leading to abnormal responses to normal stimuli (12)(13). Various risk factors, including occupations involving heavy lifting and machinery operation, contribute to severe low back pain (15). Individual factors such as gender, age, history of low back injury, and psychological factors also influence the occurrence of low back pain (16)(17). Sedentary workers, such as those in schools, hospitals, and the military, tend to experience a higher incidence and prevalence of low back pain (18). The treatment of low back pain should consider individual health risks. Pharmacological options are limited, with non-opioid analgesics such as NSAIDs and acetaminophen commonly recommended as first-line treatments (19). Alternative therapies, including acupuncture, massage therapy, spinal manipulation, and yoga, have demonstrated varying degrees of effectiveness (21)(22)(23)(24)(25). Physical therapy modalities, such as the McKenzie method and hydrotherapy, have shown promise in reducing the recurrence of low back pain and minimizing healthcare costs (26)(27). To summarize, back pain is a significant global health concern that impacts individuals and healthcare systems. It is crucial to explore diverse treatment options, encompassing both conventional and alternative approaches, to address this prevalent condition. Water has been universally acknowledged as a vital element for the human body since ancient times, with its divine associations and healing properties highly revered (27). The concept of hydrotherapy, originating from the Greek terms “hydro” meaning water and “therapy” referring to treatment, has been an integral part of healing traditions in various societies, including ancient Greece, Egypt, and Rome. During the era of Hippocrates, baths were utilized for both cleansing and medicinal purposes, employing a combination of hot and cold water to restore balance to the body (28). Vincent Priessnitz, an Austrian farmer born in the 1700s, is widely regarded as the pioneer of modern hydrotherapy. He promoted the use of “water, food, and air” as alternatives to conventional medicine for treating common ailments. In cultures such as India, Japan, and China, the utilization of natural hot springs, abundant in minerals, has long been prevalent for purifying the body and soul, making it challenging to pinpoint the precise historical origins of this practice (29). The therapeutic effects of water can be attributed to its impact on nociceptors through thermal and mechanoreceptors stimulation, which positively affects spinal segments (30). Water possesses several properties that contribute to its healing potential, including its ability to store and transfer heat and energy. Moreover, water is generally regarded as safe and non-threatening, even for individuals who are sensitive to their environment. It promotes improved blood circulation and induces a soothing, calming, and relaxing effect. Water-based exercises alleviate joint
pain by reducing the weight exerted on the joints while providing resistance (31). As a result, hydrotherapy has gained significant popularity in the field of rehabilitation (32). The benefits of hydrotherapy can be attributed to specific properties of water, including:

- **Buoyancy**: Water's buoyancy counteracts the force of gravity, facilitating muscle strengthening through resistance (33).
- **Hydrostatic pressure**: This refers to the pressure exerted by water on a submerged object. The pressure and depth of water enable easier performance of exercises (33).
- **Viscosity**: Water's viscosity creates resistance during active exercises (34).
- **Surface tension**: The use of equipment on the water's surface increases resistance (34).

In general, superficial cold applications can induce various physiological reactions, such as reduced local metabolic function, localized edema, decreased nerve conduction velocity (NCV), muscle spasms, and enhanced local anaesthetic effects (35). When individuals are immersed in water up to shoulder level at different temperatures (25°C, 34°C, and 40°C), there is no significant impact on cardiac output at 25°C compared to 34°C. However, a notable increase in cardiac output is observed at 40°C (36). Aquatic exercises provide a beneficial alternative to land-based exercises for individuals lacking confidence, at a high risk of falling, or experiencing joint pain (37). Water buoyancy alleviates stress on joints, bones, and muscles (38). Additionally, the warmth and pressure exerted by water help reduce swelling, relieve painful joints, and promote muscle relaxation (39). Aquatic exercises have shown significant effects in pain relief and related outcome measurements for locomotor diseases. Consequently, patients may become more physically active and experience an improved quality of life through aquatic exercises (40).

<table>
<thead>
<tr>
<th>Measures</th>
<th>Temperature (Degree F)</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very cold</td>
<td>32-55°F</td>
<td>Excitant and Sedative</td>
</tr>
<tr>
<td>Cold</td>
<td>55-65°F</td>
<td>Vasoconstriction</td>
</tr>
<tr>
<td>Cool</td>
<td>65-80°F</td>
<td>Tonic</td>
</tr>
<tr>
<td>Tepid</td>
<td>80-92°F</td>
<td>Calmative</td>
</tr>
<tr>
<td>Warm</td>
<td>92-98°F</td>
<td>Sudorific</td>
</tr>
<tr>
<td>Neutral</td>
<td>92-95°F</td>
<td>Calmative and Restorative</td>
</tr>
<tr>
<td>Hot</td>
<td>98-104°F</td>
<td>Excitant</td>
</tr>
<tr>
<td>Very hot</td>
<td>104°F and above</td>
<td>Excitant and Depressive</td>
</tr>
</tbody>
</table>

Various forms of application:
Warm compresses are commonly used to provide a comforting sensation of warmth, alleviate pain, reduce muscle spasms, and promote relaxation in specific areas. The application of warm compresses to areas of tension and discomfort is believed to relieve pain by reducing muscle spasms caused by inadequate blood supply, which in turn stimulates pain receptors, promotes vasodilation, and increases blood flow to the affected area (42). Hot moist packs have been found to be effective in alleviating sacroiliac joint dysfunction by reducing pain, improving lumbar range of motion, and decreasing disability (43). Other therapeutic modalities that are employed include aquatic exercises, pool therapy, fomentation, baths, spinal sprays, and packs (41).
# 2.0 LITERATURE REVIEW:

<table>
<thead>
<tr>
<th>Sl.no.</th>
<th>Author</th>
<th>Year</th>
<th>Sample size</th>
<th>Variables</th>
<th>Findings</th>
</tr>
</thead>
</table>
(b) Quantification of analgesic medication: The number of non-steroidal anti-inflammatory drugs (NSAIDs) taken is recorded to measure the extent of pain relief.  
(c) Measurement of straight leg raising angle: The angle of leg elevation, while keeping the leg straight, is measured using a goniometer.  
(d) Evaluation of lumbar spine mobility: The range of motion and flexibility of the lumbar spine are assessed through measurements of flexion, extension, and lateral flexion. | *Significant reductions in analgesic consumption were observed in the treated groups when compared to the control group. Balneotherapy shows promising efficacy as a physiological intervention for pain reduction and decreasing the reliance on analgesic medication. |
(b) The Oswestry Disability Questionnaire (ODQ)  
(c) The McGill Pain Questionnaire (MPQ) | *The study results suggest that the group undergoing hydrotherapy demonstrated a significant improvement in their functional capacity, as evaluated using the Oswestry Disability Questionnaire (ODQ). Although no statistically significant results were observed in other measurements, hydrotherapy appears to have a beneficial role in the management of individuals with chronic low back pain (CLBP). |
| 3.    | Balogh Z, Ordogh J, Gasz A | 2005 | 60          | (a) Visual Analog Scale (VAS) score | *Balneotherapy as an independent |
The modified Oswestry Disability Index intervention has the ability to relieve low back pain. The results of this study suggest that the analgesic effectiveness and improvement in mobility achieved with the use of mineral water are significantly superior to those achieved through hydrotherapy with tap water.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Benjamin Waller, Johan lambeck, Daniel Daly, et al</td>
<td>2009</td>
<td>7studies accepted into the review, Between 1990 and 2007.</td>
<td>(a) Oswestry Disability Index (b) McGill Pain Questionnaire (c) Visual Analog Scale</td>
<td>*There is substantial evidence indicating that therapeutic aquatic exercise holds potential benefits for individuals dealing with both chronic low back pain and pregnancy-related low back pain.</td>
</tr>
<tr>
<td>6.</td>
<td>Ajediran I Bello, Nkechi H Kalu, Babatunde O A, et al</td>
<td>2010</td>
<td>12</td>
<td>(a) Visual Analogue Scale (VAS) (b) Modified Schober Flexion Technique (MSFT) (c) Modified Schober Extension Technique (MSET)</td>
<td>*Both exercise modalities showed effectiveness in treating chronic low back pain (CLBP), but hydrotherapy exhibited superior results in enhancing spinal flexibility. Consequently, hydrotherapy is considered a more favorable alternative in clinical practice.</td>
</tr>
</tbody>
</table>
| 7. | Mokhtar Yaghobi, Mohammad Fathi, Daem Roshani, et al | 2012 | 60 | (a) Visual Analogue Scale (VAS) | *Both infrared and hot packs were equally effective in pain reduction following the
intervention. However, infrared therapy showed superior efficacy in reducing the duration of pain. Considering these results, it can be recommended as a safe and non-pharmacological method for alleviating pain.

8. Morteza Dehghan, Farinaz Farahbo et al 2014 87 (a) McGill Pain Questionnaire (MPQ) *The findings suggest that the combined application of thermotherapy and cryotherapy, along with pharmacological treatment, can effectively alleviate pain in patients with acute low back pain compared to the control group.

9. Baena-Beato, Enrique G Astero, Manuel Arroyo-Morales et al 2014 49 (a) Pain - Visual Analog Scale (VAS) (b) Disability - Oswestry Disability Index (c) Quality of Life - Short-Form Health Survey (SF-36). *An intensive two-month aquatic therapy program, with a high frequency of sessions (five times per week), has shown noteworthy reductions in back pain and disability, along with enhancements in quality of life, body composition, and health-related fitness in sedentary adults with chronic low back pain.

10. Frenaz farheed, et al 2014 60 (a) McGill Pain Questionnaire *The results indicate that the continuous use of a hot water bag, along with sedative medications, can provide significantly higher pain relief in patients suffering from acute low back pain compared to taking medications alone (control).
<table>
<thead>
<tr>
<th></th>
<th>Authors</th>
<th>Year</th>
<th>Sample Size</th>
<th>Measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Cosimo Costantino, Davide Romiti, et al</td>
<td>2014</td>
<td>56</td>
<td>Roland Morris Disability Questionnaire (RMDQ).</td>
<td>The Back School program and hydrotherapy have been recognized as effective treatment options for rehabilitating non-specific chronic low back pain (CLBP) in elderly individuals. Both therapies have demonstrated efficacy and can be used in conjunction with other rehabilitation programs.</td>
</tr>
<tr>
<td>12</td>
<td>Mine Karagulle &amp; Müfit Zeki Karagülle, et al</td>
<td>2015</td>
<td>3 RCTs</td>
<td>From July 2005 until 31 December 2013.</td>
<td>After reviewing previous meta-analyses, it is evident that there is a consistent and positive association between balneotherapy and spa therapy in the treatment of low back pain (LBP).</td>
</tr>
<tr>
<td>13</td>
<td>Nichapa Parasin, Sirintip Kumfu, Ajchamon Tummachai, et al</td>
<td>2017</td>
<td>40</td>
<td>Visual Analog Scale (VAS)</td>
<td>Both interventions demonstrated similar efficacy in reducing pain among individuals with non-specific low back pain. However, the Thai herbal hot pack treatment displayed greater effectiveness in improving flexibility in the lower back muscles compared to the standard hot pack treatment. Therefore, the utilization of the Thai herbal hot pack presents a potential alternative for pain reduction and enhanced flexibility.</td>
</tr>
<tr>
<td>14</td>
<td>Hidayet Yücesoy &amp; İlker Geçmen</td>
<td>2019</td>
<td>Records between 2008 and 2019</td>
<td>Visual Analog Scale (VAS)</td>
<td>Based on the results, it can be</td>
</tr>
<tr>
<td>No.</td>
<td>Authors</td>
<td>Year</td>
<td>Sample Size</td>
<td>Measured Parameters</td>
<td>Conclusion</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------</td>
<td>------</td>
<td>-------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>15.</td>
<td>Rakhi Sadanand Sawant, Sandeep Babasaheb Shinde, Et al</td>
<td>2019</td>
<td>30</td>
<td>(a) Visual Analog Scale (VAS), (b) Range of Motion (ROM), (c) Manual Muscle Testing (MMT), (d) Modified Oswestry Disability Index (MODI).</td>
<td>Significant improvement was observed in individuals who underwent a combination of conventional therapy and hydrotherapy.</td>
</tr>
<tr>
<td>16.</td>
<td>Ruixue Bai, Chihua Li, Yangxue Xiao, Major Sharma, Et al</td>
<td>2019</td>
<td>RCTs until May 2018 about spa therapy among patients with CLBP</td>
<td>(a) Visual Analogue Scale (VAS), (b) Schober test, (c) Oswestry Disability Index (ODI).</td>
<td>According to the updated meta-analysis, it is suggested that spa therapy can effectively reduce pain and improve the function of the lumbar spine in individuals with chronic low back pain (CLBP). Moreover, physiotherapy has been shown to be effective in enhancing lumbar spine function.</td>
</tr>
<tr>
<td>17.</td>
<td>Monica Karinawalea N, Nyimasfathimah, Et al</td>
<td>2020</td>
<td>35</td>
<td>(a) Numeric Pain Rating Scale (NPRS) questionnaire, (b) Assessment of lumbosacral flexibility using the Modified Back Saver Sit and Reach (MBSR) Test.</td>
<td>Hydrotherapy has demonstrated beneficial effects by reducing pain intensity and enhancing lumbosacral flexibility in patients suffering from low back pain who undergo hydrotherapy treatment at a medical...</td>
</tr>
</tbody>
</table>
18. Yaser Khanjari, Jamal F Kalkhoran et al 2020 20 (a) Functional disability is assessed using the Roland Morris Disability Questionnaire. *The findings suggest that an aquatic exercise program is an effective and reliable approach for reducing chronic low back pain in individuals with a herniated disc.

19. Masoud Mirmoezzi, Khadijeh Irandoust, Cyrine ‘mida, Morteza Taheri 2021 28 (a) Straight Leg Raise Test (SLRT) (b) Numeric Pain Rating Scale (NPRS) (c) Roland-Morris Disability Questionnaire (RMDQ). The results indicated that after undergoing a 10-session hydrotherapy program based on McKenzie and Williams therapy approaches, individuals with non-specific low back pain (NSLBP) experienced improvements in their symptoms.

3.0 METHODOLOGY:
To collect relevant information, a systematic search was conducted on online databases, including Google Scholar and PubMed. Various keywords such as chronic low back pain, acute low back pain, lumbar pain, hydrotherapy, balneotherapy, and aquatic exercises were used. This search process yielded a total of 453 references. The selection of papers was based on specific inclusion criteria, which involved non-specific low back pain, acute low back pain, chronic low back pain, and herniated disc, with the additional requirement of being published in the English language. Exclusion criteria were applied to eliminate studies related to pregnancy, back surgery, spondylolisthesis, infections, tumours, fractures, ankylosing spondylitis, and osteoporosis.

4.0 RESULTS & DISCUSSION:
Low back pain (LBP) is a prevalent musculoskeletal condition with significant clinical, social, and public health implications worldwide. Hydrotherapy, which involves the use of water and heat, has been shown to effectively address LBP by reducing pain, improving muscle strength, and enhancing joint mobility. The prevalence of chronic LBP increases steadily from the third decade of life until the age of 60, with higher rates observed in women. Hydrotherapy offers numerous advantages in terms of pain relief, muscle strengthening, and enhanced joint mobility. In this study, we conducted a comprehensive review of 556 papers focusing on hydrotherapy and LBP, selecting 21 papers that included randomized controlled trials (RCTs), meta-analyses, and systematic reviews. One study conducted by K. Konrad et al. examined the impact of balneotherapy on LBP, while Mine Karagülle et al. conducted a review specifically investigating the effectiveness of balneotherapy and spa therapy for treating LBP. Recent reviews evaluating the role of spa and balneotherapy in musculoskeletal conditions consistently reported positive outcomes, including pain reduction, relaxation, and analgesic effects. Another randomized controlled study highlighted the benefits of buoyancy provided by water, which improved mobility and reduced load-bearing in individuals with LBP. Zoltán Balogh et al. conducted a study focusing on the effects of balneotherapy on LBP, emphasizing the thermal effects of water in this therapy. Their findings indicated that balneotherapy stimulates beta-endorphin synthesis and promotes peripheral vasodilation, resulting in pain relief and sedation. A meta-analysis further supported the effectiveness of balneotherapy, particularly when combined with heat, buoyancy, and massage, as it promotes muscle relaxation and pain relief. Aquatic therapy, which reduces axial loading on the spine and utilizes buoyancy, has long been used for managing musculoskeletal conditions, including LBP. It reduces gravitational force, facilitating movement and conserving energy. Comparative studies on hot packs and infrared rays have also demonstrated their effectiveness in relieving back pain by improving circulation, providing nutrients and oxygen to affected areas, and reducing inflammation. Thermotherapy and cryotherapy have shown long-term efficacy in pain relief for individuals with LBP. Aquatic therapy has been shown to improve pain, disability, quality of life, body composition, and fitness in sedentary adults with chronic LBP. The properties of water, including buoyancy and its impact on joint tension and axial spine loading, contribute to easier movement and energy conservation. Hot water bags effectively alleviate muscle damage by improving blood circulation, reducing stiffness, and decreasing inflammation. Hydrotherapy and aquatic therapy are valid options for rehabilitating non-specific chronic LBP, especially in elderly
individuals. They address various factors involved in altered peripheral inhibitory mechanisms, nociceptive activity, and abnormal cortical feedback, which can influence pain signal intensity. The use of hydrotherapy, aquatic therapy, or pool therapy, utilizing the properties of water such as heat, buoyancy, and hydrostatic pressure, can effectively alleviate discomfort, promote physical well-being, and modulate pain signals through thermal and mechanoreceptor stimulation. These therapies positively influence spinal segments. Warm water immersion contributes to analgesia through thermal effects and hydrostatic pressure on the skin, supporting the "Gate control theory of pain. A study by Monica Karina Walean et al., utilizing a one-group pretest-posttest design, reported a decrease in pain intensity and an increase in lumbarflexibility among individuals with LBP due to the biological and physiological effects of water-based exercise. The unique properties of water, including density, gravity, hydrostatic pressure, buoyancy, viscosity, and thermodynamics, contribute to reducing muscle spasms, blocking pain signals, minimizing joint load, facilitating exercise, improving muscle strength, and ultimately leading to decreased pain and increased lumbar flexibility and stability. Aquatic exercises have demonstrated their effectiveness in alleviating pain, improving quality of life, and strengthening muscles in elderly men with LBP caused by herniated discs. The natural buoyancy, hydrostatic pressure, and viscosity of water play significant roles in these exercises. Water immersion reduces axial loading on the spine, decreases stress on joints and muscles, and enables a broader range of movement by supporting the body's weight. Warm water enhances muscle efficiency. The hydrostatic pressure, depth, viscosity, and surface tension of water create resistance during active exercises, contributing to muscle strengthening.

5.0 CONCLUSION:
Hydrotherapy, a naturopathic treatment modality that utilizes water at different temperatures (internally or externally), has shown effectiveness in relieving pain, increasing muscle strength, and improving joint mobility among individuals with lower back pain. It is considered a highly effective approach for alleviating and strengthening the lower back, as well as enhancing flexibility in the joints. However, further research is needed to investigate the underlying complexities contributing to low back pain. Various hydrotherapy techniques, such as balneotherapy, aquatic exercise, spa therapy, and cryotherapy, are employed to enhance the therapeutic effects on low back pain. Therefore, hydrotherapy can be considered an effective intervention for relieving low back pain.

LIMITATIONS:
Excluded were articles that addressed back pain specifically related to pregnancy, back surgery, spondylolisthesis, infections, tumours, fractures, ankylosing spondylitis, and osteoporosis.

FUTURE SCOPE:
- It is possible to conduct a systematic review and
- provide randomized controlled trials for the cases under review.

REFERENCES:
44. Pittler MH, Karagulle MZ, Karagulle M, Ernst E. Spa therapy and balneotherapy for treating low back pain: meta-analysis of

About the author: Dr. Ranjini Murthy P,
Post graduation student from department of Clinical Naturopathy At Alva’s college of naturopathy and yogic sciences, Moodabidri, Mangalore ,Dakshina kannada-574225