

Development of Intimate Hygiene Product

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Abstract: Absorbent hygiene products like napkins, wipes, feminine hygiene products are life necessities. Since these products have direct contact with the skin, it concerns skin health. Nursing pads are one of the feminine hygiene products which are generally used by nursing mothers to prevent staining of clothing and decreases skin irritation caused by leaking of milk. The aim of this study is to design and develop a prototype of a durable multi-layered reusable nursing pad which also serves as a panty liner in a different shape. Natural fibers like kenaf, jute, hemp is blended with cotton in various proportions and are used as raw material for the production of absorbent layers. Water absorbency, air permeability, and handle properties of the developed convertible pad are tested and determined.

Keywords: absorbent, convertible, fiber, hygiene, intimate.

1. Introduction

The Intimate hygiene products which are used with direct contact with the human body are a life necessity. There are a wide variety of hygiene products which serve a unique purpose. The use and awareness of these products is increasing in both developed and developing countries worldwide. Therefore, this area of the market is increasing and competitive.

Nursing pads also called breast pads are a very useful accessory to new breastfeeding mothers. Since leaking is common in the early days of breastfeeding, nursing pads are placed inside the bra to prevent further leakage to avoid the contamination of clothes. While considering the key features of nursing pads, it can prevent dryness and itching in the nipple area.

Panty Liners line up in the list of menstrual hygiene products. Panty liners also serve an equal importance in the intimate hygiene which is used regularly by the women of this era to keep them fresh and comfortable all day long. A panty liner is an ultra-thin and soft product which is also helpful to women to meet their unexpected and irregular periods.

The diversity of nursing pads and panty liners and the absence of data on their effectiveness led us to generate the idea of developing a reusable product which serves as a nursing pad that can be converted to a thin panty liner.

Selection of fibers and textile materials plays an important role in the development of hygiene products. The impact of textile waste on the environment has been a major concern today and to curb this concern is to focus on making a product that has a low carbon footprint which is totally made up of biodegradable natural fibers like jute and cotton. Jute is a long,

soft, shiny vegetable fiber that can be spun into core's strong thread which is most affordable and easily available. Jute fibers can be woven to a thin soft sheet of fabric which absorbs moisture and carbon dioxide neutral. It is highly absorbent and absorbs moisture readily.

2. Literature Review

[1] Afi Agbaku et al (2020) studied the properties of jute plant which is a biodegradable material used in making sanitary pads for sustainable development. They have worked on providing low-cost sanitary napkins which is affordable by everyone. They have developed a jute sanitary napkin with the following specifications. The top sheet (Acquisition Layer-perforated film, polypropylene), the absorbent core (Absorbent core, SAP + Wood Pulp), Barrier sheet (Barrier Sheet, Polyethylene), with 70 % of jute, 20% cotton and 10% of other fiber materials.

[2] Nilgun Ozdil et al (2016) have done a comparative study on absorbent layers of Disposable nursing pads produced from new generation fibers. Mixtures of bamboo viscose, soybean, seaweed-embedded cellulose, and silver fibers with cotton fibers were used as raw materials for the production of absorbent layers. Water absorbency, air permeability, and handle properties of the fibers and blends, and antibacterial activity of the raw materials and silver-added absorbent layer were determined.

[3] Barman et al (2017) studied natural and sustainable Raw materials for Sanitary napkins that discusses the properties of fibers as follows. Bamboo absorbs and wicks water 3-4 times better than cotton and reduces odor as the fiber is filled with multiple micro-holes and micro-gaps Jute is one of the best replacements for cotton, with 65-70% cellulose content and high-water affinity.

[4] Tharakeswari. S et al (2021) have developed Eco-friendly Herbal Sanitary Napkins using Cotton and Kenaf Fibers which concludes the absorbency percentage is highest for the combination of cotton-kenaf fibers which is 38% higher than the commercial napkin.

[5] Bo Runeman et al (2003) have studied and discussed the Vulva Skin Microclimate: Influence of Panty Liners on Temperature, Humidity and pH which concludes the mean skin temperature when the women were wearing a conventional panty liner (with a non-breathable back sheet) - 35.9 degrees C, 34.4 degrees C -no panty 34.5 degrees C - breathable (i.e., vapor

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permeable) back sheet.

[6] Roberta J. et al (2016) have elaborated the use, effectiveness and function of nursing pad which concludes, the majority of mothers surveyed used a new disposable breast pad made by Johnson & Johnson. The experimental studies showed that this pad allowed no leaking and kept the breast markedly drier than other disposables. Exclusive use of these pads or cotton toweling pads did not produce a detectable increase in nipple problems.

[7] Barbara C. Wallace, et al (1998) and studied Managing Milk Leakage in Breastfeeding Women: and compared A Clinical Trial Evaluating a Polyvinyl Chloride Device to a Disposable Nursing Pads where a Clinical trial was to evaluate the effectiveness and to investigate possible problems associated with the use of a polyvinyl chloride (PVC) device ("blis") compared to a disposable nursing pad.

[8] A. Das et al (2007) have developed a high-absorbent light-weight sanitary napkin which concludes, the SAF/viscose blended carded webs were sandwiched between two layers of nonwoven fabric to integrate and encapsulate it. The prepared napkin samples showed significantly better rates of absorption for saline solution.

3. Procedure

A. Methodology

To develop a two-purpose pad, research is carried out on the similar products available in the market and analysis on the pros and cons of the existing products are determined and also studied the recent innovations in similar products. The fabric and fiber specification of the nursing pads and panty liner are determined. Selected the appropriate fibers and developed a pad with the convertible heart shape as two samples. Where sample 1 is made of three different layers which is cotton fabric on top and bottom layers and thin jute fabric as absorbent core. Sample 2 is developed with 4 layers where the top and bottom layers are cotton and the middle layer, the absorbent core, is a combination of jute and cotton fiber. Sample 3 is made of pure cotton purchased from the market. These three samples were subjected to absorbency, comfort and ph test.

B. Prototype development

A sample pattern is made in a fourfold sheet as the shape is of height 4 inch in step 1 and cut and opened which gives a flower shape as step 2 represents and folded like a panty liner which is represented in step 3.

Sample 1:

TOP LAYER: Cotton fabric

MIDDLE LAYER: Jute fabric

BOTTOM LAYER: Cotton fabric

The fabrics with the above-mentioned specification are chosen and traced and cut out with the help of the developed pattern and sewn as a sandwich. The sewn three pieces of fabrics are turned inside out where the layers follow the order mentioned above appropriately. A top stitch is given which perfectly defines the shape of the pad and makes the pad even thinner.

Sample 2:

TOP LAYER: Cotton fabric

MIDDLE LAYER: Jute and cotton blend fabric

BOTTOM LAYER: Cotton fabric

The sample 2 is prepared in the same way as of sample 1 where a layer of cotton and jute blended fabric is added in the absorbent core.

Sample 3:

TOP LAYER: Cotton fabric

MIDDLE LAYER: cotton fabric

BOTTOM LAYER: Cotton fabric

A three-layer fabric cotton panty liner available in the market is purchased for the testing purpose.

Table 1 shows the fabric specification of cotton fabric and Table 2 shows the fabric specification of jute fabric.

Table 1
Fabric specification

Weave type	Plain weave
GSM	80
EPI	14
PPI	12

Table 2
Specification of jute fabric

Weave type	Self-stitched double cloth
GSM	130
EPI	13
PPI	12

Fig. 1 shows the developed nursing pad which is unfolded that can be converted to a panty liner as shown in fig. 2.



Fig. 1. Unfolded nursing pad



Fig. 2. Convertible panty liner

C. Testing

1) Tear Strength

Tear strength and tensile strength were considered important factors in this study because tear resistance (or tear strength) is a measure of how well a material can withstand the effects of tearing, whereas tensile strength is a measurement of the force required to pull something to the point where it breaks. The standard test method measures the resistance to the formation and expansion of a tear. The sample is held between two holders and a uniform pulling force is applied until deformation occurs. Force applied is divided by the thickness of the material to calculate the tear resistance.

- Jute fabric was taken.
- Warp and weft direction of the fabric was identified.
- Two strips were cut from the fabric in both directions having dimensions of 100 x 63.5 mm.
- The sample was then fixed in the jaws of the tearing tester.
- A cut of 20mm was made along the width of the fabric using the cutter in the tearing tester.
- By using falling pendulum of the tearing tester the fabric was tear and the readings were noted from the Elmendorf's tester's scale.

Observations & Calculations:

Fabric type:

Fabric = 100% jute

Count of yarn used in the fabric = 60 Ne

Weave Design = Self stitched double cloth

Warp yarn = Sized

Table 3 represents Weft-wise fabric Tear strength.

Table 4 represents Warp-wise fabric Tear strength.

The tear strength of jute fabric in both directions is concluded from the table as follows Weft-wise tear strength = 1575 Kg, Warp-wise tear strength = 2570 Kg.

Table 3
Weft-wise fabric tear strength

Sample number	Tear strength(g)
1	1600
2	1800
3	1400
4	1500
Mean value	1575

Table 4
Warp-wise fabric tear strength

Sample number	Tear strength(g)
1	2560
2	2360
3	2760
4	2600
Mean value	2570

2) Absorbency

The absorbency % is the total amount of fluid a pad can absorb till the point of leakage. Dry weight of the pad was recorded and laid on a flat level glass plate, so that the underside of the pad is visible. On the center of the pad water was added drop by drop slowly using a syringe. The liquid was dropped till the pad has absorbed the maximum amount of liquid and has started to leak and this will be the end point of the pad. The absorbency% was calculated and recorded.

$$\text{Absorbency \%} = \frac{\text{FW}-\text{IW}}{\text{IW}} * 100$$

Table 5 shows the reading of this test.

Table 5
Absorbency test

Sample	Absorbency %
Sample 1	330.85
Sample 2	388.85
Sample 3	381.74

4. Conclusion

Jute fibers proved to be a good alternative for cotton and can be effectively used and easily adaptable by everyone. Jute fiber in combination with cotton fiber provided added advantage in panty liner. Jute possesses inherent properties such as good absorbency which can be beneficial to the absorbent core in combination with cotton fibers which results in higher efficacy of the produced two purpose hygiene pad. The modified shape of the panty liner could be easily accessible and convertible to a nursing pad with 12 layers which is three times higher than the available nursing pads.

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