



## Health Care Textile Products using Antibacterial Herbal Finish

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### ABSTRACT

An important and growing part of the textile Industry is the medical and related healthcare and hygiene sectors. The number of applications range from the simple cleaning wipe to the advanced barrier fabrics used for operating rooms. This paper reviews the healthcare and hygiene products used and required by consumers extensively today. The preferences of experts was sought to select healthcare and hygiene textile products to be developed using antimicrobial finish. The products selected from hygiene/utility textile articles category were multipurpose wipes and apron, from textile articles used for cleaning purposes were kitchen napkin and hand towel and from medical textiles category were mask and head cover. A total of thirty designs *i.e.* five designs for each selected article were created and the top ranked design of each article was selected for product development using herbal finished fabric. Cotton woven fabric was selected for development of multipurpose wipes, apron, kitchen napkin and head cover whereas cotton knitted fabric was selected for hand towel and face mask.

**Key Words:** Cotton, healthcare, hygiene, medical, textile products.

### INTRODUCTION

An important and growing part of the textile Industry is the medical and related healthcare and hygiene sectors. Textile has always been a part of healthcare. The range of products available is vast but typically they are used in the operating room theatre or on the hospital ward for the hygiene, care and safety of staff and patients (Meena *et al*, 2021). The number of applications range from the simple cleaning wipe to the advanced barrier fabrics used for operating rooms (Desai, 2020). The healthcare and hygiene textile products can be organized into different categories *i.e.* patient specific, general management and occasion specific (Spagnolo *et al*, 2013). The textile products includes wide varieties of items like towel, napkin, apron, sponges, sheets, under-pads, diapers, wipes sterilization wrap, surgical gowns, drapes, table covers, face masks, head and shoe covers. etc.

Natural textiles are sources of unwanted microbes. Sweat, dirt and dust present in natural textile fibres (cellulosic and protein) create conducive environment for microbes to grow in millions (Tang *et al*, 2017). Textile fibres having microbes can

contaminate users and give rise to many diseases (Ravindra *et al*, 2010). Many bacteria populations double every 20–30 minutes at 36–40 deg.C and pH 5–9. A single bacteria cell can increase to 1 million cells in 7 hr. Hence, to avoid contamination of users and to avoid bad odour, one should apply an antimicrobial finish for textiles (Czajkowski and Paluszkiwicz, 2008).

There are lots of benefits of using antimicrobial finish in textiles that includes improve fabric strength, protects against generation of unpleasant odour, protects the fabric from discolouration, protects the fabric from stain, reduce chances of user contamination (Anonymous, 2021).

### MATERIALS AND METHODS

#### Selection of products

For selection of products an exhaustive list of hygiene/utility textile articles, textile articles used for cleaning purposes and medical textile articles was prepared. Preferential choice index was developed and preferences of thirty experts were obtained on three point rating scale *i.e.* highly preferred, preferred and least preferred scoring 3, 2 and 1, respectively. Weighted mean scores were calculated and on the basis

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of scores obtained, rank was assigned to each article. Total six articles i.e. top ranked two articles from each category were selected for development of products using herbal finished fabric.

**Creation of designs for selected products**

For creation of designs, scaled outline of desired shapes with constructional feature for each article were drawn with the help of CorelDRAW-12 software. Various software tools for enlargement/reduction of size, transformation, modification, rotation, editing were used until required shapes/designs were obtained. A total of thirty designs i.e. five designs for each selected article were prepared.

**Selection of designs for article development**

To select the designs for development of selected articles, preferences of thirty experts were sought on three point rating scale using developed preferential choice index. On the basis of scores obtained, rank was assigned to each design. The top ranked design of each article was selected for product development using herbal finished fabric.

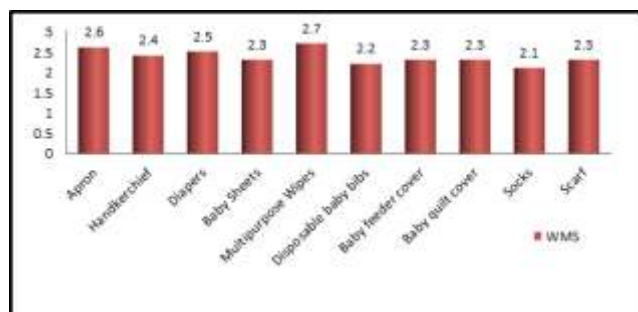
**Selection of fabric**

Suitable fabrics for development of selected articles were selected as per experts' preferences. Percentage was calculated on the basis of frequency.

**RESULTS AND DISCUSSION**

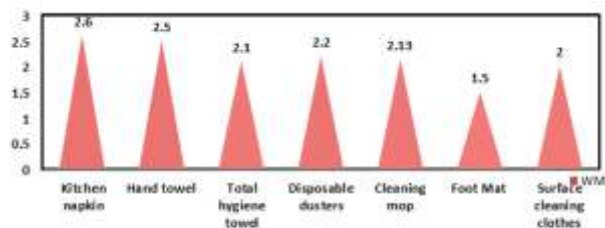
**Selection of products**

An exhaustive list of hygiene/utility textile articles, textile articles used for cleaning purposes and medical textile articles was prepared for selection of products. Total six articles i.e. top ranked two articles from each category were selected on the basis of preferences of thirty experts for development of products with antimicrobial finish.



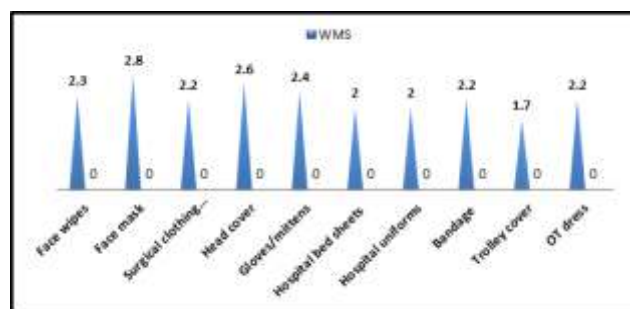
**Fig. 1 Preferential choices for hygiene/utility textile articles (n=30)**

The data pertaining to preferences of experts for hygiene/utility textile articles in Figure1 highlight that multipurpose wipes got I rank by scoring highest (WMS 2.7) and apron (WMS 2.6) ranked II. The preferences of experts for rest of the articles in descending order were diapers (WMS 2.5), handkerchief (WMS 2.4), baby sheets (WMS 2.3), baby feeder cover (WMS 2.3), baby quilt cover (WMS 2.3), scarf (WMS 2.3) and bibs (WMS 2.2). Socks was the least preferred hygiene/ utility article that scored 2.1 weighted mean score and ranked X.



**Fig2: Preferential choices for textile articles used for cleaning purposes (n=30)**

The data presented in Figure 2 elucidate that for textiles articles used for cleaning purposes, kitchen napkin was preferred most by scoring WMS 2.6 and ranked I followed by hand towel (WMS 2.5) ranked II and disposable dusters which obtained WMS 2.2 ranked III. The other products preferred by experts in declining trend were cleaning mops (WMS 2.13), total hygiene towel (WMS 2.1) and surface cleaning clothes (WMS 2.0) The least preferred product in cleaning category was foot mat which with WMS 1.5 ranked VII.



**Fig3: Preferential choices for medical textile articles (n=30)**

The data depicted in Figure3 reveal that from medical textiles articles category, mask scored highest with weighted mean score 2.8 and ranked I followed by head cover (WMS 2.6) ranked II and gloves/ mittens

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ranked III by scoring WMS 2.4. The other articles obtained descending order of preferences as face wipes (WMS 2.3), surgical clothing gowns (WMS 2.2), bandage (WMS 2.2), OT dress (WMS 2.2), hospital bed sheets and pillows (WMS 2.0) and hospital uniform (WMS 2.0). Trolley cover was the least preferred medical textile article that scored 1.7 weighted mean score and ranked IX.

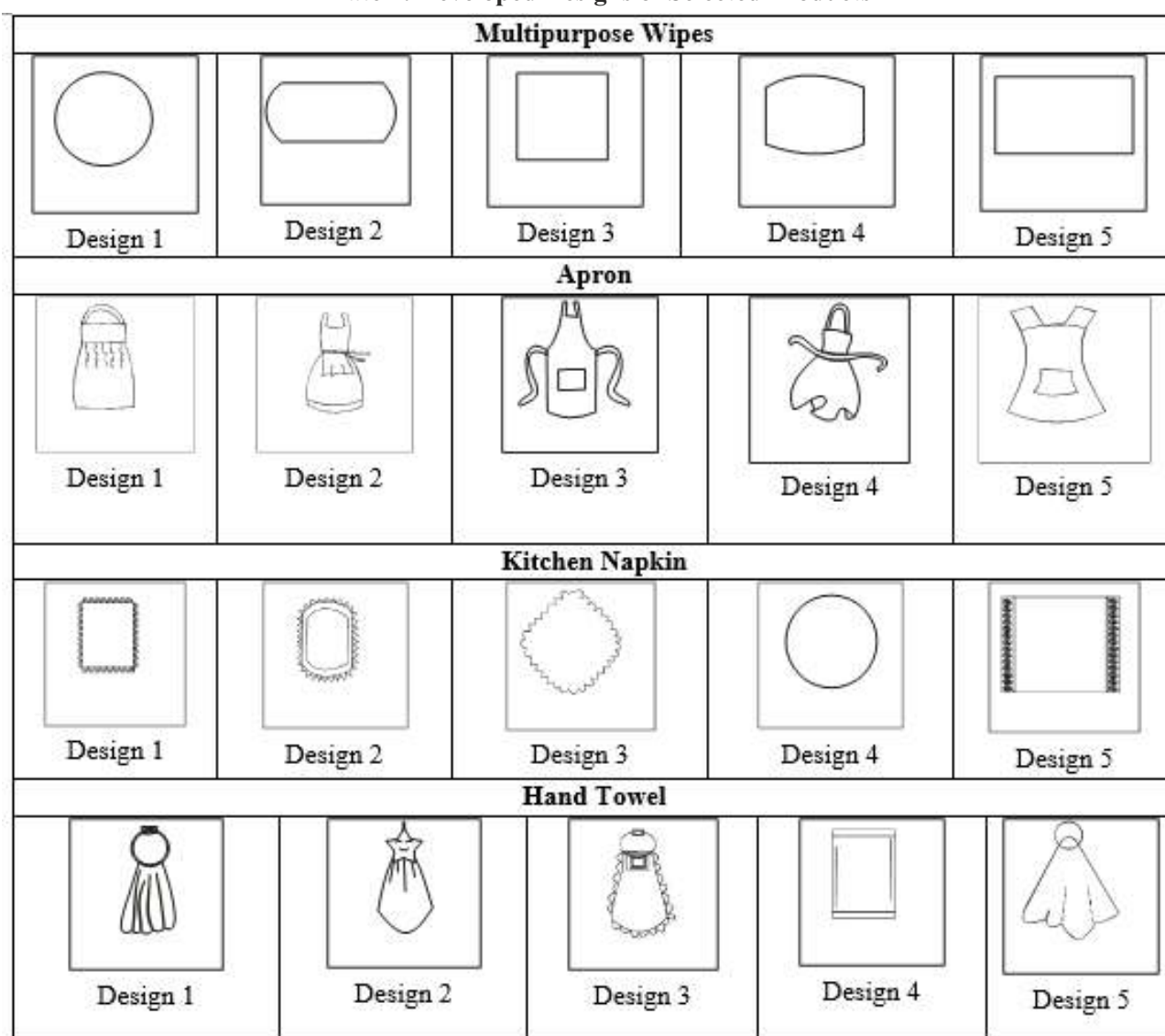
Thus, a total of six products i.e. two from each category were selected as per the preferences of experts from the listed products of hygiene/utility textile

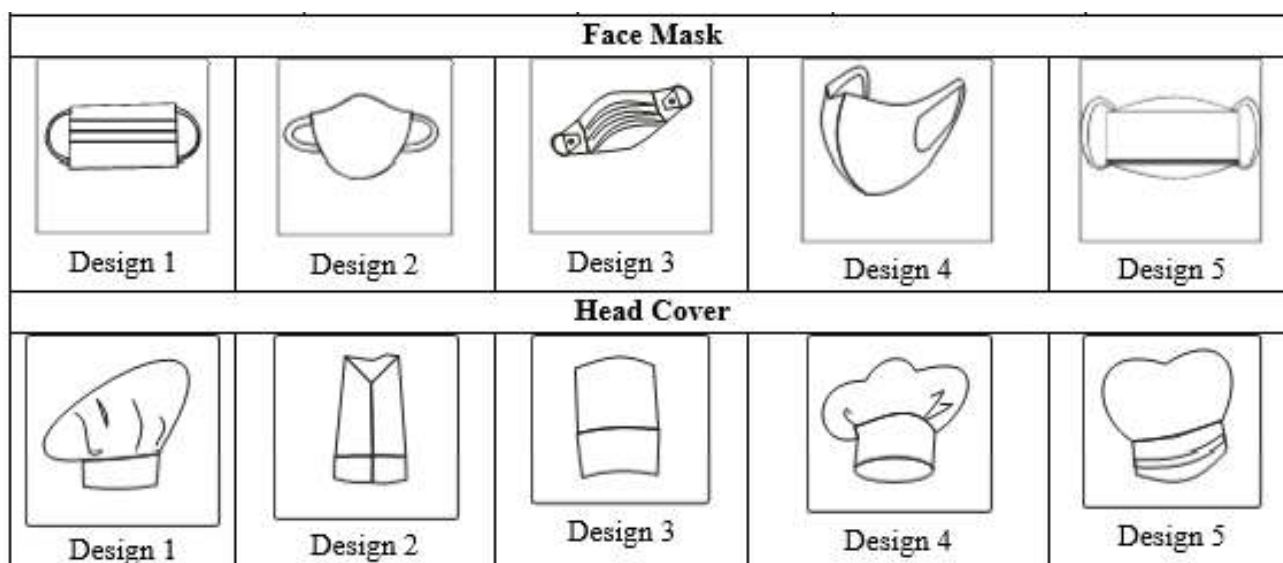
articles, textile articles used for cleaning purposes and medical textiles for product development using herbal finished fabric. The products selected from hygiene textile articles category were multipurpose wipes and apron, from textile articles used for cleaning purposes were kitchen napkin and hand towel and from medical textiles category were mask and head cover.

### Creation of designs for selected products

The designs were created using CorelDRAW-12 software. A total of thirty designs i.e. five designs for each selected article were created.

**Plate 1: Developed Designs of Selected Products**





**Selection of designs for article development:**

Five designs for each selected article were developed using Corel DRAW 12 software and illustrated in Plate 1. From developed thirty designs,

top preferred one design of each article was selected on the basis of experts' preferences for the development of products and the data are presented in Tables 8 to 10.

**Table 1: Preferential choices of developed designs for hygiene/ utility textile articles**

Design	Articles			
	Multipurpose wipes		Apron	
	WMS	Rank	WMS	Rank
1	2.56	II	2.36	III
2	2.26	III	2.46	II
3	2.20	IV	2.50	I
4	2.10	V	2.13	V
5	2.63	I	2.16	IV

The data presented in Table 1 regarding preferential choices of developed designs for hygiene/utility textile articles reveal that amongst all the developed designs the most preferred design for multipurpose wipes was design number 5 scoring highest weighted mean score 2.63 and ranked I followed by design number 1 ranked II scoring 2.56. The design number 2 (WMS 2.26), 3 (WMS 2.20) and 4 (WMS 2.10) got III, IV and V rank, respectively.

For apron, the most preferred design was design number 3 scoring highest weighted mean score

2.50 and ranked I followed by design number 2 ranked II scoring 2.46. The other developed designs preferred in descending order were design number 1 (WMS 2.36) rank III, design number 5 (WMS 2.16) rank IV and design number 4 with lowest weighted mean score (2.13) was ranked V.

Thus, it is inferred that design number 5 for multipurpose wipes and design number 3 for apron were top preferred designs which were selected for development of textile articles.

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**Table 2: Preferential choices of developed designs for textile products used for cleaning purposes (n=30)**

Design	Products			
	Kitchen napkin		Hand towel	
	WMS	Rank	WMS	Rank
1	2.63	II	2.63	I
2	1.46	V	2.20	V
3	2.13	III	2.53	II
4	2.06	IV	2.33	IV
5	2.73	I	2.43	III

The data pertaining to preferences of experts for designs of textile products used for cleaning purposes presented in Table 2 highlight that amongst all the developed designs for kitchen napkin, design number 5 scored the highest weighted mean score 2.73 and rank I followed by design number 1 at rank II with weighted mean score 2.63. The design number 3 (WMS 2.13), 4 (WMS 2.06) and 2 (WMS 1.46) got III, IV and V rank, respectively.

For hand towel, design number 1 was most preferred (WMS 2.63) by the experts which obtained

rank I followed by design number 3 which obtained ranked II with weighted mean score 2.53. The other developed designs preferred in descending order were design number 5 (WMS 2.43) rank III, design number 4 (WMS 2.33) rank IV and design number 2 with the lowest weighted mean score (2.20) was ranked V.

Thus, it is inferred that design number 5 for kitchen napkin and design number 1 for hand towel were top preferred designs which were selected for development of selected articles.

**Table3: Preferential choices of developed designs for medical textile articles (n=30)**

Design	Products			
	Face m ask		Head cover	
	WMS	Rank	WMS	Rank
1	2.26	IV	2.53	II
2	2.53	II	1.86	V
3	2.43	III	2.20	IV
4	2.70	I	2.63	I
5	2.13	V	2.30	III

The data presented in Table 3 elucidate that for designs created for medical textile articles, design number 4 was most favored for mask by scoring highest weighted mean score 2.70 and rank I followed by design number 2 at rank II with weighted mean score 2.53. The design number 3, 2 and 5 got III (WMS 2.43), IV (WMS 2.26) and V (WMS 2.13) rank, respectively.

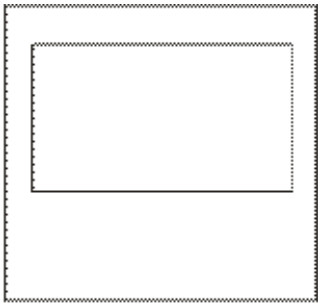

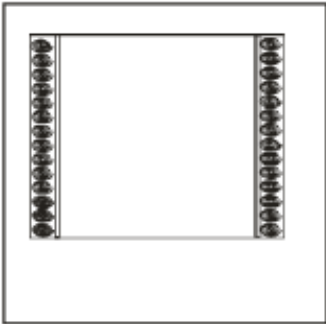



For head cover, design number 4 was most preferred (WMS 2.63) by the experts which obtained rank I followed by design number 1 which obtained

ranked II with weighted mean score 2.53. The other developed designs preferred in descending order were design number 5 (WMS 2.30) rank III, design number 3 (WMS 2.20) rank IV and design number 2 with the lowest weighted mean score (1.86) was ranked V.

Thus, it is inferred that design number 4 for face mask and head cover were top preferred designs which were selected for development of selected articles.



Plate 4: Selected Designs for Development of Products with Antimicrobial Finish

Hygiene/ Utility Textile Articles	
 <p>Multipurpose Wipes Design 5</p>	 <p>Apron Design 3</p>
Textile Products used for Cleaning Purposes	
 <p>Kitchen Napkin Design 5</p>	 <p>Hand Towel Design 1</p>
Medical Textiles	
 <p>Face Mask Design 4</p>	 <p>Head Cover Design 4</p>

**Fabric Selection for Selected Products:** Suitable fabrics for development of selected articles were selected as per experts' preferences.

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**Table 4: Preferential choices for selection of suitable fabric for product development**

n=30

S. No.	Articles	Cotton woven F (%)	Cotton knitted F (%)	Cotton blend F (%)	Non woven F (%)
<b>Hygiene/ utility textile articles</b>					
1.	Multipurpose wipes	12 (40)	9 (30)	3 (10)	6(20)
2	Apron	21 (70)	3 (10)	6 (20)	-
<b>Textile articles used for cleaning purposes</b>					
1.	Kitchen napkin	24 (80)	3 (10)	3 (10)	-
2.	Hand towel	9 (30)	18 (60)	3 (10)	-
<b>Medical textile articles</b>					
1.	Mask	9 (30)	18 (60)	3 (10)	-
2.	Head cover	21 (70)	3 (10)	3 (10)	3 (10)

The data in Table 4 pertaining to preferences of experts for selection of fabric for development of hygiene/ utility textile articles show that 40 percent of the experts preferred cotton woven fabric followed by cotton knitted (30 %), nonwoven (20 %) and cotton blend (10 %) for wipes. Majority of experts preferred cotton woven fabric (70 %) followed by cotton blend (20 %) and cotton knitted (10 %) for apron.

The preferences of experts for selection of fabric for development of cleaning textile articles show that majority of experts preferred cotton woven fabric (80 %) followed by cotton knitted (10 %) and cotton blend (10 %) for kitchen napkin. Most of the experts preferred cotton knitted fabric (60 %) followed by cotton woven (30 %) and cotton blend (10 %) for hand towel.

It can be inferred from the data that for development of medical textile articles, majority of experts preferred cotton knitted fabric (60 %) followed by cotton woven (30 %) and cotton blend (10 %) for face mask. Majority of experts' preferred cotton woven fabric (70%) followed by cotton knitted (10 %), cotton blend (10%) and non woven (10 %) for head cover.

### CONCLUSION

Health care and hygiene textile products are not directly used in medical treatment but are used for healthcare and good hygiene applications. These textile products help to improve people's lives and in some cases transform them. Hence, the products selected for product development using herbal finished fabric were multipurpose wipes, apron, kitchen napkin, hand towel, mask and head cover. A total of thirty designs *i.e.* five designs for each selected article were created and the top ranked design of each article was selected for product development using herbal finished fabric. Cotton woven fabric was selected for development of multipurpose wipes, apron, kitchen napkin and head cover whereas cotton knitted fabric was selected for hand towel and face mask.

### REFERENCES

- Anonymous(2021). *Antimicrobial For Textile Industry*. Retrieved from <https://www.versatiletextiles.com/antimicrobial/versatile-antimicrobial-agent-vam-for-textile-industry/> on 18 October, 2021.
- Czajkowski W and Paluszkiwicz J (2008). Synthesis of bifunctional monochlorotriazine reactive dyes increasing UV protection properties of cotton fabrics. *Fibres Text East Eur* 16:122–126.
- Desai A A (2021). Medical Textiles: Healthcare And Hygiene Products. Retrieved from file:///H:/research%202021/Experiment%20on%20antimicrobial%20mask/new%20references/Medical%20Textiles\_%20Healthcare%20And%20Hygiene%20Products%20-%20Fibre2Fashion.html on 12 October, 2021.
- Meena C R, Ajmera N and Sabat P K(2021). Medical textiles. Retrieved from <https://www.technicaltextile.net/articles/medical-textiles-2587> on 16 October, 2021.
- Ravindra S, Mohan Y M, Reddy N N and Raju K M (2010). Fabrication of antibacterial cotton fibres loaded with silver nanoparticles via "Green Approach." *Colloids Surf A* 367:31–40.
- Spagnolo A M, Ottria G, Amicizia D, Perdelli F and Cristina M L( 2013). Operating theatre quality and prevention of surgical site infections. *J Prevent Med and Hygiene* 54(3): 131–137.
- Tang B, Lin X, Zou F, Fan Y, Li D, Zhou J, Chen W and Wang X (2017). In situ synthesis of gold nanoparticles on cotton fabric for multifunctional applications. *Cellulose* 24:4547–4560.

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