



An In-Vitro Study On *Streptococcus Pyogenes* : A Review

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Article History	Abstract
Received: 10 Dec 2023 Revised: 25 Dec 2023 Accepted: 04 Jan 2024	<p>Aim: An in-vitro study on <i>Streptococcus pyogenes</i>: a review</p> <p>Materials and Methods: Tonsillitis caused by bacteria, commonly known as GAS (Group A Streptococcus) or <i>Streptococcus pyogenes</i>.⁽¹⁾ Several homoeopathic drugs have shown effect on tonsillitis. The present review reveals the evidence based medicinal effects of different homeopathic medicine on <i>Streptococcus pyogenes</i>, in-vitro with the help of quality studies. The antibacterial potencies were determined by the agar well diffusion method and minimum inhibitory concentrations (MIC). Articles published between the years 2000 to 2022 were encompassed in this review. Articles published in relevant studies are summarized by different computerized database literature searches (searches were made in PubMed, Google Scholar, Research Gate).</p> <p>Result: After studying various articles, some articles were reviewed for the study. The articles reviewed were from 2000 to 2022 years.</p> <p>Conclusion: On comprehensive evaluation of various articles on <i>Streptococcus pyogenes</i> by Homoeopathic medicine, Anti-bacterial test, Well diffusion method and MIC were used to evaluate the Anti-bacterial activity by in-vitro process.</p>
CC License CC-BY-NC-SA 4.0	Keywords: Homoeopathy, <i>Streptococcus pyogenes</i> , In-vitro, review.

INTRODUCTION

The term Streptococcus was first introduced by Billoth (1874). *Streptococcus pyogenes* was used by Rosenbach (1884).^(1,2) *Streptococcus pyogenes* is a Lactobacillales, in the phylum Firmicutes. It infects throat, genital mucosa, skin and rectum.⁽³⁾ These bacteria grow in chains, causes numerous infections in humans such as Available online at: <https://jazindia.com>

Tonsillitis, Rheumatic fever, Cellulitis, Pharyngitis, Erysipelas, Post-Streptococcal glomerulonephritis. The *Streptococcus pyogenes* name is derived from Greek word meaning a chain (Streptos) of berries and pus forming (genes).⁽⁴⁾ According to WHO, to human mortality, GAS infection is the ninth leading infectious aetiology. Around 700 million GAS infections occur worldwide each year. Overall mortality rate for common infections is 0.1% and in severe cases mortality rate is around 25%. *Streptococcus pyogenes* incidence and mortality rate was high during pre-penicillin era, but it got decreased before widespread availability of penicillin.^(5,6,7) The incidence of *Streptococcus pyogenes* is around 2 to 4 per 100,000 population in developed countries and around 12 to 83 per 100,000 population in developing countries. *Streptococcus pyogenes* is found more frequently in men than women with highest rates in elderly people than followed by infants.^(8,9) The recently used conventional therapies like antibiotics such as penicillin, ampicillin, tetracycline, erythromycin vancomycin and amoxicillin are effective, but long-term use of antibiotic therapy causes unwanted adverse effects (bacterial tolerance, stomach ache, nausea, vomiting, diarrhoea. In this situation, Homoeopathic ultra-diluted medicine has scope for the treating the suffering of people. The Homoeopathic System of Medicine prescribes medicine in minute doses, which are capable of treating disease without any side effects to combat this situation.

MATERIAL AND METHODS

The articles reviewed and data is collected and summarized in a table 1.

Table 1: Homoeopathic Studies related to *Streptococcus Pyogenes*

Sr. No	Author	Year	Bacteria	Methods and Assay	Control	Homoeopathic medicine	Result
1.	S Sharma, et al	2021	<i>Bacillus cereus</i> , <i>Klebsiella pneumonia</i> , <i>Streptococcus pyogenes</i>	Well diffusion method	DMSO	Pongamia pinnata	Highest inhibition was seen in <i>Klebsiella pneumoniae</i> and least in <i>Streptococcus pyogenes</i>
2.	DA Azmi, et al	2020	<i>Streptococcus pyogenes</i> and <i>Pseudomonas aeruginosa</i>	Dilution method, MIC		Centella asiatica	Higher the level of ethanol extract of Centella asiatica (L.) Urban leaves, the higher the inhibitory and killing power of the growth of <i>Streptococcus pyogenes</i> And <i>Pseudomonas aeruginosa</i>
3.	Maryam-sadat Sadrzad ehAfshar, et al.	2020	<i>Streptococcus mutans</i> , <i>Streptococcus pyogenes</i> , <i>Staphylococcus aureus</i> , <i>Enterococcus faecalis</i> , <i>Pseudomonas aeruginosa</i>	Disk diffusion test, MIC	Amoxicillin	Propolis	All bacterial strains were sensitive and intermediate resistance to the antibiotics of amoxicillin.
4.	M Ghazi, et al	2018	<i>Streptococcus mutans</i> , <i>Streptococcus pyogenes</i>	MIC, MBC	Chlorohexine	Cuminum cyminum and Carum carvi	<i>S. pyogenes</i> was most resistant to caraway.

5.	O Onyeka, et al	2018	<i>Staphylococcus aureus</i> , <i>Escherichia coli</i> and <i>Streptococcus pyogenes</i>	antibacterial sensitivity well diffusion method		<i>Apis mellifera</i>	The growth of <i>Streptococcus pyogenes</i> was inhibited to 1.26, 4.34, 6.60, 8.45 and 13.26 mm at 20, 40, 60, 80 and 100% honey concentrations
6.	H Rashid, et al	2018	<i>Staphylococcus aureus</i> , <i>Bacillus subtilis</i> , <i>Streptococcus pyogenes</i> , <i>Pseudomonas aeruginosa</i> and <i>Klebsiella pneumonia</i>	Agar well diffusion method	Solvents	<i>Zingiber officinale</i>	Extracts showed maximum activity against <i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i> , <i>Klebsiella pneumonia</i> and <i>Pseudomonas aeruginosa</i>
7.	Jacob, A. G, et al.	2018	<i>Staphylococcus aureus</i> , <i>Pseudomonas aeruginosa</i> and <i>Streptococcus pyogenes</i>	Well diffusion method, MIC, MBC	Chloramphenicol standard	<i>Sida corymbosa</i>	The methanol extract especially inhibited the growth of <i>Staphylococcus aureus</i> , <i>Pseudomonas aeruginosa</i> and <i>Streptococcus pyogenes</i> at MIC of 25 mg/ml
8.	FR Ede, et al	2017	<i>Staphylococcus</i> , <i>Escherichia coli</i> , <i>Klebsiella spp.</i> <i>Proteus mirabilis</i> , <i>Proteus vulgaris</i> , <i>Streptococcus species</i> and <i>Pseudomonas aeruginosa</i>	MIC, Well diffusion method	Ciprofloxacin	Honey	<i>Staphylococcus aureus</i> was the predominant bacterial isolates
9.	Dr. Rashid Rahim Hateet et al	2015	<i>Escherichia coli</i> , <i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i> , <i>Pseudomonas aeruginosa</i>	Agar well diffusion, MIC (Minimum Inhibitory Concentration)	Methanolic DPPH solution	<i>Anethum graveolens</i>	Highest MIC is of 200µg/ml towards both bacterial species <i>P. aeruginosa</i> and <i>Streptococcus pyogenes</i>
10.	FM Jumare et al	2015	<i>S. pyogenes</i>	Antibacterial susceptibility test, MIC	Dimethyl-Sulphur oxide (DMSO) Erythromycin and Ampicillin	<i>Allium sativum</i>	Highest antibacterial activity recorded with acetone extract of lemon juice inhibited by <i>S. pyogenes</i> isolates.
11.	Nezar Alhebshi	2015	<i>Streptococcus pyogenes</i>	Antimicrobial activity	Tetracycline, amoxicillin and penicillin	<i>Catha edulis</i>	The extracts of <i>Catha edulis</i> were

							active against <i>Streptococcus pyogenes</i> .
12.	P Vengadesan, et al	2013	<i>Bacillus cereus</i> , <i>Klebsiella pneumonia</i> , <i>Streptococcus pyogenes</i> , <i>Vibrio cholerae</i> , <i>E. coli</i> , <i>Proteus vulgaris</i> and <i>Salmonella typhi</i> .	Disc diffusion method, MIC		Sargassum weightti	Maximum activity was recorded from the extract of Sargassum weightti against <i>K. pneumoniae</i> and minimum activity against <i>Streptococcus pyogenes</i> .
13.	TIRAN G R., et al.	2007	<i>Streptococcus pyogenes</i>	disc diffusion methods	Ampicillin, amoxicillin and cephallexin	black and green tea extracts	Both black and green tea completely inhibited the <i>Streptococcus pyogenes</i> growth
14.	B.A. Iwalokun, et al.	2004	<i>Staphylococcus aureus</i> , <i>Staphylococcus epidermidis</i> , <i>Streptococcus pneumoniae</i> , <i>Streptococcus pyogenes</i> , <i>Haemophilus influenzae</i> , <i>Salmonella typhi</i> , <i>Pseudomonas aeruginosa</i> , <i>Escherichia coli</i> , <i>Shigella</i> spp., and <i>Proteus</i> spp.	Antibacterial activity of AGE by Well diffusion and macro broth dilution method, minimum inhibitory concentration (MIC)		Allium sativum L.	AGE Bacterial growth inhibition and anticandidal efficacy were observed.

RESULT

After studying various articles, some articles were reviewed for the study. The articles reviewed were from 2000 to 2022 years.

DISCUSSION

The present review shows the AYUSH systems especially Homoeopathy is effective in treating the infections caused by the bacteria *Streptococcus pyogenes*. In this review, in-vitro studies are included. *Streptococcus pyogenes* infect adults, the paediatric age group and the geriatric age group in human beings. Due to the lack of awareness about the disease as well as management of bacterial infection among the population, it is becoming difficult to treat this infection.

Homoeopathy is a system based on a holistic principle ‘Similia Similibus Curentur’, has a good reputation in treating bacterial infections.

From the studies, it is evident that Homoeopathic medicines have in-vitro antimicrobial activities at lower potencies, medium potencies. However, the precise mode of action of these drugs remains unknown. Therefore, more extensive research investigations are needed in the age of evidence-based medicine to determine the precise mechanism of action of these ultra-high diluted homoeopathic medications. A systematic procedure must be used to replicate the substantial evidence on these serially diluted pharmacological findings in order to provide conclusive data.

CONCLUSION

The treatment for bacterial infection in conventional system with antibacterial drugs will have harmful effects on patients. Whereas treatment in alternative system of medicines AYUSH has very minimal or no side effects, give permanent relief to the patient and are cost-effective. Homoeopathy is the second largest system of medicine being practised worldwide. Homoeopathy provides treatment based on nature's law of cure (*Similia Similibus Curentur*). There is an immediate urge for the exploration of the efficacy of the alternative system of medicine for the treatment of bacterial diseases, the preclinical and clinical studies to know the efficacy and mechanism of action of these alternative or complementary systems of medicine, as Homoeopathic treatment are cost effective and with less or no side effects.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR'S CONTRIBUTION

The author has designed the analysis after collecting the data from various articles. The articles were searched from different search engines such as Google scholar, PubMed. The collected data was designed in a form of table for the study in the reviewed article.

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