

Exploring Awareness of Medical Textiles in Healthcare Products Among Young Women

Veena Sachdeva*, Latesh**

Associate Professor*

Department of Botany,

Government PG. College for Women, Rohtak.

Assistant Professor**

Department of Home Science

Government PG College for Women, Rohtak

Mobile: +91 9466172244, Email: veenasachdevaa@gmail.com

Mobile: +9194169 20020, Email: sainilatesh@gmail.com

ABSTRACT

Medical textiles have become an essential part of contemporary healthcare, providing creative answers to a range of medical problems. This essay delves into the complex realm of medical textiles, examining its key traits, many uses, and prospective effects on healthcare. Medical textiles are appropriate for use in medical applications when they have certain properties, including biocompatibility, porosity, breathability, absorbency, and sterility. They are used in orthopaedics, surgery, wound care, implants, and hygiene products, and they significantly improve patient comfort and treatment outcomes. Their potential is further increased by the incorporation of smart fabrics and nanotechnology, allowing for improved functionality and real-time monitoring. Medical textiles continue to progress healthcare as researchers and professionals work together, promising a future where patient care is further optimised through the invention of these materials.

Keywords: Biocompatibility, Porosity, Breathability, Absorbency, Sterility, Surgical procedures, Orthopaedics, Implants

Introduction:

The intersection of textile technology and medical science has led to the development of a field that is today regarded as "the new frontier" in the field of medical research and development. By providing ground-breaking solutions to a broad range of medical problems, these specialised fabrics—designed and developed to fulfil exacting medical standards—have revolutionised contemporary healthcare practises. Medical textiles have become an essential part of enhancing patient comfort, enhancing treatment outcomes, and raising the standard of healthcare services in general. This is true for everything from wound care and surgical procedures to patient attire and biomedical implants.

Due to their distinctive qualities that meet certain healthcare needs, the market for medical textiles has grown significantly over time. These fabrics' primary property of biocompatibility guarantees that they are safe for interaction with live tissues and body fluids, reducing the possibility of negative responses or infections. Additionally, medical fabrics frequently have good porosity and breathability, enabling optimal airflow and moisture management. This characteristic is especially important for wound dressings since preserving

a favourable environment is necessary for efficient healing and avoiding infections. Matthews and Rajendran (2011) offer insightful information on medical textiles and biomaterials, addressing issues such material selection,

Another crucial quality of medical textiles is their absorbency, which is especially important for cleanliness and wound care treatments. High-absorbency advanced wound dressings created from these materials effectively manage fluid exudates and encourage a hygienic and healthy wound healing process. Additionally, sterile medical textiles must be utilised in surgical environments to avoid infections while performing procedures. Because of their resilience and robustness, they can tolerate several sterilisation processes while still performing as intended. Ko (2006) explores the use of medical textiles in orthopaedic and surgical procedures, with a focus on tissue engineering methods. In addition, Jayaramudu and Rajulu (2019) concentrate on the most recent developments in medical textiles and their applications in healthcare, offering insightful information on new trends and creative solutions. Their study discusses the value of medical textiles in surgical settings, highlighting their part in maintaining a clean environment throughout procedures.

Medical textile applications cover a wide range and are essential to contemporary healthcare. One of the most important applications is wound care, with modern dressings including bioactive components, antimicrobials, and drug-delivery systems that promote quicker and more effective wound healing. The use of medical textiles in surgical drapes, gowns, and coverings helps surgical procedures by maintaining a sterile environment and lowering the risk of surgical site infections.

Medical textiles have an impact on biomedical implants in addition to external uses. In this field, textiles are crucial to the development of artificial heart valves, blood arteries, and other tissue replacement or repair implants. Their biocompatibility and specialised qualities allow for successful body integration, aiding patients with a range of medical ailments. Ko's (2006) research investigates the development of artificial blood arteries, heart valves, and other tissue-repair or -replacement implants using medical textiles.

The field of medical textiles is poised to expand as science and technology develop. For example, smart fabrics are opening the door to fabric-integrated sensors and electronics that can track vital signs in real-time, providing a novel method of diagnosis and treatment. Additionally, the use of nanotechnology to medical textiles is increasing features like antibacterial activity and medication delivery systems and opening up fascinating new possibilities. According to Matthews and Rajendran's research (2011), the development of smart textiles with real-time monitoring capabilities is paving the way for fabrics with integrated sensors and electronics. Healthcare diagnoses and treatment could be revolutionised by this ground-breaking technology.

Despite the considerable contributions that medical textiles have already made to healthcare, ongoing research and development hold the promise of even more ground-breaking innovations. The potential for innovation in medical textiles is limitless as long as scientists,

textile engineers, and medical practitioners keep working together. This study aims to add to the corpus of knowledge by illuminating the complex world of medical textiles and its significant influence on contemporary healthcare. We can foresee a future where medical textiles play an even more crucial part in developing healthcare for the benefit of patients all over the world by comprehending the subtleties of these specialised materials and investigating upcoming trends and breakthroughs.

Since ancient times, medical textiles have had a substantial impact on the healthcare sector, with an emphasis on fiber-based items used for cleaning, care, and prevention. During the COVID-19 pandemic, there was an increase in demand for medical textile products such as face masks, medical gowns, and Personal Protective Equipment (PPE). In addition, the production of medical textiles is a rising industry as a result of developments in medicine and textile technology, as well as population growth, lifestyle changes, and higher life expectancies.

Despite the ongoing advancements in the field of medical textiles, certain organisations still lack knowledge in this area. In order to determine how much young women in Haryana, India, are aware of the use of medical textile products, this study was done in two government PG institutions for women. This study examined young women's knowledge of medical textile goods used in healthcare and cleanliness at two government PG women's colleges in Haryana, India. Using a sampling strategy, data were gathered, and the study's methodology included both questionnaires and interviews. The major goal was to determine how much information young women had about medical textile goods and their uses in hygiene and healthcare.

Medical textiles include a variety of fabric types that are used for a range of healthcare applications. Typical types of medical textiles include the following:

Wound Dressings: These materials are used to manage and care for wounds. They could consist of advanced dressings with antimicrobial qualities to encourage the best possible wound healing, hydrogels, foams, films, and non-adherent dressings (Rajendran, S., & Anand, S. C. (2018).

Surgical textiles: These textiles, which include surgical gowns, drapes, coverings, and wraps, are utilised during surgical procedures. During operations, they act as a sterile barrier to stop contamination and infections (Rajendran, S., & Anand, S. C. (2018).

Implantable textiles: These materials are utilised in biomedical implants such as hernia mesh, prosthetic heart valves, and artificial blood vessels. They are made to be biocompatible and easily meld with the tissues of the body (Karthikeyan, M. (2018).

Compression Textiles: Patients with venous insufficiency can benefit from improved blood circulation by wearing compression garments made of medical textiles to treat disorders like lymphedema.

Incontinence goods: To treat urine or faecal incontinence, medical textiles are used in the production of adult diapers, absorbent pads, and other incontinence goods.

Smart textiles: These are sophisticated textiles that incorporate sensors and electronic parts. They are appropriate for uses like wearable health monitors and smart bandages because they can monitor vital signs, gather data, and give real-time feedback (Karthikeyan, M. (2018).

Orthopaedic textiles: These textiles are used in braces, casts, and supports, among other orthopaedic devices, to offer stability, immobilisation, and support while musculoskeletal injuries and fractures heal.

Textiles for Hygiene: To preserve hygiene and stop the transmission of illnesses, medical textiles are used in goods including hospital bed linens, patient gowns, and wipes (Tzou, J. C., & Dai, S. (2017).

Protective textiles: To safeguard healthcare professionals and patients from potential risks and infections, medical textiles are used in Personal Protective Equipment (PPE), such as masks, gloves, and gowns (Dissanayake, N., & Sagara, L. P. (2017).

Bioactive textiles: These fabrics are made to release bioactive compounds, such as growth factors or antimicrobial agents, to promote tissue regeneration and wound healing (Karthikeyan, M. (2018).

Every type of medical textile has a distinct purpose and is essential for many different elements of healthcare, including patient comfort and safety, wound care, and surgery. Their adaptability and material science developments continue to spur innovation in the medical industry, increasing patient outcomes and overall healthcare.

Fiber Types	Applications
Cotton	Surgical clothing gowns, Beddings, Sheets, Pillow cover, Uniforms, Surgical hosiery, Lint etc.
Viscose	Caps, Masks, Wipes, PPE, Plasters, Bandages, Wound care pad etc.
Hollow viscose	Artificial Kidney. Artificial Liver.
Polyester	Gowns, Surgical cover, drapes, Blankets, Cover stock, Surgical hosiery, Sutures, Artificial tendon etc.
Hollow polyester	Artificial Kidney.
Polyamide	Surgical hosiery, Bandages, Wound care pad etc.
Polypropylene (PP)	Protective Clothing, Sutures Plasters etc.

Polyethylene (PE)	Surgical Covers, Drapes, Artificial joints/bones etc.
Polytetrafluoroethylene (PTFE)	Heart valves, Vascular grafts, Bio-degradable Sutures etc.
Carbon	Artificial tendon, Artificial bones etc.
Glass	Caps, Masks, Plasters etc.
Collagen	Artificial skin, Ligament, Lumen, Sutures
Silicone	Artificial joints/bones, Artificial lumen, Artificial skin etc.
Hollow silicone	Artificial Lung
Elastomeric	Surgical hosiery, Gloves etc

Table 1. **Fibers Used in Different Purposes in Medical & Health Care**

The kinds of fibres and fabrics that are utilised to make medical textiles can also be used to categorise them. Following is a list of medical textiles categorised according to their fibres and fabrics.

Classification on the basis of Fibres:

Natural fibres:

a. Cotton: Due to its softness, absorbency, and breathability, cotton fibres are frequently utilised in medical textiles. They are frequently found in hygiene products, hospital gowns, and wound dressings (S. Muthu, T. W. Y. Tam, & J. R. S. Wong (Eds.). (2018).

b. Silk: Silk fibres are appropriate for use in medical implants and wound dressings since they are both biocompatible and antibacterial (Karthikeyan, M. (2018).

Synthetic Fibers:

a. Polyester: Polyester fibres are strong, light, and resistant to creases and shrinking. Synthetic fibres: a. They are utilised in patient clothing, surgical gowns, and drapes (Zhang, M., Chen, X., Zhang, H., & Du, Y. (2019).

b. Polypropylene: Polypropylene: Due to its superior wicking and moisture management capabilities, polypropylene fibres are perfect for use in disposable surgical clothing and wound dressings (Zhang, M., Chen, X., Zhang, H., & Du, Y. (2019).

c. Polyethylene: Polyethylene fibres are used to make barrier fabrics for safety gear and operating room drapes (Rajendran, S., & Anand, S. C. (2018).

d. Nylon: Nylon fibres are renowned for their durability and resistance to abrasion. Both compression clothing and wound dressings use them (Karthikeyan, M. (2018).

Fibres made from regenerated cellulose

a. Rayon/Viscose: Rayon and viscose fibres are soft and absorbent, making them ideal for use in hygiene products and wound dressings ((S. Muthu, T. W. Y. Tam, & J. R. S. Wong (Eds.). (2018).

Classification based on Fabrics:

a. Non-Woven Fabrics: Through the use of mechanical, chemical, or thermal procedures, fibres are entangled to create non-woven medical textiles. They are utilised in surgical gowns, disposable hygiene items, and wound dressings (Matthews, S., & Rajendran, S. (Eds.). (2011).

b. Woven Fabrics: To generate a sturdy structure for woven medical textiles, strands are interlaced in a predictable way. They are frequently utilised in bandages, clothing, and surgical drapes (Rajendran, S., & Anand, S. C. (2018).

c. Knitted textiles: Knitted medical textiles are made of interlocking loops of yarn that offer flexibility and stretch. They are utilised in patient clothing, wound dressings, and compression garments (Rajendran, S., & Anand, S. C. (2018).

d. Composite Fabrics: To attain particular performance qualities, composite medical textiles layer a variety of fibres or fabrics in numerous layers. They are utilised in cutting-edge medical implants and bandages for wounds (Rajendran, S., & Anand, S. C. (2018).

The ability to choose the best materials for certain healthcare applications is made possible by the classification of medical textiles based on fibres and fabrics. This guarantees the best performance, comfort, and safety for both patients and healthcare workers.

Medical textiles' uses and advantages:

Applications for wound care:

Advanced Wound Dressings: Medical textiles play a key role in the creation of advanced wound dressings with attributes like foams, hydrogels, and antibacterial characteristics. These dressings foster a favourable environment for wound healing, accelerating recovery and lowering the risk of infections. (Rajendran & Matthews, 2011)

Compression Bandages: Medical textiles are used in compression bandages, which help in the treatment of ailments like oedema and venous ulcers. Compression clothing promotes healing by enhancing blood flow and minimising oedema. (Karthikeyan, 2018).

Applications in Surgery:

Surgical Drapes and Gowns: Using medical fabrics, surgical drapes and gowns are made to act as a sterile barrier during surgical procedures. This vital activity lowers the possibility of surgical site infections and guarantees patient security (Rajendran & Matthews, 2011).

Implantable Medical Devices: Medical textiles are utilised in implantable medical devices, such as hernia meshes and artificial blood arteries, which are used to replace or repair injured organs or tissues. These implanted fabrics guarantee tissue integration and biocompatibility. (Ko, 2006)

Applications for Personal Protective Equipment (PPE):

Face Masks: Medical textiles are crucial in the production of a variety of face masks, such as surgical masks and N95 respirators, which are essential for protecting patients and healthcare personnel from airborne toxins (Rajendran & Anand, 2018).

Gloves: Medical textiles are necessary for the manufacture of both disposable and reusable gloves, which serve as a vital barrier against the spread of infections in medical facilities (Rajendran & Anand, 2018).

Applications for hygiene and incontinence

Hospital Bed Linens and Apparel: To uphold strict cleanliness standards and prevent cross-contamination, medical textiles are used in hospital bed linens, patient gowns, and staff attire (Rajendran & Anand, 2018).

Products for treating incontinence: Medical textiles are used in adult diapers and absorbent pads to manage urination or faeces incontinence and improve patient comfort (Rajendran & Anand, 2018).

Applications for smart textiles:

Wearable Health Monitors: Wearable health monitors are made possible by medical textiles that have sensors embedded into them. These devices can track vital signs, allow for remote patient monitoring, and aid in the early diagnosis of health problems (Tzou and Dai, 2017).

Smart Bandages: Textiles with embedded sensors enable for real-time tracking of the progress of wound healing, the early detection of infection symptoms, and the prompt implementation of therapies for better results (Tzou and Dai, 2017).

Advantages of Medical textiles':

Improved Patient Comfort: Medical fabrics are made with the user's comfort in mind and prioritise softness, breathability, and a delicate touch. In accordance with Karthikeyan (2018)

Infection control: Medical textiles having antimicrobial qualities help prevent infections, protecting patients and medical personnel from the danger of contracting infections (Rajendran & Matthews, 2011).

Wearable Health Monitors: By integrating sensors into medical textiles, wearable health monitors are now able to track vital signs, allow for remote patient monitoring, and aid in the early diagnosis of medical conditions (Tzou and Dai, 2017).

Smart Bandages: Embedded sensors in smart textiles provide real-time monitoring of wound healing

Improved Wound Healing: Modern wound dressings promote the best circumstances for wound healing, hastening recovery and reducing complications (Rajendran & Matthews, 2011)

Safety and Sterility: The usage of medical textiles in surgical settings ensures a sterile environment, lowering the risk of problems and infections following surgery (Rajendran & Matthews, 2011).

Customizability: Due to their adaptability, medical textiles can be tailored to satisfy the unique needs of diverse healthcare applications. Rajendran & Anand (2018) are cited.

Longevity and Robustness: Medical textiles are made to resist repeated sterilisation procedures and wear and tear while preserving their integrity (Rajendran & Anand, 2018).

Cost-Effectiveness: Using medical textiles in disposable items results in lower costs and more effective healthcare procedures, particularly in PPE and wound care (Rajendran & Matthews, 2011).

Research Methodology

The main goal of this study is to find out whether young women are aware of the value of medical textile goods for hygiene and healthcare. The following research methods was used to accomplish this goal:

Research Objectives:

- To assess young women's level of awareness of medical textile items.
- To figure out how young women analyse the value of medical textile items.

Research Method:

To ascertain young women's understanding of and relevance for medical textile items, the survey method was used as the main study strategy.

Research Location and Sampling: The Government P.G. College for Women, Rohtak located in Haryana, India, were the site of the study. Sixty young women were selected as research sample. The participants were divided into three age groups: under 18, between 18 and 20, and over 20.

Data Collection: A questionnaire and interview technique were utilised to acquire the data. A survey questionnaire with particular inquiries about medical textile products was created. This questionnaire was used as the basis for an interview with the participants to collect their answers.

Data analysis was conducted using the following two techniques:

Table Method: A table with three columns was made. The response alternatives were listed in the first column, the frequency of each response was noted in the second column, and the percentage of responses was shown in the last column.

Percentile Method:

The formula $\text{Percentage} = (\text{Number of specific respondents} / \text{Total number of respondents}) \times 100$ was used to determine the percentage of particular respondents who gave a particular response.

Ethics: During the research phase, ethical guidelines were followed. Participants gave their informed consent after being assured of their privacy and confidentiality.

Group	Total no. of Respondents =60	Frequency	Percentage
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Age	Less than 18 years	1	51.7
	18-20 years	20	46.7
	Above 20 years	31	1.6
Religion	Hindu	57	95
	Sikh	2	3.4
	Muslim	1	1.6
Residency	Urban	34	56.7
	Rural	26	43.3
Marital status	Married	2	3.3
	Unmarried	58	96.7
Occupation of father	Private service	11	18.3
	Business	9	15
	Government job	9	15
	Other	31	51.7
Occupation of Mother	Private services	4	6.7
	Business	4	6.7
	Government job	4	6.7
	Housewife	48	80
Family Income per month	25000	16	26.7
	25000-50000	16	26.7
	Above 50000	28	46.7

Table 2. Sociodemographic Data of Respondents

All respondents were females, and the data in the table shows that 51.7% of the female respondents were under the age of 18, 46.7% were between the ages of 18 and 20, and the remaining female

respondents were over the age of 20. Nearly half of all respondents in this study were from urban regions, and 95% of respondents identified as Hindu. Additionally, it was disclosed that only 2% of respondents were married and that 46.7% of respondents' families made more than 50,000 Indian rupees every month.

Sr.No.	Option	Frequency	Percentage
1.	Doctor's green dress	12	20
2.	Cotton clothing	13	21.7
3.	All of the above	31	51.7
4.	Don't know	4	6.6
	Total	60	100

Table 3: Awareness about clothing material observe in hospitals

According to the survey, 20% of respondents had seen doctors wearing green coats at hospitals. Nearly half of the respondents had seen both of these goods in hospitals, and approximately 21.7% of respondents were aware of them, as opposed to 6.6% of respondents who were unaware of them.

Sr.no.	Option	Frequency	Percentage
1.	Greater absorption capacity	10	16.7
2.	Soft	9	15
3.	It is non-allergic	3	5
4.	All of the above	37	61.7
5.	Don't know	1	1.6
	Total	60	100

Table 4: On the basis of knowledge about characteristics of cotton used in medicine

The preceding table clearly shows that 81.4% of respondents acknowledged the anti-microbial characteristics of medical textiles. Respondents admitted that non-toxic and non-carcinogenic nature, respectively, by 61.6% and 3.4%. 3.3% of young women were unaware of the three common types of medical textile, compared to 61.3% of them who were aware of all the above facts.

Sr.no.	Option	Frequency	Percentage
1.	Sutures	7	11.7
2.	Artificial skin	4	6.6
3.	Eye contact lenses	2	3.3
4.	All of the above	27	45
5.	Don't know	20	33.4
	Total	60	100

Tablet 6: On the basis of knowledge about impantable medical textile products

According to the above table, 11.7% of respondents said textile products for implantable medical devices had a future. However, only 3.3% of respondents felt that contact lenses for the eyes were implantable, whereas 6.6% of respondents recognised artificial skin as implantable medical textile items. A third of respondents were unaware that these products were implantable medical textiles, but nearly half of respondents preferred them.

Sr.No.	Option	Frequency	Percentage
1.	Viscose	13	21.7
2.	Cotton	23	38.3
3.	Polyester	11	18.3
4.	Don't know	13	21.7
	Total	60	100

Table 7: On the basis of knowledge about fabric material used in caps, mask and wipes

According to the aforementioned chart, 21.7% of respondents claimed to be unaware of the existence of the viscose material used in caps, masks, and wipes. Cotton was proposed as a material for caps, masks, and wipes by 31.3% of participants, whereas polyester was preferred by 81.3%.

Sr.No.	Option	Frequency	Percentage
1.	Yes	54	90

2.	No	6	10
	Total	60	100

Table 7: On the basis of opinion about more comfortable nature of fabric Handiplast than plastic one

The above table represents that 90% of respondents were believed that fabric handiplast is more comfortable than plastic one whereas leftover denied this opinion.

Sr.no.	Option	Frequency	Percentage
1.	Sprain and Strain	22	36.7
2.	Exact compression	7	11.7
3.	Padding	7	11.7
4.	Don't know	24	40
	Total	60	100

Discussion:

It is clear from the studies mentioned above that medical textiles have significant potential to change the healthcare industry. Patients will be able to deal with their previous pain and illnesses more successfully thanks to the revised approach and contemporary medical textile materials.

- ❖ The study's key finding indicated that 61.7% of young women were aware of the properties of cotton used in medicine and 51.7% of young women were aware of the garment materials used in hospitals.
- ❖ Nearly 58.3% of survey participants knew that textiles are anti-microbial, non-toxic, and non-carcinogenic. Despite the fact that 45% of respondents were aware of the implantable nature of medical textile, 33.4% were not. 38.3% of young women knew that wipes, masks, and caps are made of cotton. According to 90% of responders, fabric handiplasts are more pleasant than plastic ones.
- ❖ Another interesting finding was that 40% of respondents were unaware of the use of light support bandages, while the remainder claimed that they provided precise compression, padding, and relief from sprains and strains. Additionally, 76.6% of respondents think that gauze bandages are used for healing wounds.
- ❖ Furthermore, 66.7% of respondents were aware of the useful uses for medical textile. In the debate between sanitary napkins and cotton clothing, 99% of young women frequently answered "yes" to favouring the sanitary napkin, and 71.6% of young girls were aware of all the reasons for doing so.

- ❖ When asked about their preference for menstrual products, 88.4% said they preferred sanitary napkins, whereas only 1.6% of young women said they preferred tampons. Ultimately, 70% of respondents were aware of the benefits of using diapers for kids, which include being hygienic, comfy, and non-allergenic.
- ❖ This leads to the conclusion that more than 50% of respondents were aware of medical textile products, and 90% of young girls were also aware of the significance of medical textile items (such as sanitary napkins during menstruation to keep them clean and hygienic).

Conclusion:

Medical textiles are now an essential component of contemporary healthcare, making a substantial contribution to patient safety, wound care, surgical operations, and infection control. These specialised fabrics continue to progress healthcare practises due to their wide range of uses and intrinsic advantages. They provide better patient comfort, better treatment results, and an essential line of defence against infectious infections. Medical textiles will continue to play a crucial role in raising healthcare standards and enhancing the general wellbeing of patients and healthcare professionals in the future, according to the continuous research and innovation in this field.

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