

Study on Medical Textile Diabetic Wound Care using Natural Herbs

K.Kavithasan¹, Dr.J.Banu Priya²

¹ Research Scholar, Department of Costume Design and Fashion, PSG College of Arts and Science, Coimbatore, Tamilnadu, India

²Department of Costume Design and Fashion, PSG College of Arts and Science, Coimbatore, Tamilnadu, India
E-mail: kavi15thas@gmail.com

Abstract:

Medical textile is an emerging area with numerous uses, Medical textile products are produced from high performance textile materials that are manufactured primarily for their functional and performance properties rather than their aesthetic or decorative properties. Studies have carried out in the present work to impart the properties of wound care and antibacterial finishes in medical textiles producing a “medicated herbal bandage”. Medical textiles are versatile fibrous fabrics designed to safely treat wounds and medical conditions. Plants have been the traditional source of raw materials for medicine. A rich heritage of knowledge to preventive and curative medicines is available in ancient scholastic works included in the Atharva Veda, Charaka, Sushruta, etc.

Keywords: *Wrightia tinctoria, Viscose Non-woven, Wound Healing, Antibacterial.*

I. INTRODUCTION

Diabetic wound ulcers are injuries to the body tissues caused by excess sugar in the blood stream states Gadepalli et al., (2006). Foot infections are a common and serious problem in persons with diabetes and patient with a foot wound should receive appropriate wound care. Diabetic foot infections (DFIs) usually arise either in a skin ulceration that occurs as a consequence of peripheral (sensory and motor) neuropathy or in a wound caused by some form of trauma views Lipsky et al., (2012). Nonwoven have an increasing global demand for disposable, personal and healthcare articles and has resulted in stiff competition for unique and improved absorbent products opines Dutkiewicz, (2002). Plants have been the traditional source of raw materials for medicine. A rich heritage of knowledge to preventive and curative medicines is available in ancient scholastic works included in the Atharva Veda, Charaka, Sushruta, etc.

II. OBJECTIVES OF MEDI-TEX DIABETIC WOUND CARE

- To promote wound healing.
- To reduce the pain of the wound.
- To apply antimicrobial finish on viscose nonwoven fabric by pad-dry-cure method.
- To identify the antimicrobial activity of *Wrightia tinctoria* wound dressing compared with commercial antibiotic discs.
- To test the wound dressing on diabetic induced animal.
- To reduce the risk of bacterial infection.

WOUND

A wound is a type of injury in which skin is torn, cut or punctured (an open wound), or where blunt force trauma causes a contusion (a closed wound). In pathology, it specifically refers to a sharp injury which damages the dermis of the skin. Wound can be defines simply as the disruption of the normal, cellular and anatomic continuity of a tissue as a result of injury says Beckert et al., (2006). Wound any break in the external or internal surface of the body involving a separation of tissue, and caused by external injury or force views Nolascorn (2008).

Classification of wound

1. Acute wound - An acute wound is defined as a recent wound that has yet to progress through the sequential stages of wound healing.
2. Chronic wound - Chronic wounds take a layer time to heal or sometimes even recur due to the underlying pathology. Hence the underlying problem should first be identified and treated accordingly

Types of wounds

Lacerations: Injury where tissue is cut or torn, for treatment tissue is first cleansed of any blood clots and foreign material, described and irrigated. Local anesthetic is administered and a traumatic technique of wound closure is employed, where wound margins are realigned with careful regard to prevention of any further crush injury to tissues. Sterile dressings are applied and immobilization is recommended for complex extremity wounds opine Zinn SP (2008).

Avulsions: Injuries where a section of tissue is torn off, either partially or in total. In partial avulsions, the tissue is elevated but remains attached to the body.

Non-penetrating wounds: These are usually the result of blunt trauma or friction with other surfaces; the wound does not break through the skin.

Penetrating wounds: These result from trauma that breaks through the full thickness of skin; reaching down to the underlying tissue and organs.

DIABETIC WOUND

Diabetes mellitus can be virtually harmless if controlled, but the state of abnormally high blood glucose levels associated with the condition can lead to some serious complications. If left uncontrolled for a long time, or if diabetic patients fail to adapt their lifestyles in order to manage the disease, they will have more difficulty preventing complications from occurring. Serious complications that diabetics may encounter are diabetic wounds states Gadepalli et al (2006).

For a diabetic patient, every wound is a health concern and requires immediate attention. The most common two types are wounds of external origin and wounds of internal origin. Due to peripheral neuropathy, wounds of external origin, such as skin cuts, burns, bumps and bruises, may often go unnoticed by the diabetic patient. If external wounds go unnoticed for some time, delayed treatment can put the patient at risk for further complications. Wounds of internal origin, such as skin ulcers, ingrown toe nails or calluses, can lead to the breakdown of skin and surrounding tissue, increasing the risk of bacterial infections describes Falanga and Iwamoto (2006).

III. MATERIAL AND METHODS

Plant collection and authentication:

Wrightia is named after a Scottish Physician and botanist William Wright (1740-1827). The leaves of this tree yield a blue dye called pala indigo. *Wrightia tinctoria* belongs to family Apocynaceae. It is known by common name as "Indrajar". It has got very important place traditional healing and also is widely recognized medicinal plant opines Khyade and Vaikos (2009).

Wrightia tinctoria is a small and deciduous tree which grows up to 10m with milky latex, scaly, smooth and ivory colored bark. Leaves are about 8-15 cm, opposite, variable elliptic lanceolate or oblong lanceolate. Leaves are acute or rounded at the base, acuminate at the apex petioles 5 mm long. Flowers are usually seen at the tip of branches with 6cm long cymes, white with fragrance, Calyx and Corolla with 5 lobes. Anthers are sagitate, ovary bilocular and stigma bifid. Fruits are long follicles up to 50 cm with adhered tips. Seeds are many, linear 1-2 cm long, pointed at the apex. The seeds are released as fruit dehisces. Flowering and fruiting is seen between March to November. It is widely distributed in India and Burma especially in deciduous forests of Rajasthan, Madhya Pradesh and peninsular India states Daniel and Sabnis (1982).

Selection of nonwoven fabric

The selected fabric is viscose nonwoven. The fabric is made of manmade fibers, which have a cellulosic base. Considering the suitability of viscose for the application of medical textiles, the investigator has selected viscose nonwoven fabrics for this study. Viscose fibers, have a high moisture regain and it is biodegradable. It is used in many apparel end uses and hygiene disposable where its high absorbency is a great advantage. Viscose 100% nonwoven fabric was used to assess the antimicrobial finish. A total of five meters of fabric were purchased.

Selection of finish

Antimicrobial finishes are also known as antibacterial, bacteriostatic, germicidal, perma fresh, anti-odor or antiseptic finishes. These finishes are used in clothing that comes into contact with the skin, shoe linings, bandages, surgical clothing and hospital linens. The application of natural antimicrobial wound dressing intended either to enhance wound healing or extend the intervals between the changing of dressing.

Preparation of extract

The fresh leaves of *Wrightia tinctoria* (Plate- 1) washed thoroughly 2-3 times with running tap water and allowed shade drying for seven days. Then the leaves were thoroughly dried. The dried leaves were

powdered (plate-2) using a grinding and followed by mixing with solvents namely methanol and ethanol at room temperature in the ratio of 1:5 in a conical flask it was closed and kept into automatic shaking machine for 24 hours, so that the methanol and ethanol takes in the active compound of the leaves. The extract was filtered by using fine muslin cloth.

Application of Antimicrobial finish

The antimicrobial finish was applied on viscose nonwoven fabrics with herbal extract of *Wrightia tinctoria* by pad- dry-cure method in a padding mangle. The finishing was done by four methods methanolic crude extract, ethanolic crude extract, nano methanolic extract, nano ethanolic extract. For the crude extract fixing agent was myrobalan. Finally the fabrics were subjected to drying and curing.

Antimicrobial activity

Antibacterial activities of the samples were tested by quantitative method (AATCC 90-1982).The *Wrightia tinctoria* plant extract treated with viscose nonwoven fabric with crude and nano treated samples were tested for antimicrobial activities against *Staphylococcus aureus*, *Lactobacillus* gram positive and *Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa* gram negative bacteria and standard antibiotic disc Ciprofloxacin according to agar diffusion test.

Evaluation

The finished viscose nonwoven fabric have to be tested for its change in their properties, if any, the fabric is evaluated. The performance of a finished fabric in actual service could be the object of a product test. Subject to this the laboratory tests has been done to confirm and to evaluate the samples. The characterization of the nonwoven products encompasses the determination and measurement of the various properties which are relevant for any particular objective. The properties of the nonwoven material could be classified into various ways.

Wound healing activity

Male Wistar albino rats (150–180 g) were selected for the experiment. Six rats were taken for each group. They were kept in the animal house at $26\pm 2^{\circ}$ C and light dark cycles of 10 and 14 h, respectively. Animals were provided with rodent diet and water *ad libitum*. The present study aims to the initial phases of diabetic induced, infected wound. The study was conducted after obtaining the “animals’ ethical committee clearance” bearing the number 1012/C/06/CPCSEA.

IV. CONCLUSION

This research work has given that the synthesis of phyto nano particles finished on viscose Non-woven with methanolic extract and ethanolic extract treated samples (N-VME and N-VEE) show excellent antibacterial activity towards *Staphylococcus aureus*, *Lactobacillus*, *Escherichia coli*, *Salmonella typhi* and *Pseudomonas aeruginosa*. The results of wound healing activity suggest that wound healing action is good on crude and Phyto nano viscose with methanolic extracts treated samples (C-VME and N-VME) on diabetic wounded rats.

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