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Impact of Herb Based Sanitizer on Handflora and Isolation of Dermatophytes from Dermatophytosis patients

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ABSTRACT: Hands are the first and common mode of disease transmission. In the present study dermatophytes isolated immunocompromised cancer patients and compared with healthy individuals. The study involve preparation of polyherbal sanitizer and check its efficacy. In the present study 20 immunocompromised cancer patients were selected from JNCH&RC, Bhopal. The samples were inoculated in Dermatophyte slant media with growth in 15 – 20 days of *Trichophyton*species, *Microsporon*sp., *Epidermophyton*sp. and *Candida albicans*. The bacterial strains were also isolated were *Staphylococcus aureus*, *Bacillus subtilus*, *Bacillus cereus*, *Escherichia coli*, *Staphylococcus epidermidis* and *Streptococcus pyogenes.* The polyherbal sanitizer prepared using 1 mg extract of 5 plants namely *Lawsoniainermis*, *Ocimum sanctum*, *Ocimumgratissum*, *Azadirachtaindica*and *Menthapiperita* dissolved in 40% ethanol, 10 ml rose water, 5 ml lemon juice, 2 gm *Aloe vera*gel and volume make up to 100 ml using distilled water. The color of sanitizer was yellow brown with pleasant smell, no turbidity and pH was found alkaline 8 with good shelf life. The results of antimicrobial activity were promising with maximum activity was observed against *B. cereus.* The efficacy of sanitizer showed growth reduction in healthy individuals from 80% to 98 %. The results of polyherbal sanitizer was promising with no side effects further study can be done in for in vivo analysis.

KEYWORDS: Sanitizer, dermatophytosis, polyherbal sanitizer, and bacterial strains

I. INTRODUCTION

Dermatophytes are filamentous fungi that invade and proliferate in the outer layer of the epidermis (stratum corneum) and degrade keratin by causing Dermatophytosis infection. In addition to invading the stratum corneum, some species may also invade the hair and nails. Dermatophyte infections are common and increase in frequency with increasing age, in hot, humid climates and in crowded living conditions. For example, tinea capitis is quite prevalent in children, especially in urban areas. In one area of the United States, 4% of asymptomatic children had a positive fungal culture for scalp dermatophytes, and 50% of children with tinea capitis had a household member who was culture positive (Chanyachailert*et al.*, 2023).

Hands are the first mode of transmission of microbes and infections. Hand hygiene is most important measure to avoid the transmission of harmful microbes and prevent the infections. To keep the skin safe from harmful microorganisms and to prevent spreading of many infectious disease, hand washing and hand sanitizing is absolutely an important precaution (Abdulmalik and Bader, 2024). Hand sanitizer or hand antiseptic is an alternative to the hand washing with soap and water. Hand sanitizers are even more essential in places where there is no clean water, or when a health care worker has so many patients to attend to and does not have the plenty of time to wash the hands after attending to each patient or can be used after washing hands (Singh *et al.*, 2020).

Infectious diseases are largely preventable, yet they continue to pose a significant threat to public health, particularly among vulnerable populations in developing countries. Basic hygiene practices, especially hand and skin hygiene, have been shown to significantly reduce the risk of the cross-transmission of infections, including those caused by multi-drug-resistant organisms. In light of the growing global concern about antimicrobial resistance, there is an urgent need to review and reinforce these practices. Strengthening hand and skin hygiene, along with environmental sanitation and preventive measures, can help reduce the spread of nosocomial infections. By emphasizing the importance of these fundamental hygiene practices, particularly in regions where theburden of infectious diseases is highest, the development of antibiotic-resistant diseases can be prevented, improving patient safety and enhancing public health outcomes. Adopting comprehensive hygiene policies,including regular handwashing, is crucial

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for reducing the prevalence of infectiousdiseases and improvinghealth outcomes in developing countries (Akinsulie*et al.*,2024).

Hand sanitizer can stop the chain of transmission of micro - organisms and other bacteria from hand to different parts of our body. Hand hygiene is important and one of the most critical steps in food production, food service as well as in homes and other day care preparations. Hand sanitizer avoids adverse effects like itching, irritation, dermatitis etc. So, maintaining hand hygiene as the prime criteria instead of some synthetic formulation, an attempt has been made by number of scientist to formulate an herbal hand wash by using some extracts of commonly available plants like Neem, clove and mint (Shaloo*et al.*, 2017).

II. METHODOLOGY

In the present study Dermatophytes were isolated from skin of hands, legs and other body parts of healthy volunteers, as well as from Dermatophytosis patient. The Polyherbal sanitizer was prepared using different plant extracts and efficacy was checked on different bacterial strains isolated from the hospital premises. The efficacy of sanitizer was checked on hands on healthy volunteers and compared with market available sanitizers.

Preparation of Sanitizer

The plants used for the preparation of sanitizer include leaves of *Ocimumgratissum* (Van tulsi), *Ocimum sanctum* (Shyamatulsi), *Azadirachtaindica* (Neem), *Menthapiperita*(Mint), *Lawsoniainermis*(Mehndi), gel of *Aloe barbadensis*(Ghritkumari) and juice of *Citrus limon*(Lemon). The plant leaves were dried, powdered and mixed 1 mg with 40 ml ethanol, 10 ml rose water, 5 ml lemon juice and make up to 100 ml in distilled water. The prepared sanitizer was prepared and stored in clean bottles for further use. The pH of the sanitizer was determined by using pH strip and its texture.

Antimicrobial activity of plant extracts and sanitizer

The plant extracts and prepared sanitizer was evaluated for antimicrobial activity against three gram positive bacteria *Staphylococci aureus, Streptococcus pyogenes* and *Bacillus cereus,* two gram negative strains *Pseudomonas aeruginosa* and *Escherichia coli* by disc diffusion method. The discs were prepared of whatmann filter paper and plant samples were dissolved in methanol.

Isolation of dermatophytes from dermatophytosis patient and healthy Individuals

The dermatophytes samples were collected from Dermatophytosis patient and healthy individuals. The skin and hair samples were taken and inoculated on Dermatophyte test medium and growth observed. Before collection of samples from individual's ethical approval was taken from Institutional Ethical Committee (IEC), Jawaharlal Nehru Cancer Hospital and Research Centre (JNCH&RC), Bhopal. The dermatophytosis samples were taken collected from dermal infected immunocompromised patients of cancer from OPD of JNCH&RC. In presence of Duty doctor affected areas samples were collected from skin, hair, or nails using a sterile cotton swab or scalpel. The samples were inoculated on dermatophytetest media (Himedia) and incubated at 30 ° C till growth observed for a month. The growth was further identified by gram's staining and fungal by 10 % KOH mount.

Study Population and duration

The study population included dermatophytosis patients diagnosed without medication taken. The patient consent oral and written taken before sample collection. The sample of consent form prepared in English and Hindi for patient consent. The duration of the study was **3 months** from 20 February 2026 to 20 May 2026.

Direct Microscopy

The patient samples also identified by direct microscopy by scratching suspected area in 10% KOH using sterile scalpel, apply coverslip and observe under 10 X microscope. For thick, hyperkeratotic specimens, potassium hydroxide was left for half an hour to 2 hours for digestion and clearing of samples. In case of hairs and nails extended to 24-48 h.

Efficacy of Poly – herbal Sanitizer

The efficacy of poly herbal sanitizer prepared were determined by examining its antimicrobial activity on bacterial strains isolated form the laboratory. The shelf life, pH and skin test performed to check its effect on skin. The organoleptic evaluation by determining its colour, odour, texture, grittiness, stability, shelf life and stability determined at different temperatures 40°C, 25°C, and 37°C for 1 week.

Shelf life of Sanitizer

The shelf life of the herbal sanitizer prepared was evaluated at temperature of 4 ± 2°C, 27 ± 2°C and 40 ± 2°C. The hand sanitizer was kept at different temperature and observed every week for

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homogenicity. Viscosity and consistency were determined at weeks 0 and 12 of storage (Maryam *et al.*, 2017).

Skin exposure to sanitizer

Individual exposure will be assessed by questionnaires. The sanitizer prepared was applied 5 ml to different individuals and feedback was taken. The individuals were asked questions regarding sanitizer odour and experience after using. The skin of hand was examined for redness, irritation and dryness. The feedback was collected in consent form filled by individuals (Jyotsana*et al.*, 2021).

Determination of efficacy of hand sanitizer

The modified method of David was used to determine the potency of the hand sanitizers (David, 2009). Thirty healthy volunteers were selected for the study and verbal and written consent was obtained from all volunteers prior to the conduct of the experiment. The samples were collected from laboratory employees, including Staff, Researcher, Technician, Sanitary and Office workers. The subjects chosen were without clinical evidence of dermatoses, dermal abrasion, trauma and infection. Surface samples were obtained by swabbing each individual hand (areas of 4 cm^2) and after using 5 ml of sanitizer respectively. The individuals were asked to rub sanitizer properly, allow it to dry and then sample was taken. The samples obtained was inoculated onto Sabouraud Dextrose agar plates, incubated at 37°C for 24 h and examined for growth. This temperature was chosen for incubation to ensure detection of both normal aerobic skin microflora and slow growing bacteria from the environment. The colonies were picked up and identified by gram's staining.

Percentage reduction in the bacterial load was calculated as

$$\% R = [(BBW - BAW)/BBW] \times 100$$

Where,

BAW is bacterial load after sanitizer use
BBW is bacterial load before hand wash

Statistical analysis

All experiments were performed in triplicate and results are expressed as mean ± standard deviation (SD). The mean, standard deviation and percentage reduction values were calculated in MS excel.

III. RESULTS

The dermatophytes were isolated from skin of healthy individuals and patients of Dermatophytosis. The poly herbal sanitizer was prepared in the laboratory and its efficacy was checked, its shelf life, pH and other physical parameters were evaluated.The antimicrobial activity of the sanitizer and its ingredients were evaluated on different bacterial strains and its efficacy on different individuals was also evaluated. The study involves patient dermal sample collection using swab sticks from dermatophytosis patients and healthy individuals. Before patient recruitment and sample collection an ethical approval taken from Institutional Ethical Committee of Jawaharlal Nehru Cancer Hospital and Research Centre, Bhopal. The ethical approval number 1131/JNCH/RES/08/04/2026, dated 08 April 2026.

Study population and duration

The patient was selected and recruited by Duty Doctor and Consultant Oncologist from OPD of Jawaharlal Nehru Cancer Hospital and Research Centre, Bhopal. Total 20 patients which includes 15 males and 5 females (age ranges from 15 to 84) were selected in the study after oral and written consent, similarly healthy volunteers were also taken. Patients on fungal medication were not included in the study. The study duration is for 3 months. The samples were all skin samples from face, neck, stomach area, as well as one hair samples. The maximum samples collected of Tinea was Tinea corporis than Tinea pedis and tinea versicolor, as well as Tinea capitis which was uncommon.

Growth on Dermatophyte test media

The growth was observed after 15 days incubation with pH change in dermatophyte slant media. Out of 20 samples inoculated 19 showed growth and no growth in one sample till one month. The growth morphology includes white cottony growth, black fungal growth and white small and big colonies. The healthy individuals showed white colonies small and big out of 20 samples 3 samples showed growth.

Microscopy

Out of 20 patients of Dermatophytosis 3 were positive in direct examination (KOH) and rest were negative by direct examination. The gram staining results showed growth of *Candida* species, *Trichophyton*sp., *Microsporon*sp. and *Epidermophyton*sp. The bacterial isolates were also found on hands and grow with fungal strains. The bacterial strains isolated were *Staphylococcus aureus*, *Bacillus subtilus*, *Bacillus cereus*, *Escherichia coli*, *Staphylococcus epidermidis* and *Streptococcus pyogenes.* The growth in healthy individuals sample include *S. aureus*, *S. epidermis* and *E. coli.*

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Results of Antimicrobial activity of plants and other ingredients used to prepare sanitizer

The results of antimicrobial activity by of plant extracts and other ingredients used for poly herbal sanitizer by disc diffusion method showed that all were found effective against both gram positive and gram negative strains. *Lawsoniainermis*showed maximum activity against all the strains used as compared to other plant extracts. The maximum activity was observed in gram positive bacteria *B. cereus* and gram negative, *E. coli*. The methanol, ethanol and distilled water was used as control as these ingredients were used for preparation of sanitizer (Table 1).

Table 1: Antimicrobial activity of ingredients used for sanitizer preparation by disc diffusion method. The readings were taken diameter of zone of inhibition (mm) in triplicate and mean and standard deviation were calculated.

S. N	Plant Name	**Zone of Inhibition (mm)**				
		S. aureus	***B. cereus***	***S. pyogenes***	***E. coli***	***P. aeruginosa***
1.	*Aloe barbadensis*	6 ± 0.01	6 ± 0.06	6 ± 0.4	7 ± 0.04	No zone
2.	*Azadirachtaindica*	10 ± 0.10	9 ± 0.07	8 ± 0.06	7 ± 0.3	7 ± 0.01
3.	*Lawsoniainermis*	20 ± 0.04	15 ± 0.04	20 ± 0.01	10 ± 0.05	13 ± 0.5
4.	*Ocimum sanctum*	11 ± 0.1	10 ± 0.01	16 ± 0.1	15 ± 0.08	11 ± 0.6
5.	*Ocimumgratissum*	9 ± 0.01	10 ± 0.10	13 ± 0.05	13 ± 0.10	10 ± 0.1
6.	*Menthapiperita*	6 ± 0.08	7 ± 0.05	7 ± 0.01	7 ± 0.06	No zone
7.	Lemon juice	15 ± 0.09	6 ± 0.4	15± 0.2	10 ± 0.02	10 ± 0.04
8.	Rose water	No zone	6 ± 0.11	No zone	No zone	No zone
9.	Ethanol	No zone	No zone	No zone	No zone	No zone
10.	Methanol	No zone	No zone	No zone	No zone	No zone
11.	Distilled water	No zone	No zone	No zone	No zone	No zone

Results of Antimicrobial Activity of Polyherbal Sanitizer

The maximum activity was showed against *P. aeruginosa* and minimum against *S. pyogenes* by all the sanitizer used. The poly - herbal sanitizer showed potent activity against all the strains. The commercial sanitizers used were Dettol, Hand safe, Lab Alcohol and Savlon. The commercial sanitizer, Dettol gave maximum activity than other sanitizers used in the study. The results are given in tabular form (Table 2).

Table 2**:** Antimicrobial activity of sanitizer compared with commercial sanitizer against gram positive and gram negative bacterial strains by disc diffusion method. The readings were taken in triplicate and mean and standard deviation were calculated.

S. N	**Name of sanitizer**	**Zone of Inhibition (mm)**				
		P. aeruginosa	***E. coli***	***S. pyogenes***	***S. aureus***	***B. cereus***
1.	Dettol	25 ± 0.05	20 ± 0.02	10 ± 0.08	10 ± 0.1	20 ± 0.03
2.	Poly – herbal sanitizer	9 ± 0.01	10 ± 0.33	7 ± 0.5	9 ± 0.04	7 ± 0.1
3.	Savlon	8 ± 0.01	10 ± 0.01	7 ± 0.04	No zone	9 ± 0.20
4.	Lab alcohol	7 ± 0.04	No zone	No zone	No zone	7 ± 0.42
5.	Hand safe	No zone	8 ± 0.5	No zone	No zone	7 ± 0.30

Efficacy of hand sanitizer

The Sabouraud Dextrose agar plates showed growth after 24 hours with white colonies, small orange colonies and black fungal growth. The plates after growth were kept for a week to observe growth. The fungal black and white colonies enlarged in size. The number of colonies counted and results were noted after 48 hours as number of colonies enhanced with bacterial and fungal growth. Out of 32 samples 8 showed no growth before applying sanitizer as well as after applying sanitizer. The fungal growth showed
presence of dermatophytes, *Mucor* and *Aspergillus*. The results were given in table 3, percentage reduction value was calculated and it was found percentage reduction was 90% found after using hand sanitizer prepared by us. The details of individuals are also given in table 3 and 4, as well as number of colonies isolated before and after using

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hand sanitizer. The bacterial and fungal colonies found were identified by gram staining. Common bacterial colonies found were *Staphylococcus aureus*, *Staphylococcus epidermidis, Proteus vulgaris*, *Streptococci pyogenes*, *Escherichia coli*, *Bacillus subtilis* and *Bacillus cereus*.As well as dermatophytes were also isolated *Trichophyton*species, *Epidermophyton*species and *Microsporon*species. The results showed that after applying sanitizer the plates were found sterile and it eradicated the bacteria residing on hands of individuals.

Table 3: Efficacy of hand sanitizer evaluated on different individuals using Sabouraud Dextrose Agar. Total number of colonies counted before and after using sanitizer and percentage reduction value calculated.

S.N.	Individual Name	Total fungal colonies		Total bacterial colonies		% Reduction
		Before using sanitizer	After using sanitizer	Before using sanitizer	After using sanitizer	
1	Volunteer 1	1	Sterile	20	Sterile	100 %
2	Volunteer 2	2	Sterile	50	Sterile	100 %
3	Volunteer 3	No colony	Sterile	20	3	85 %
4	Volunteer 4	1	Sterile	10	Sterile	100%
5	Volunteer 5	2	Sterile	No colony	Sterile	100%
6	Volunteer 6	No colony	Sterile	20	Sterile	100%
7	Volunteer 7	No colony	No colony	30	4	86.6 %
8	Volunteer 8	No colony	No colony	No colony	No colony	88 %
9	Volunteer 9	2	1	20	No colony	99.5 %
10	Volunteer 10	No colony	Sterile	25	Sterile	100 %
11	Volunteer 11	No colony	Sterile	25	Sterile	99.5%
12	Volunteer 12	1	Sterile	30	3	80%
13	Volunteer 13	No colony	Sterile	50	5	80 %
14	Volunteer 14	1	Sterile	70	7	85 %
15	Volunteer 15	No colony	Sterile	30	Sterile	99.1 %
16	Volunteer 16	No colony	Sterile	25	Sterile	98 %

Physical stability of hand sanitizer

The physical changes were determined by observing color, odor and pH of sanitizer weekly. After sanitizer preparation the pH of the sanitizer was found 7.9, alkaline. Alkaline pH is good for skin and maintains moisture and does cause dryness of skin. The sanitizer was prepared in May and its color, pH and odor were checked every week. The sanitizer was checked every week for 1 month and it was found stable without change in color, odor and pH.

Shelf life of hand sanitizer

The sanitizer was kept at different room temperature and observed. The sanitizer was kept at high temperature at 40 ± 2°C, room temperature at 27 ± 2°C and low temperature in refrigerator at 4 ± 2°C. The sanitizer was found stable at all the three different temperatures. The physical stability including pH, color and odor was stable. As well as consistency and viscosity was also found stable. The turbidity was checked in sanitizer and no turbidity was also seen. High temperature promotes the growth of bacteria and fungus, but sanitizer made by us did not showed any turbidity or growth in sanitizer. The sanitizer was checked for 1 month, but no growth or physical change was seen.

Skin exposure to sanitizer

No irritation, eczema, redness and dryness were reported by 20 healthy individuals after using sanitizer.

IV. DISCUSSION

Dermatophytes are keratinophilic and keratinolytic fungi. They are responsible for dermatophytosis which are superficial mycosis affecting skin (Tinea corporis, Tinea cruris, Tinea pedis), hair (Tinea capitis), beard (Tinea barbae), nails (onychomycosis or Tinea unguium). Dermatophytosis is a nonfatal disease except in extremely rare cases of Hadida and Schousboe'sdermatophytic disease (Robert andPihet, 2008). Infection generally involves skin and restricted to the cornified layers because of the inability of the fungi to penetrate the deeper tissues or organs of immunocompetent hosts (Cas, 1986). Dermatophytes are a group of closely related organisms that can use keratin as a nitrogen source. There are three genera of Dermatophytes,

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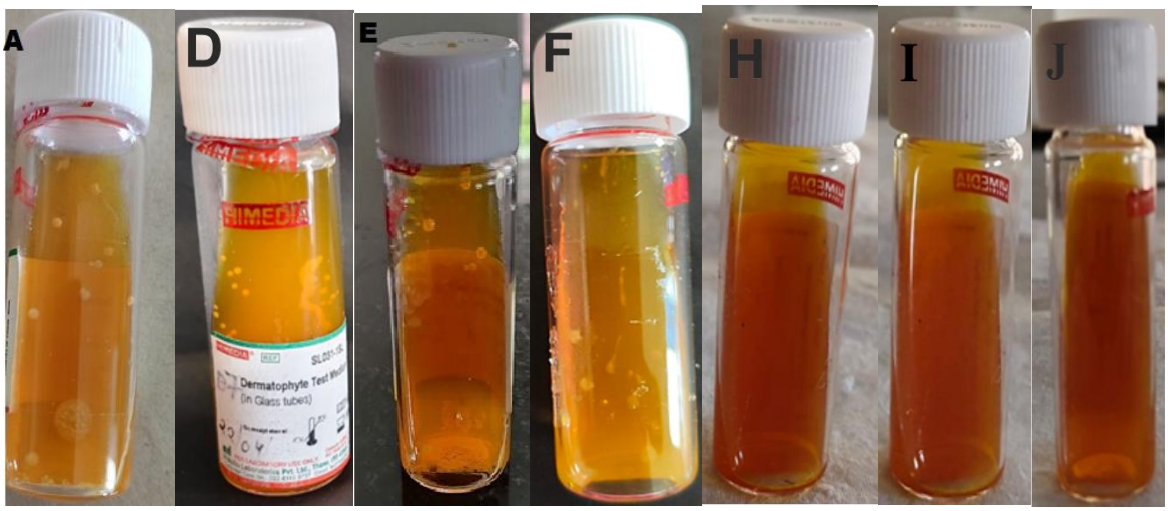

Figure 1: Growth on Dermatophyte slant medium isolated from dermatophytosis patient and healthy individuals

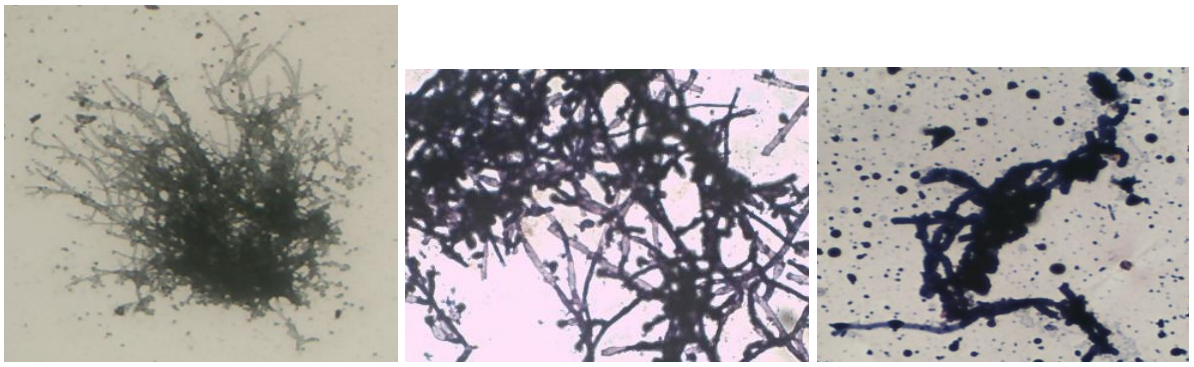

Figure 2: Direct examnation by KOH Mount and Lactophenol cotton blue stained slides of fungus

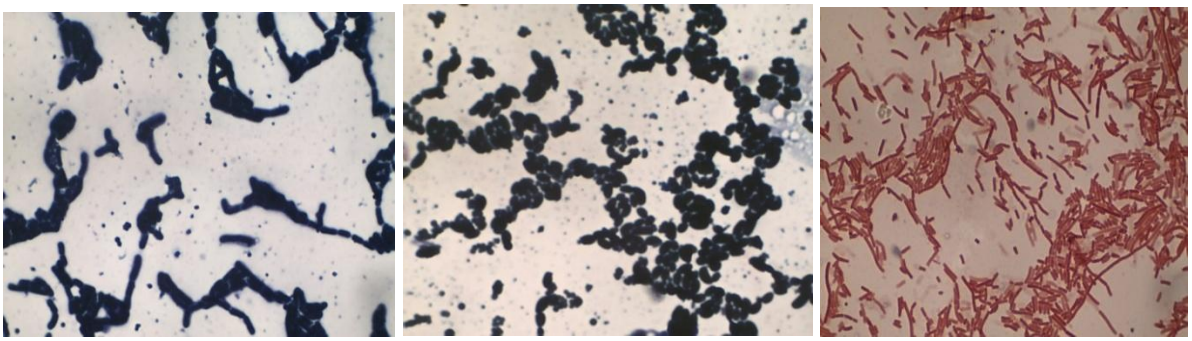

Figure 3: Gram's staining slides of Dermatophytes. The slides were observed at 100 x oil immersion

Trichophyton, *Microsporum* and *Epidermophyton*. The diagnosis involve culture as well as direct microscopic examination for definitive identification of etiological agent and in many instances the choice of therapy depends upon the specific identification of the invasive mould. This is especially important in nail and skin infection, often caused by non-dermatophytic filamentous fungi, which are often resistant to usual dosage of the therapy used for dermatophytic infections. Before starting treatment for dermatophytosis, it is essential to establish the diagnosis of the disease, so that specific therapeutic modalities can be

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monitored during the course of the treatment (Anupama, 2017).

Dermatophytes are group of fungi that cause superficial infections via enzymes that degrade keratin in human skin. Several factors, including climate, gender, age, lifestyle, human migration, cultural habits and socioeconomic status influence the prevalence of dermatophyte infections. In a study done on prevalence of dermatophyte isolates in a hospital in Eastern Saudi from 2000 to 2019. Among the 10,021 samples analyzed, 3040 (30.33%) were positive for fungi and only 398 (3.97%) were dermatophytes. The fungal isolates were examined microscopically for the presence of hyphal structures and conidia. The causative organisms responsible includes presence of *Microsporum* species was the most common dermatophyte accounting for 50.5% ($n = 201$) followed by *Trichophyton* with 36.9% ($n = 147$). The most common positive samples were scrapping (251, 63%) and hair (68, 17%). The culture results positive in children below age of 10 years with 215 (54%) of all cases and among 10–19 years of age with 60 (15) of the cases ($p < 0.001$). *Microsporum* species were the prevalent dermatophytes in patients < 10 years of age, while *Epidermophyton* species were the most frequent dermatophyte species in age groups 10–19, 20–29, and 30–39 years. However, *Trichophyton* species were the most frequent dermatophyte species in individuals 70-79 years. The percentage of *Microsporum* and *Trichophyton* species decreased significantly over time ($p < 0.001$). In addition, there was a significant seasonal variation in relation to *Trichophyton* species. A comparison between the most frequent species showed that there was no difference in relation to gender, but there was a difference in relation to the specimen type and age group (Alshehri*et al.*, 2021).

The scientific research on Dermatophytosis in Medical College and Research Institute, Mysore. Clinically diagnosed random nearly 200 patients selected from Department of Dermatology and Venereology. demonstrated in 148 cases (74%) either by KOH preparation and culture. The common clinical type isolated was Tinea corporis (45%) followed by Tinea cruris (19%) and Tinea unguium (17%). The commonetiological agent found was *T. rubrum* (62.7%) followed by *T. mentagrophyte* (25.42%), *M. gypseum*(5.08%), *T. tonsurans* (5.08%) and *E. floccosum* (1.69%). The results of Dermatophytosis was found common in the age group of 21 – 30 years (28%) and in males (64%), as well as most of the patients belonged to low socio economic status (85%) and were manual workers (39%) (Niranjan*et al.*, 2011).

Most of the tinea infections was found prevalent in immunosuppressive patients or patients due to abuse of antibiotics. The infection caused by keratinophilic fungi infecting skin, nails and hair. Terbinafine was seen to be the most effective drug against the isolates, followed by clotrimazole. Fluconazole showed least activity (Shakir*et al.*, 2019). Invasive fungal infections cause significant morbidity and mortality in patients with impaired immune defences. Defects in neutrophil function and neutropenia predispose to disseminated *Candida*, *Aspergillus* and Mucoraceae infections while altered T-lymphocyte mononuclear phagocyte function predisposes to infection with C. *neoformans*, *Histoplasma* and *Coccidioides* (Hawkins and Armstrong, 1984). The slides examined should show refractile, long, smooth, undulating, branching and septate hyphal filaments with or without arthroconidiospores in dermatophyte involvement. The hyphal filaments seen by microscopy in non dermatophytic mold involvement of the nail, especially of the great toes, tend to be irregular, vesiculated, tortuous or pigmented. In case of Candida infection, the dozens of hyaline, oval, budding (blastoconidiating) yeast cell forms with or without pseudo-hyphal filaments seen. Thick-walled spherical yeast in clusters, often with short filaments resembling “banana and grapes” or “spaghetti and meatballs” are characteristic of *Malassezia furfur* in pityriasis versicolor scales (Kurade*et al.*, 2006).

Human skin provides nutrients and suitable growth conditions for most pathogens as well as opportunistic bacterial pathogens and these bacteria evidently have the ability to be resistant to most of the cleaning regimen, thus contributing to their persistence in an ecosystem. Hand hygiene is a simple and least expensive means of preventing hospital acquired infections specially derived from environmental surfaces. Nowadays, use of alcohol based hand sanitizer is one of the components of hand hygiene, and is recommended. The use of hand sanitizers is gaining popularity both among medical and non-medical personnel. There are different types of sanitizers available in the market commercially which includes alcohol and non - alcoholic basedsanitizer. Different sanitizer has different effect of bacterial growth and leads biocidal activity.

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The stratum corneum is in the outer layer of the epidermis, and it contains several proteins and lipids that are important for skin health. This skin layer can be disrupted by agents that cause skin dryness and irritation, resulting in a dysfunctional skin barrier when there is loss of filaggrin breakdown products, also referred to as natural moisturizing factor (NMF), and lipids. This then leads to the unwanted dermatologic effects of skin dermatitis, and in some patients, contact dermatitis. While, it is known that frequent hand washing and hand sanitizer use causes hand dermatitis, the effects on skin barrier proteins and lipids has not been studied (Pranali*et al.*, 2023).

The need of Poly – herbal sanitizer which will inhibit bacteria due to presence of alcohol and plant based will enhance by nullifying its side effects was prepared in the present study by using extracts of 5 plants with medicinal properties namely *Lawsoniainermis*, *Azadirachtaindica*, *Menthapiperita*, *Ocimum sanctum* and *Ocimumgratissum*, along with it rose water, lemon juice, ethanol and *Aloe vera*gel taken. Every ingredient has a specific role in inhibiting the growth of bacteria and fungus also. Our study focused on antibacterial activity of hand sanitizer and was found potent as compared to other well-known commercial sanitizer. The ingredients antibacterial property was checked against bacterial strains *Pseudomonas aeruginosa, Bacillus cereus, Streptococcus pyogenes, Escherichia coli* and *Staphylococcus aureus* and gave potent activity against all pathogens used for the study. The gel of *Aloe vera*gives soothing effect in sanitizer, rose water is good for skin and protects from infection. Ethanol possess antimicrobial, antifungal and antiviral property which protects from infectious agents. The lemon juice was added in sanitizer which increases shelf life and good for skin. The use of all these ingredients protect skin from infections as well as use of gel of *Aloe vera*decreases irritability and skin dryness caused by alcohol added in sanitizer. Mint-containing hand sanitizers combine the antimicrobial properties of alcohol (typically 70%) with natural mint extracts (*Menthaarvensis* or piperita) to provide effective germ-killing, refreshing aroma, and a cooling sensation on the skin. These herb-infused formulations often include moisturizing agents to combat skin dryness (Shaloo*et al.*,2017). Mehndi helps in to manage all type of skin conditions like itching, allergy, skin rashes and wound. This is due to its healing property. It also helps to control excessive burning sensations due to its cold nature when applied to the affected area (Shazia *et al.*, 2016). Due to its healing effect on skin and antimicrobial property, it is used in the making of sanitizer.

The other studies also demonstrated better activity of Polyherbal sanitizer than commercially available. In one of the study efficacy of herbal hand sanitizer was evaluated using microorganism suspensions (*E. coli* and *Staphylococcus aureus*) which revealed that the herbal hand sanitizer is efficient in reducing higher number of microorganisms from the hands as compared to commercial synthetic hand sanitizer (Rina *et al.*, 2019). Other study showed results of zone of inhibition and by bacterial load, the prepared hand sanitizer was more effective than other marketed hand sanitizer (Minal*et al.*, 2020). An Ayurveda formulation of herbal sanitizer prepared in Covid pandemic to overcome ill effects of chemical based sanitizers on the skin. The results were validated by questionare at camps organized by Diabport health care, Kanpur. Diabetic dermopathy was also relieved with sign of improvement in both the texture of skin as well as decreased number of rashes (Pranay*et al.*, 2021). On the other hand herbal gel sanitizer prepared using tulsi and neem ethanolic extract showed safe and effective against pathogens and no irritation felt on hands after using this herbal sanitizer (Latif *et al.*, 2024). Poly – herbal sanitizer is economic and has less or no side effects like itching, dryness which was experienced in commercial sanitizer.

V. CONCLUSION

In the present study dermatopytosis patient were treated with poly herbal sanitizer formulated by us and showed promising results along with their medications. The sanitizer was used by healthy individuals and good response was obtained. Therefore, use herbal products should be promoted for better health, especially for immunocompromised patients.

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