

Analysing the Therapeutic Potential of Epsom Salt across Multiple Human Physiological Systems: A Comprehensive Review

SAKSHI VATS¹, LAKSHYASHREE², NISHAT KHAN³, MANSI JAIN⁴, KAMRAN ALI⁵

ABSTRACT

Epsom salt, also known as magnesium sulphate, has received a lot of interest in the realms of medicine and cosmetics because of its numerous medicinal and cosmetic uses. This article presents a detailed overview of the use of epsom salt in these sectors, emphasising its efficacy and adaptability. In medicine, epsom salt is known for its muscle-relaxing effects, making it a popular choice for treating discomfort, tension, and stress. Epsom salt's magnesium content is thought to play an important role in inducing muscular relaxation and lowering inflammation, making it a helpful adjunct therapy for illnesses like muscle cramps and fibromyalgia. Furthermore, its osmotic laxative qualities have been recognised, providing a gentle but effective remedy for constipation relief when taken orally in adequate doses. In cosmetics, epsom salt acts as a natural exfoliator, removing dead skin cells and impurities to reveal smoother, revitalised skin. Its ability to clear pores and enhance skin texture has made it a popular ingredient in skincare products including scrubs, masks, and lotions. Furthermore, epsom salt baths have become a luxurious self-care practice, valued for its capacity to relieve sore feet, soften skin, and promote relaxation.

Keywords: Fibromyalgia, Inflammation, Self-care

INTRODUCTION

The term "Epsom salt" refers to a colourless or white crystalline salt known as magnesium sulphate hepta-hydrate ($MgSO_4 \cdot 7H_2O$), which is dissolved in seawater and most mineral fluids, occurs in the minerals like kieserite and epsomite. It was discovered in 1618, and it derived its name from the location of its original preparation in Epsom, England [1]. There, it underwent distillation and was mostly sold as bath salt. It is made from hydrated magnesium sulphate and created by reacting magnesium salt with sodium hydroxide, the salt has an unpleasant flavour. Scientists have known about it and its numerous applications since the 1500s [2].

In the medical field, Epsom salt is used to treat a variety of conditions in individuals, including osteoporosis, fibromyalgia, respiratory congestion, and cardiac arrest. It is given to women who is going through labour too soon in order to postpone or extend the process. It also cleans the body of toxins produced by stress, helps in relaxation of muscles, and reduces discomfort. Epsom salt is also utilised in cosmetic procedures, laundry, soap products, food processing, pharmaceutical, and agricultural industries, as well as in sewage treatment as an emulsion breaker [3].

Epsom salt has diverse beneficial effect on different bodily functions and systems, to relieve of pain and inflammation due to inflammatory disease such as osteoarthritis, Rheumatoid Arthritis by decreasing the level of cytokines in the body which are the byproducts of inflammation. It is helpful in reduction of rapid weight loss that is generally practiced by martial arts athletes. In neuromuscular blockage epsom salt has proven to be efficient as it is working on both presynaptic and postsynaptic actions, increased levels of magnesium have the potential to block presynaptic calcium channels, which are responsible for stimulating the release of acetylcholine. Furthermore, magnesium ions reduce the irritability of the muscle fibre membrane and block postjunctional potentials [4].

As a result, the objective of this review was to evaluate unveiling role of epsom salt in treating different human physiological disease/ conditions.

USAGE OF EPSOM SALT ACROSS HUMAN PHYSIOLOGICAL SYSTEM

Inflammatory Conditions

Arthritis is the most common inflammatory condition which leads to pain, discomfort and limitations of daily activities prompting the need to diversify the strategies need to manage the pain and enhance functionality. Inflammation is the body's innate response to tissue damage, whether caused internally or externally. In case of arthritis inflammation plays a central role in disease process. A study was performed and stated that hot water mixed with epsom salt can be helpful in reducing pain and discomfort due to arthritic pain along with that reducing joint stiffness without any side-effect. As epsom salt contains magnesium which is readily absorbed by the skin and indeed has been found to inhibit the activation of cytokines responsible for inflammation. The potential of this non invasive intervention could be effectively utilised to alleviate arthritis-related pain. Another study was conducted which stated that magnesium oil integrated methotrexate is helpful in decreasing inflammation, improving joint mobility, repair and in reducing pain. Methotrexate (Mtx) plays a vast potential role in managing rheumatoid arthritis as Mtx leads to the inhibition of enzymes that are responsible for the metabolic activated T cells, binding of IL-1 β with its receptor and methyltransferase activity due to which it is considered as the drug of choice in treating the arthritis [5,6]. The beneficiary effects of magnesium have been noted because of its anti-inflammatory property. Magnesium is known as one of the important mineral which is involved in the production of Adenosine Triphosphate (ATP) and it has been known good for muscle health and calcium and the increased production of proinflammatory cytokine which leads to the magnesium deficiency therefore magnesium oil may help in overcoming arthritis associated conditions [7]. Epsom salt (magnesium salts) can be used in physiotherapy treatment to reduce superficial inflammatory conditions [8]. A study was conducted by Satralkar SP and Dhudum B, in which epsom salt dissolved in hot water for 10-15 minutes helped in relieving joint pain [9]. Epsom salt when dissolved in water it breaks down into magnesium and sulphate. When limb is soaked in epsom salt bath,

they get soaked inside the body through the skin which relaxes the muscles and reduces the stiffness and decreases pain [10]. Epsom salt fomentation showed the positive effect on decreasing knee swelling, reducing knee joint pain as well as the activities of daily living were also improved among elderly according to Ray S et al., [11].

Respiratory System

Asthma is a complicated inflammatory process involving particular cell populations and mediators. The clinical focus was on the typical bronchospasm found in asthma [12]. Magnesium is essential for several enzymatic activities, including the adenylate cyclase system. It also interacts with calcium to alter neuromuscular transmission. Adenylate cyclase enzyme generates cyclic adenosine monophosphate from an ATP. This cAMP relaxes the smooth muscle primarily by altering Ca²⁺ metabolism [13]. A study was performed by Gourgoulianis KI et al., to see the effect of intravenous magnesium sulphate on pulmonary function among patients with asthma and results stated that MgSO₄ improved FEV1 in patients with acute severe asthma. So, epsom salt can be utilised in treating asthma and related conditions [13].

Eclampsia

Preeclampsia is the constellation of three clinical conditions hypertension, proteinuria and oedema that occurs after 20 weeks of gestation. Magnesium sulphate (MgSO₄) is used for eclampsia therapy and prevention in individuals with severe preeclampsia. It is commonly administered via the intramuscular or intravenous methods. It has been established by international collaborative trial that MgSO₄ is more effective and well-tolerated than other medicines for preventing and treating eclampsia [14,15]. It has been used as an antiarrhythmic agent [16] and osmotic cathartic [17].

Body Weight

Epsom salt is used in rapid weight loss, it can cause temporary weight loss by pulling water from the body through a process known as osmosis. When epsom salt is dissolved in water, magnesium and sulphate ions are released, which can increase the osmotic pressure in the bathwater. This can cause water to be pulled out of the body through the skin, resulting in a temporary reduction in water weight and bloating. It is crucial to remember, however, that this weight loss is only transitory and mostly due to water loss rather than fat loss. Epsom salt may provide transient weight loss by lowering water retention, but it doesn't boost fat loss. Fat loss takes place when the body uses stored fat for energy, usually through a calorie deficit caused by eating fewer calories than burned. Epsom salt does not address the fundamental causes of fat buildup, such as food and exercise habits [18].

Digestive System

Magnesium has been used medicinally in eastern nations for much longer. Magnesium nitrate had already been utilised in Chinese herbal medicine before magnesium sulphate was discovered in the west. Magnesium nitrate with its predicted laxative properties was used to treat constipation alongside rhubarb, which has an anthraquinone glycoside molecule that serves as a stimulating laxative. In this trial, magnesium oxide delivery resulted in greater overall symptom improvement as well as improvements in spontaneous bowel movement. Stool shape, colonic transit time, abdominal symptom and quality of life [19]. Advances states that magnesium salts are used for the functional chronic constipation in children. Two studies were conducted which showed the effect of magnesium oxide in treating chronic constipation in children. Bu LN et al., compared the *Lactobacillus casei rhamnosus* Lcr 35 with magnesium oxide and the results showed that the children who received magnesium oxide have higher defecation frequency, softer stools and less use of glycerin enema as compared to probiotics [20]. Another study

was conducted by Kubota M et al., who compared probiotic *Lactobacillus reuteri* DSM 17938 and magnesium oxide among children with chronic functional constipation. Results showed that defecation frequency was much higher in patients those who were treated with magnesium oxide [21].

Skin

For generations, people have used epsom salt, which is actually magnesium sulphate chemically, due to its supposed health and cosmetic properties. While adding it to bathwater is a popular cure for relieving muscle aches and pains, applying it straight to the skin has certain advantages as well. Despite their inherent abrasiveness, epsom salt crystals are mild enough to be used as a skin exfoliator. It can be used with a small amount of water or preferred oil (such coconut or olive oil) to create a scrub that helps get rid of dead skin cells, making skin look and feel smoother and more radiant. In addition to reducing acne and enhancing the texture of the skin generally, this exfoliating method can help clear clogged pores. Additionally, epsom salt baths can help relieve the symptoms of psoriasis and eczema. Magnesium sulphate's anti-inflammatory qualities can help calm inflamed skin and reduce itching. Magnesium is a necessary element that is often lacking in the body. It is involved in more than 300 enzymatic processes. Increasing magnesium levels through skin absorption through epsom salt baths may offer a number of health benefits, such as enhancing general wellness, lowering stress levels, promoting better sleep [22].

CONCLUSION(S)

The diverse uses of epsom salt highlight its adaptability and possible healing advantages for a range of illnesses. Epsom salt exhibits promising utility in clinical contexts, ranging from aiding in cardiac stabilisation during emergencies to mitigating respiratory discomfort, alleviating inflammatory symptoms, and enhancing skin health. But it is crucial to stress the need of prudent and monitored use, since incorrect administration or high dosages may have unfavourable effects. In order to ensure that epsom salt is used safely and effectively, customised to each patient's needs and circumstances, collaboration between healthcare providers and patients is essential. More investigation into its modes of action, ideal dosages, and long-term effects will advance knowledge of its potential medical uses and make it easier to include it into evidence-based treatment plans. Eventually, even if epsom salt shows potential as a useful supplement in medicine, careful use in the framework of all-encompassing healthcare procedures is necessary to optimise its advantages and reduce its hazards.

REFERENCES

- [1] Smith J. A historical overview of epsom salt: From discovery to modern applications. *Chemical History Review*. 2023;2.7(3):112-28.
- [2] Christy IC, Nnanna II, Uche AC. The effects of epsom salt on microorganisms isolated from sewage. *J App Sci Res*. 2014;1(1):38-42.
- [3] Stentor, I. Pontiac fever at a sewage treatment plant in the food industry. *Malaysian J Industrial Med*. 2001;25:291-29.
- [4] Elbossaty WF. Pharmaceutical influences of epsom salts. *Am J Pharmacol Pharmacother*. 2018;5(1):02. Doi: 10.21767/2393-8862.100011.
- [5] Yang C, Daoping Z, Xiaoping X, Jing L, Chenglong Z. Magnesium oil enriched transdermal nanogel of methotrexate for improved arthritic joint mobility, repair, and reduced inflammation. *Journal of Microencapsulation*. 2019;37(1):77-90.
- [6] Damor DC, Pujari J, Mansuri MU, Rawat VS. A comparative study to assess the effectiveness of epsom salt with hot water versus plain water on pain and functional performance among arthritis patients at selected hospital, Udaipur. *Int J Health Sci Res*. 2023;13(9):137-49.
- [7] Fiehn C, Müller-Ladner U, Gay S, Krienke S, Freudenberg-Konrad S, Funk J, et al. Albumin-coupled methotrexate (MTX-HSA) is a new anti-arthritic drug which acts synergistically to MTX. *Rheumatology (Oxford, England)*. 2004;43(9):1097-105.
- [8] Deshmukh J, Ray S. Effectiveness of application of hot water with epsom salt v/s plain hot water on knee joint pain among geriatric women. *The Pharma Innovation J*. 2019;8(6):434-41.
- [9] Satralkar SP, Dhudum B. Effectiveness of application of warm compress with epsom salt to reduce knee joint pain among women. *Int J Sci Res*. 2018;7(5):319-22.
- [10] Why take an epsom salt bath? Webmad newsletter. Available from: <https://www.arthritis.org/living-with-arthritis/painmanagement/tips/warm-water-therapy.php>.

- [11] Ray S, Thakur S, Chacko R, Singh P, Devi A. Oral health of children in the selected anganwadi. *Int J Academic Res Develop.* 2018;3(1):1347-50.
- [12] Fredberg JJ. Bronchospasm and its biophysical basis in airway smooth muscle. *Respir Res.* 2004;5(2):01-16.
- [13] Gourgoulanis KI, Chatziparasidis G, Chatziefthimiou A, Molyvdas PA. Magnesium as a relaxing factor of airway smooth muscles. *Journal of Aerosol Medicine: The Official Journal of the International Society for Aerosols in Medicine.* 2001;14(3):301-07.
- [14] The Eclampsia Trial Collaborative Group. Which anticonvulsant for women with eclampsia? Evidence from the collaborative eclampsia trial. *Lancet.* 1995;345:1455-63.
- [15] Lucas MJ, Leveno KJ, Cunningham FG. A comparison of magnesium sulfate with phenytoin for the prevention of eclampsia. *N Eng J Med.* 1995;333(4):201-05.
- [16] Perticone F, Adinolfi L, Bonaduce D. Efficacy of magnesium sulfate in the treatment of torsade de pointes. *Am Heart J.* 1986;112(4):847-49.
- [17] Morris ME, LeRoy S, Sutton SC. Absorption of magnesium from orally administered magnesium sulfate in man. *Clin Toxicol.* 1987;25(5):371-82.
- [18] Connor J, Shelley A, Egan B. Comparison of hot water immersion at 37.8°C with or without salt for rapid weight loss in mixed martial arts athletes. *J Sports Sci.* 2020;38(6):607-11.
- [19] Mori H, Tack J, Suzuki H. Magnesium oxide in constipation. *Nutrients.* 2021;13(2):421.
- [20] Bu LN, Chang MH, Ni YH, Chen HL, Cheng CC. *Lactobacillus casei rhamnosus* Lcr35 in children with chronic constipation. *Pediatr Int.* 2007;49:485-90.
- [21] Kubota M, Ito K, Tomimoto K, Kanazaki M, Tsukiyama K, Kubota A, et al. *Lactobacillus reuteri* DSM 17938 and magnesium oxide in children with functional chronic constipation: A double-blind and randomized clinical trial. *Nutrients.* 2020;12:225.
- [22] Chandrasekaran NC, Sanchez WY, Mohammed YH, Grice JE, Roberts MS, Barnard RT. Permeation of topically applied Magnesium ions through human skin is facilitated by hair follicles. *Magnesium Res.* 2016;29(2):35-42.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Allied Healthcare Sciences (Physiotherapy and Occupational Therapy), Vivekananda Global University, Jaipur, Rajasthan, India.
2. Assistant Professor, Department of Allied Healthcare Sciences (Physiotherapy and Occupational Therapy), Vivekananda Global University, Jaipur, Rajasthan, India.
3. Assistant Professor, Department of Allied Healthcare Sciences (Physiotherapy and Occupational Therapy), Vivekananda Global University, Jaipur, Rajasthan, India.
4. PhD Scholar, Department of Physiotherapy, School of Medical and Allied Health Sciences, Galgotias University, Greater Noida, Uttar Pradesh, India.
5. Associate Professor, Department of Physiotherapy, School of Medical and Allied Health Sciences, GD Goenka University, Gurugram, Haryana India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Lakshyashree,
Department of Allied Healthcare Sciences (Physiotherapy and Occupational Therapy),
Vivekananda Global University, Jaipur-303012, Rajasthan, India.
E-mail: lakshyasingh1995@gmail.com

PLAGIARISM CHECKING METHODS: [\[Lain H et al.\]](#)

- Plagiarism X-checker: May 15, 2024
- Manual Googling: Aug 12, 2024
- iThenticate Software: Aug 14, 2024 (13%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? NA
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **May 14, 2024**

Date of Peer Review: **Jun 01, 2024**

Date of Acceptance: **Aug 17, 2024**

Date of Publishing: **Sep 01, 2024**