

BIODEGRADABLE AND REUSABLE CLOTH PADS

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ABSTRACT

The biodegradable cloth pads originated with the view on sustainable product development. The layers of sanitary napkins are studied in detail and materials used in each layer were discussed. The design is drafted with the existing model of sanitary napkin. Various fibre selection and replacement for the existing fibre is also discussed. The various layers used in the napkin and the type of fibres used in the napkin are also written in this paper. Various non-bio-degradable napkins are used in the market but, that pollute the environment. The use of reusable napkin may reduce the environmental pollution. This paper explains the various layers of napkin and the fibres used in the napkin.

Keywords: Napkin, Reuse, Pads, Sanitary, Hygiene, Absorbent, Cotton, Biodegradable.

I. INTRODUCTION

Currently, the world is facing a big problem of the carbon footprint on feminine hygiene products. As there is a huge amount of non-biodegradable materials dumped in landfill, which releases harmful gases into the atmosphere. A sanitary napkin takes about 500 to 800 years for degradation. They are not properly disposed so they are the main reasons for landfills. In urban areas they are disposed of by throwing them into the garbage or by flushing in toilets. Rural people are disposing by means of burying into the land or by incineration. In sanitary pads not only cotton fibre is used, to increase the absorbency synthetic fibres such as rayon and super absorbent polymer is also used. In addition to that deodorants are also used. They release dioxin which causes cervical cancer and other skin problems. Short term exposure to dioxin causes darkening of skin and altered liver functions. Prolonged use of sanitary napkins also causes infertility and ovarian cancer by the growth of bacteria in the vagina. The various sanitary options available are cloth pads, tampons, menstrual cups, interlabial pads, etc. The super absorbent polymer used in the sanitary napkin causes landfills and also contamination of water. Some people are not disposing these sanitary wastes properly. They are disposing by flushing them into toilets. Rural people dispose them by the process of incineration. But the incineration is preferred only for the napkins which do not contain super absorbent polymer. If these wastes are not disposed properly, then many pathogenic bacteria will grow on them. In India, 200 tonnes of sanitary wastes are disposed daily. In order to reduce the wastes on the environment and also to protect the health of women, reusable cloth pads are suggested to be use. They cause no harmful effects as they are made from the fabric. They do not need any super absorbent polymer and no deodorants. They are environmentally friendly as they can be washed and reused again. Femine hygiene is the most important consideration in the point of view of the health and also the products used for femine hygiene is also important consideration in the textile point of view. The various sanitary protection options available are [1-4]

- Conventional sanitary napkins
- Reusable cloth pads
- Menstrual cups
- Tampons
- Interlabial pads
- Period underpants

SANITARY NAPKINS

Top Layer

The function of the top layer is to absorb the blood and transfer the blood to the absorbent layers. This layer should have perforation to allow the blood to pass to the absorbent layer. Conventionally polypropylene fibres are used as top sheet. Normally thermoplastic fibres are preferred to use along with the small amount of hydrophilic fibres to absorb the blood and also to provide a dry top surface. The top surface has to dry because this layer will be in contact with the skin. If it is wet, it will give unpleasant feel to the wearer. As the

thermoplastic fibres and polypropylene fibres are harmful for health issues point of view, it is suggested to use the organic cotton. They are cultivated in land without the use of any fertilizer or pesticides. This organic cotton gives good comfort, absorbency and more breathability. It is very soft and it does not create any skin irritation or allergy. So it is mostly preferred to use as a top sheet. Another material preferred for top sheet is the TENCEL. It is biodegradable and has an excellent wicking property. The wicking property makes the top sheet to be maintained in the dry state [5-7].

Absorbent Core Layer

Absorbent layer main function is to absorb all the blood and holding it. This layer absorbs all the blood and distribute that to all the nook and corner of the pad. Non woven fabrics that are thermally bonded or air laid nonwovens are mostly used. Regenerated fibres such as rayon are used along with the super absorbent polymer which is sodium polyacrylate. The use of super absorbent polymer is to absorb the blood and convert the blood into a gel like state. After gel like state is achieved, the blood will not be taken back. For absorbent core layers, instead of using rayon and superabsorbent polymer bamboo fibres are suggested to use. Bamboo fibres are naturally more absorbent than cotton. They absorb more than the cotton fibre absorbs the liquid. Bamboo is also having anti-microbial properties naturally. So they can be used as a core layer as it protects them from the pathogenic micro organisms. Some sanitary napkin producers are now using banana fibres as an absorbent core in the sanitary napkins. Banana fibres are naturally produced and are biodegradable. Banana fibres are also naturally more absorbent. The main reason for their absorbency is due to their porous structure. It is also found that flax is also used as an absorbent core in the sanitary pads. Flax is cheaper than the cotton. It is also naturally more absorbent and their absorbency can be improved by the process of scouring and bleaching. Antimicrobial property can also be given by treating the fibre with the aloe vera gel extract. Instead of using synthetic super absorbent polymer such as sodium polyacrylate, sodium hydroxyl methyl cellulose or hydroxyl ethyl cellulose are preferred to use. They are produced by treating the cellulose with chloroacetic acid. It has good water retention properties. Its function is similar to the synthetic super absorbent polymer such as sodium polyacrylates [8].

Barrier Layer

Barrier layer, as the name indicates that it restricts the blood from leakage which may further causes stain on the fabric. Mostly polyethylene films are used as barrier layer as it does not allow the blood to penetrate. Polyethylene film is made from synthetic film which is not biodegradable material. This material cannot be decomposed by the bacteria. This may causes landfill and creates pollution to the environment [9].

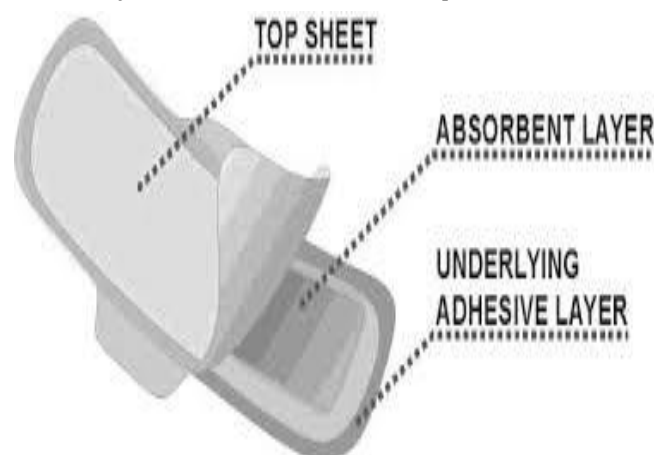


Figure 1 Layers of sanitary napkin

Menstrual Cups

Menstrual cups are nothing but an option available for female hygiene. It is a funnel shaped sanitary product made up of rubber and medical grade silicon. It is used to collect the menstrual blood. sanitary napkin and cloth pad are used externally where a menstrual cup is used internally. It is folded and inserted into the vagina. The menstrual cups can hold up to 15 to 30 ml of blood. The menstrual cups are available in two sizes. The shorter cups are designed for younger women and the larger cups are designed for the women who have babies. It is

not that easy to use menstrual cup. Before selecting the menstrual cup, women have to know about their flow, appearance of the cup and also the size of the stem [10,11].

Tampons: Tampons are one of the sanitary protection options that are designed for them internally. They are cheaper compared to the menstrual cups. It is a cylindrical shaped material made by using cotton. They are available in the various forms according to light, medium or heavy flow.

Interlabial Pads: Interlabial pads are more or less like a leaf shaped cloth. It holds up to 2 to 5 ml of blood. It is placed in the labia that are at the either side of vagina so it is named as interlabial pads. They are also a fabric made mostly from cotton. This is not internally worn as tampons or menstrual cups. So this may not give any uncomfortable feel for the wearer as they are worn externally. They can be worn along with the pad. This helps in preventing the channelling. Channelling means when the wings of the pads are too wide, it may tends to move inwards and causes bunching effect [12-14].

CLOTH PADS

Natural Fibre : Natural fibres are available from the sources of plants and animals. Fabrics made out of cotton fibre are more widely used. Cotton is more absorbent, gives a cooler feeling, much comfortable and also more breathable. But when the fabric made out of cotton fibre is used in the top layer it gives a wetter feeling as it holds some of the blood. But at the same time it gives a cooler and more comfortable feel compared to fabrics made from synthetic fibres [15].

Synthetics Fibre : These fabrics are used in the top layer as it makes dry on the top layer. Because these fabrics are not able to hold the blood on the fabric. The blood on the top sheet is penetrated to the core making the top layer dry. Backing layer is used to make a barrier and to prevent the flow of blood [16].

Layers of Cloth Pads: Similarly like the sanitary napkins, the cloth pads made from the fabric also has several layers. They are, Topper fabric, Absorbent core fabric, and Backing fabric. Topper fabric is the first layer of the cloth pad. It will absorb the blood and transfer it to the core layer. The core fabrics are bulkier as it holds most of the blood. Backing fabric is a barrier layer as it should prevent leakage of blood. There are many natural and synthetic fabrics are used in the cloth pads to give comfort and protection [16].

Topper Fabric: Topper fabric is the very first layer of the fabric in the cloth pads. There are some parameters that need to be considered while selecting the topper fabric. They are, It should hold the blood, It should have wet surface, It should be comfortable, It should be super soft as it in contact with the skin, It should be a open fabric to transfer blood to the core. Fabric used as topper in conventionally available cloth pads are, Cotton flannel, Knitted cotton, Quilters cotton, Cotton velour, Bamboo velour, Wicking jersey, Minky. A tightly woven cotton fabric does not have proper wicking property and also causes stain on the fabric. So cotton flannel which is loosely woven is preferred to use as a topper fabric. As it is an open width fabric it has good wicking property. Also this cotton flannel is more breathable and allows the blood to pass through the core of the pad easily. Cotton velour and bamboo velour is a fabric that has good absorbency and it has a velvet like appearance. Cotton knitted fabric has better absorbency than the cotton woven fabric. So this is also preferred to use as a layer in the cloth pad. Wicking jersey is a polyester material which is known for its dry property. So it also preferred to give a dry surface on the topper fabric. Compared to cotton fabric, polyester fabric like minky is completely resistant to stain. So it is mostly preferred to use as a topper fabric. But compared to polyester cotton fabric is more comfortable for the user to wear. To avoid the traces of stain on the fabric, deeper dyeing and printing is done. Because light colours are more prone to stain and it cannot be removed easily. But the dyeing and printing uses harmful chemicals which on prolonged use causes health hazards to the user [17,18].

Absorbent Core Fabrics: Core fabric is the fabric which is the most absorbent layer used in the centre of the cloth pads. This layer holds most of the blood so it should not be a loosely woven fabric. It should be thicker than the topper fabric and comparatively less breathable. More absorbent fabrics are used in the core to prevent leakages and also to hold the blood. Flannel is a very thin absorbent fabric. To make thick fabric many layers of flannel has to be used. But it is very difficult to stitch the many layers of flannel fabric. So this fabric is mostly used in combination with other fabrics like terry fleece etc. Cotton terry is a terry fabric made from cotton which is used for bathing or washing towels. To make the terry more absorbent more thickness has to be used or else less thickness is preferred. Cotton terry is comparatively less absorbent and more bulky than

hemp. Bamboo is also the more absorbent fabric used in the core. Bamboo has lustrous appearance and has more absorbency compared to cotton and hemp. Even though it has more absorbency, the process of converting bamboo into fabric is an intensive process. Bamboo is less durable compared to cotton fabric. In conventionally available cloth pads, bamboo fleece is mainly used as a core. Bamboo fleece contains 70/30 of bamboo and cotton. As mentioned earlier bamboo is less durable, stability is ensured by using the cotton. If the gram per square metre of the bamboo fleece is high, the fabric will be thicker and absorbency will be more. Zorb is a special fabric made by the blend of natural and synthetic fibre. Zorb is especially used in diapers and baby wear as it absorbs more like the sponge holds the water. Zorb absorbs ten times more than the other fabrics such as cotton and bamboo. Normally zorb is the fabric made from blend of the cellulosic fibres such as cotton, bamboo and the synthetic fibres such as polyester. It is used in combination with other fabric like flannel [19].

Backing Fabric: Backing fabric is the fabric which is the last layer of fabric in the cloth pad. This fabric is placed on the underwear. This fabric acts as a barrier for the leakage of blood. Backing fabric should be good or else it will affect the overall comfort of the cloth pad. Conventionally used backing fabrics are, Polyurethane laminates, Cotton and flannel, Fleece, Wool. Polyurethane laminated fabric is a fabric in which polyester knitted cloth is laminated by polyurethane film on both sides of the fabric. Due to this lamination this fabric will slip when placed on the underwear. This laminated fabric is bulkier hence it acts as a barrier to prevent the leakage of blood. There are two choices in the backing fabrics. They are water proofing and water resistant fabrics. Water proofing fabrics are not breathable as they have a coating on the backing layer and the liquid will not penetrate through the fabric. Micro fleece is a synthetic fleece that forms a water resistant layer and does not allow the leakage of blood. Loosely packed fabric has less leak proofing property compared to heavily packed fabric. For leak proof fabric heavily packed fabric is preferred for more absorbency. To produce pads with anti-slip effect fleece is more widely preferred [20].

Closure: Closure is the closing material used in the cloth pad. Without this closure the pad may not remain in the fixed position. Choosing the material for closure is also very important as it also affects the comfort of the cloth pads. Some closure material gives unpleasant feel to the user. The options available for closure are, Buttons, Snaps (plastic/metal), Velcro, Sliders, Clasps, G-hooks, Frog fasteners, Bra clasp. Snaps are the easiest type of fastener available. They are more commonly used in baby wears. Snaps can also be available in the form of tapes. Velcro is also a type of fastener which has two fabric strips. When they are pressed the hooks catches the loop and they are fastened together. They can be easily removed by pulling off the two strips. Button is also a type of fastener available in the form of plastic, metals which is used to fasten the fabric. Buttons are mostly used in the apparel. In cloth pads, the user felt unpleasant when buttons are used [20].

Cloth Pad Styles and Types: There are two styles available in the cloth pads. They are winged pad and Wingless pads. In winged pad, the crotch is covered by the wings designed. The wings are attached on the pad by addition fabric or with the same fabric. The wings are attached at the bottom by the use of snaps, buttons, Velcro, etc. Wingless pads, as the name indicate that the pad has no wings. It is more or less like hour glass shaped pad. To prevent the pad from slipping, backing fabric should be slip resistant [21].

Pad Bunching: Pad bunching looks unpleasant for the cloth pads. Bunching is caused by the design of the pad wings. It is similarly like the race track that the outer track has to cover more distance to complete the track. As in the case of pad, the top layer has to cover more distance than the bottom so that it causes bunching effect in the fabric. Thicker fabric causes more bunching than the thinner fabrics as it is very flat. So the pads which are polyurethane laminated will causes more bunching. Already mentioned that the shape of the wings will cause bunching of fabrics. If the wider wings are used, it will cover the underpants easily and bunching effect can be avoided and side leakages will also be avoided. The bunching effect does not create any problems in the function of pad; it will give firmness to the pad to stay in the same position. To avoid bunching effect thinner pads are used but they give less coverage in the crotch area. Bunching effect not only happens in the cloth pad but also happens in the underpants too. To avoid the bunching effect in the cloth pads and also the underpants, the following options are possible [21]. They are,

- When snap is used, before wearing the cloth pads the backed fabric is smoothed. So that it will perfectly fit to the underpants.
- If bunching effect is unpleasant it is suggested to use the thinner pads.

- To avoid bunching, pads with wider crotch is preferred and also the underwear with narrow crotch is preferred.

Pad Slipping Effect: One of the major issues faced by the women in cloth pad is slipping. Slipping is also due to the improper design or shape of the cloth pads. This may also be caused by the short pads also. Slipping can be sideways or forward and backward slipping. Sideways slipping is mainly due to the crotch width of the cloth pad is more than the width of the underwear. Another reason is due to the improper design or shape of the pad. Slipping can also be caused by the underwear too. If the crotch length of the underpants is less and if we use the cloth pad having wider crotch length then the action of sliding would takes place. If the crotch length of the underwear is wider than the crotch length of the cloth pads then an extra fabric is needed to put snap buttons. If the pad does not suit for the particular underwear it may have a chance of slipping out through the leg hole. Forward or backward slipping is majorly due to the length of the pad [21].

II. CONCLUSION

As we know a regular sanitary napkin would take so many hundred years to degrade which is not eco friendly. The biodegradable cloth pad which also provides a path for a sustainable environment. Firstly considering the pattern of the pad we can also alter the pattern according to our need and idea. The fibre selection again it's a choice chosen among available natural fibres. Cotton fabric was selected, because of its economical friendliness and availability. The layers of cloth pad are to be noticed for its unique idea where layers of topper and absorbent fabrics are not stitched together. They can be used accordingly with user's comfort. This entire product is bio degradable and especially no SAP is used to convert fluid to gel as they are used in sanitary napkins. As the world is facing towards sustainability, we have to sustainable products to reduce the waste on environment. Sanitary disposable waste causes more health hazards. As the condition of the waste disposed on our environment is going worse. Being on the textile side, one of the things we can do is to reduce textile waste by creating sustainable products.

III. REFERENCES

- [1] M Pohlmann. Int. Journal of Engineering Research and Application www.ijera.com ISSN : 2248-9622, Vol. 6, Issue 11, (Part -2) November 2016
- [2] <https://www.socochem.com/super-absorbent-polymer-for-hygiene-products.html#:~:text=Sodium%20polyacrylate%2C%20also%20known%20a,Agriculture%20grade%20and%20Industry%20grade.>
- [3] <https://clothpads.wordpress.com/fabrics/core/>
- [4] Gupta BS (1992) Study of absorbency in Non Woven: The role of structure factors and fluid characteristic. Papers of International Conference on NonWoven, Published in 1992 The Textile Institute North India Section.
- [5] <https://www.seamwork.com/magazine/2020/06/how-to-sew-cloth-pads>
- [6] Development And Characterisation Of Sanitary Napkins With Lyocell / Modal As Absorbent Core Dr.M.Dhinakaran 1, C.S.Senthil kumar2, 3 Dr.T.Sathis kumar
- [7] <https://clothpads.wordpress.com/diy/drafting/>
- [8] <https://www.hilarispublisher.com/open-access/natural-and-sustainable-raw-materials-for-sanitary-napkin-2165-8064-1000308.pdf>
- [9] <https://menstrualcupreviews.net/choosing-the-right-fabric-reusable-pad/>
- [10] <https://clothpads.wordpress.com/buying/buying-absorbency/>
- [11] <https://pixielovesitallblog.wordpress.com/2016/10/17/cloth-pads-101-basic-construction-fabric-breakdown/>
- [12] <https://clothpads.wordpress.com/buying/buying-cloth-pads-fabrics/>
- [13] <https://saraldesigns.in/sanitary-napkins-and-its-environmental-impact-part-1/>
- [14] <https://clothpads.wordpress.com/fabrics/>
- [15] <https://scroll.in/article/817607/iit-researchers-are-using-nanotechnology-to-make-better-and-healthier-sanitary->

