

Sanitary Towels, Their Menace, and the Ministration of Herbalism: An Overview of the Feminine Pad Patron Mad Mady

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Abstract: Menstruation is the process with which women shedding blood and other material from the inner layer of the uterus each 28 to 35 days from puberty until menopause. If not effectively examined, it might cause serious problems for women. Access to menstrual hygiene goods to absorb or collect the flow of blood during menstruation, privacy to change the materials, and access to facilities to dispose of discarded menstrual management materials were every instance of menstrual hygiene management (MHM) or menstrual health and hygiene (MHH). Menstrual hygiene commodities include sanitary pads, a menstrual cup, tampons, menstrual wipes, reusable cloth menstrual pads, etc furthermore. Many women use sanitary napkins. The sanitary pad is a thin pad made with absorbent material that absorbs menstrual fluid during menstruation.

These are readily accessible in a wide range of shapes and sizes, with varying the ability to absorb for days of heavy and light menstrual bleeding. It supplies benefits such as easy availability, simplicity of use, and cost effectiveness, though it also has negatives such as irritation, rashes, uncomfortable odour, and non-biodegradable chemicals. The excessive use of sanitary napkins is being associated with menstrual problems, infertility, PCOD/PCOS, cervical and ovarian cancer, urogenital challenges, hormone imbalance, and vaginal microbial imbalance. This study studies the sanitary napkin, including its composition, structure, and use-related disorders and negative effects. In an attempt to find economically and politically accountable inventions, the research on sanitary napkin alternatives is discussed. Herbal remedies that are used to treat sanitary pad users' ailments are also discussed, to be are some nutraceuticals that have secondary metabolites can be used to treat PCOD or PCOS conditions.

Highlights: Cervical cancer, Infertility, Menstruation, Microbe imbalance, Ovarian cancer, Sanitary napkins and Tampons.

I. INTRODUCTION

On a yearly basis on May 28, Menstrual Hygiene Day (MHD, or MH Day for short) encourages awareness of the significance of effective menstrual hygiene management (MHM) on a global scale. The German NGO WASH United established it in 2013, and it first came to light in 2014. There are 3.73 billion women in the world today[1]. Of those women, 1.9 billion, or 52%, are of reproductive age and periods, thereby according to the World Health Organization (WHO) (WHO, 2018). Women will reach reproductive age and begin menstruating at some time in their lives. According to projections, approximately 300 million women undergo periods every day; a woman will, on average, have a cycle for 3,500 days of her life. More recent research has shown that the inability of 50% of Indian women to safely manage their periods leads to an increase in UTIs (urinary tract infections). Kidney failure may ensue from UTIs if they aren't properly addressed. Due to insufficient menstrual health management, the majority of females in India are at risk for reproductive tract infections (RTI). The Menstrual Hygiene Scheme is a programme established by the Ministry between Health and Family Welfare to motivate adolescent girls in rural regions around the ages of 10 and 19 to maintain good menstrual hygiene.

The goals of this menstrual hygiene programme are to improve teenage girls' knowledge about menstrual hygiene, as well as improve their access to and usage of high-quality sanitary items in rural locations. For young women between the ages of 11 and 17, the menstrual cycle typically starts between the ages of 12 and 13. A woman usually gets her period every 28th day, or 12–13 times a year. On average, a menstrual cycle lasts 3 to 7

days. The typical quantity of fluid lost during a period is 65–80 ml, or half a cup. Giving birth and using contraceptive had a direct effect on the menstrual cycle. The period of menstruation lasts from the ages of 45 to 55 until menopause. Over the past 100 years, the market for feminine hygiene products has changed. Tampons, sanitary pads, trousers liners, menstrual cups and period pants are the current five period items used by menstruators[2]. You insert tampons, which are tiny cotton-wool tubes, into your vagina to absorb your blood. When you're ready to take them down just tug on the thread at the bottom of the object. Tampons are discrete and portable. To absorb the blood from your period, you place strips of absorbent cloth known as sanitary pads, also known as sanitary towels, in your underwear[3]. The absorbencies range broadly from extremely poor to exceptionally high flows.

Menstrual cups are accessible in various sizes and are made of adaptable user-friendly silicone or rubber. Menstrual cups are put into the vagina identically to tampons, but as opposed to absorbing blood, they collect it and can store more than tampons can. Then you empty out the cup, flush the blood down the toilet, and replace it. Period trousers consist of absorbent, leak-proof fabric to catch your blood yet may be worn and washed like normal underwear. These are washable and long-lasting. Pantyliners resemble neater, more distinct, and slimmer sanitary pads. They work best on extremely light days or shortly before your menstruation ends. Additionally, it can be utilized if you want more safeguards from leaks when you're using a tampon or menstrual cup.

Good menstrual hygiene includes replacing period

products at the appropriate times. To avoid vaginal rashes, irritation, and other health issues, sanitary pads are replaced every four hours, tampons every two hours, and menstrual cups are correctly and thoroughly cleaned after use. Ovarian cancer, cervical cancer, polycystic ovarian syndrome or disease, infertility, vaginal dysbiosis, hormonal dysfunction, endometriosis, etc. are among the health problems brought on by uninformed usage of sanitary napkins. Designing biodegradable and human-friendly sanitary pads now advantages through the use of herbal raw materials and formulas. Natural remedies are used to correct problems with hormones, as well as to lessen irritation and body heat. Humans are more receptive of herbal formulations, and they experience fewer negative effects[4]. A further option for treating vaginal dysbiosis brought on by the usage of sanitary pads is the idea of providing probiotics to maintain normal vaginal microbes[5].

A. Different kinds of sanitary towels: A clean napkin, sanitation towel, sanitary pad, bleeding pad, maxi pad or pad is an absorbing material item worn by a woman during her periods, while she recuperates from vaginal surgery, over lochia or (post-birth bleeding), abortion or any other circumstance where it must be used for absorbing a flow of blood from a woman's vagina. Additionally, they provide girls and women with the confidentiality, ease, and feminine appearance that have been desired for generations. There are two different types of padding that do a comparable task but are applied slightly differently.



Types of period products



Kinds of sanitary towel

Reusable pads, commonly referred to as washable pads,

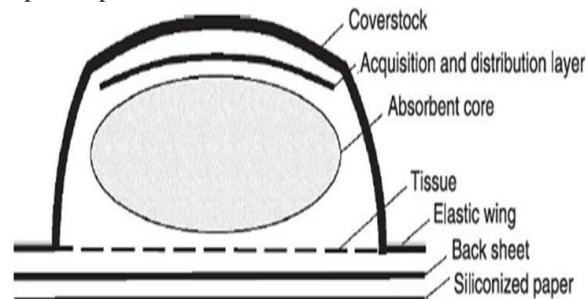
have a hole in the centre where you may tuck in

absorbent liners. They're a more environmentally responsible option because they can be recycled rather than being disposed away. Disposable pads are intended for single use and must be discarded properly[6].

B. Sanitary towel structure: Similar to infant diapers, this product has multiple layers, each of which performs a different function. Typically, sanitary napkins have three layers. They have a nonwoven inner the outermost layer that comes into contact with the skin. In terms of performance, it must be able to: (1) quickly transfer blood from menstruation from the interior to the core layer and cease counter flow of blood to the inner interface; (2) feel comfortable soft and pliable; and (3) be wet mechanically sustainable. The transplanted blood is absorbed by its superabsorbent core layer of polymers. To prevent blood leakage, the outermost layer is typically constructed of polyethylene (PE) film.

A reusable sanitary pad's usual components are depicted in Figures. Coverstock, a purchase and shipment layer, the absorbent core, an inner sheet, tissue that an elastic wings, and siliconized paper. Nonwovens are used in their coverstock, acquiring and transportation layer, absorbency core, and back sheet. The following paragraphs[7] detail every one of these four components composition and function.

C. Coverstock: The microfiber coverstock in a disposable napkin was previously believed to be as absorbency as possible; nevertheless, the coverstock of a feminine product is generally lighter compared to that of a baby diaper. As a result, the coverstock was prepared using a lot of viscose rayon. In order to provide superior skin care, coverstock should be hydrophobic; as a result, synthetic fibres like polyester and polypropylene were utilised. Later, it was found that sanitary pads' hydrophobicity was important but insufficient for optimal performance.



Schematic diagram of the sanitary napkin structure
In order to maintain the surface of dryness on the skin,

the coverstock must simultaneously permit rapid liquid passage through to the pad's core while preventing liquid passage back over in the opposite way (wet-back). A modest amount of an efficient rewetting agent was applied to the outside of the coverstock to resolve this challenging issue. These days, the coverstock is often constructed of polypropylene spunbond microfiber that has been lightly rewetted. Other than this substance, it was discovered that perforated films were only sometimes used as a coverstock in feminine hygiene products.

D. Acquisition and distribution layer: Similar duties are anticipated of the purchase and distribution layer in sanitary pads as they are of the purchase and distribution layer in newborn diapers. This layer absorbs the liquid away from the site of her release, distributes it longitudinally, and retains it for the absorbent core to absorb because the absorbent core cannot instantly absorb the localised discharge. Typically, thermally or through-air-bonded composites nonwoven material makes up this layer. As is well known, the majority of structures are capable of obtaining and moving a relatively tiny quantity of fluid such as that which must be controlled during menstruation, adequately.

E. Absorbent core: In the past, wood pulp was used to create the sanitary pad's absorbent core. However, there is still interest in using air-layed pulp in conjunction with super-absorbing polymers to replace this at the required location in the structure. Super absorbent polymer is widely utilised in numerous sanitary pad types. The solid polymer is frequently only loosely adhered to a tissue in powder form. This combined layer is then inserted either in the lower layer of the pad or between the back paper and the absorbent pulped. The placement of the superabsorbent polymeric is crucial because it must absorb and store liquid while not obstructing the pores of the surface that it is bonded.

F. Back sheet: The rear sheet serves as a barrier or impermeable thin film to stop leaks. It is a permeable but liquid-impervious film, and polyethylene is usually used to make it.

I. Working of sanitary towel: Its tasks include absorbing menstrual liquid discharge, separating moisture from the skin, retaining monthly liquid discharge, and separating menstrual liquid from the surrounding area. These

features should be paired with others that maximise comfort, are visually appealing, stop odours, and remain in place. Period blood can be absorbed and turned into gel by the superabsorbent polymers found in sanitary napkins. Fluid travels from the fluid absorption layer to the absorption layer as it contacts the first layer vertically, avoiding spreading to the surface layer. Fluid distributes and can be held after it contacts the absorbent Acquisition layer (porous structure)

layer without changing the flow's direction⁷.

J. Chemical in sanitary towel and its impact: Polymers and plasticizing agents, dioxins and furans, artificial perfumes, pesticide remnants, and genetically engineered organisms (GMOs) are included on the list of significant chemicals[8].

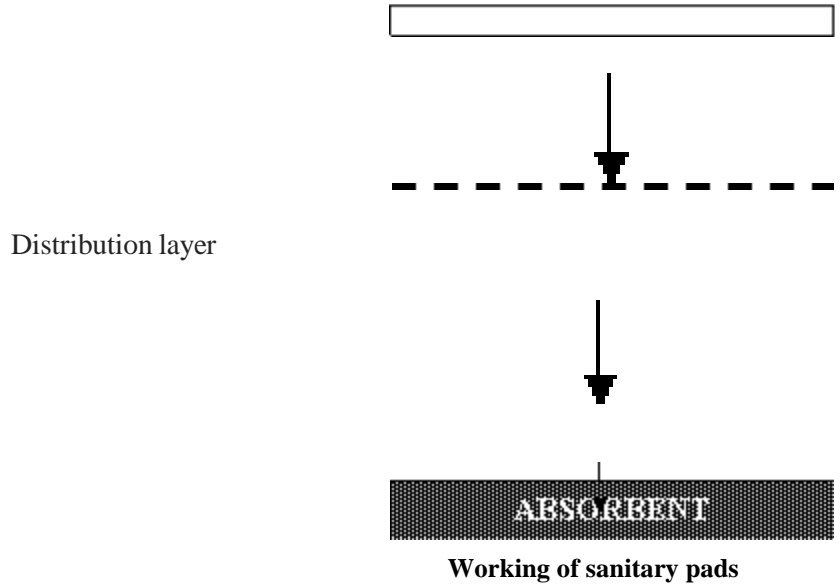


TABLE 01: Chemical present in sanitary pads and its impacts

Chemicals present in Sanitary pads	Impacts
Volatile organic compounds (used to mask bad odour)	Irregular menstrual cycles, loss of appetite, memory loss, paralysis
Phthalates (used to make products soft)	Issues in pregnancy, foetal development, female reproductive health, heart disorders, diabetes, and cancer
Plastics and plasticizers (to make the product flexible and reduce friction on the surface)	Disturb the balance of vaginal microflora, urogenital infections, and rashes.
Dioxins and furans (for bleaching to give a conventional white colour)	Impairment of the immune system, endocrine system, and reproductive functions as a carcinogen
Superabsorbent polymers (to absorb large amounts of liquid)	Rashes, toxic shock syndrome, and endocrine disruption
Cotton (as a layer or absorbent)	Contain pesticide residue, act as carcinogens, and cause endocrine disruption.

K. Hormonal imbalances due to sanitary napkin: This year's study examined ten different pad brands and found evidence of phthalate and VOCs in each sample. According to the press statement, twelve different forms of phthalate (DIBP, DBP, DINP, DIDP, DMP, DEP, BBP, DNOP, DEHP, DHP, DIPP, and DPP) were discovered. The report also mentioned that one of the tested organic sanitary pads had a DIDP content of 19460

g/kg, which was the highest number of phthalates ever found in sanitary products. Since phthalates have been related to a number of health problems, such as endocrine disruption, impacts on the circulatory and female reproductive systems, type 2 diabetes, some malignancies, and congenital defects, this is dangerous. Most of these substances are included to increase the pad's elasticity. However, they are risky due to the fact

that they can result in issues like PCOS, a condition known as hypothyroidism, etc.

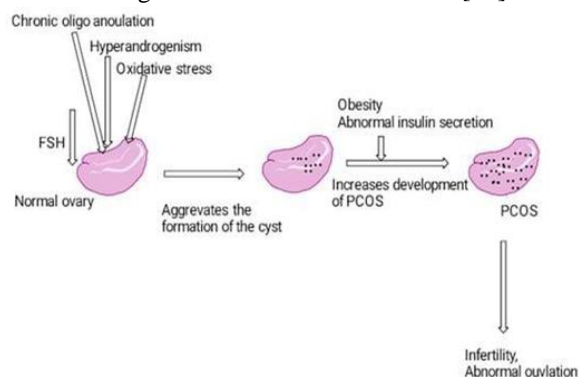
L. Polycystic ovarian syndrome: PCOD affects over 10% of women worldwide. In PCOD (Polycystic Ovarian Disease), a woman's ovaries generate an excessive amount of undeveloped or partially mature eggs, which over time develop into cysts in the ovaries. As a result, the ovaries enlarge and release a lot of androgens, which can lead to infertility, irregular menstruation periods, hair loss, and unnatural weight gain. PCOD can be managed with dietary and lifestyle changes [9-17].

M. Symptoms of pcod:

- Irregular periods (oligmenorrhea)
- Skipped or absence of menstruation (amenorrhea)
- Heavy menstrual bleeding (menorrhoea)
- Excessive hair growth (face, body, including on the back, belly, and chest)
- Acne (face, chest, and upper back)
- Weight gain
- Hair loss (hair on the scalp gets thinner and falls out)
- Skin darkening (neck, groyne, and breasts)

N. Difference between pcod and pcos: PCOD is a common condition that affects 10% of women worldwide. PCOS is a significant medical illness which impacts 0.2% to 2.5% of women globally. The ovaries produce a large amount of immature or partially established eggs as a result of PCOD. Poor lifestyle choices, obesity, stress, and hormone imbalance all contribute to this. A more severe case of PCOS, which is a metabolic disease, can cause anovulation, in which the ovaries stop producing eggs. Women with PCOD do not have decreased fertility; they can still ovulate organically, become pregnant, and deliver children to term with the use of medication. Women with PCOS suffer severe fertility issues. Women with PCOS are unable to ovulate regularly, which makes it difficult for

them to become pregnant. There is a chance of miscarriage, early birth, or pregnancy difficulties if they get pregnant. There are no significant issues with PCOD. Type 2 diabetes, high blood pressure, cardiovascular disease, and cancer of the reproductive system are just a few of the significant side effects of PCOS[18].



Pathophysiology of PCOS

O. Herbs used to treat pcos: The holistic medical system known as Ayurveda places an emphasis on the idea that mental, physical, and spiritual harmony is the key to good health and wellbeing. Along with a nutritious diet and lifestyle changes, Ayurveda suggests Virechana (detoxification), Nsaya (nasal passage cleaning), Shirodhara (body and mind soothing), and Uttarbasti (genio-urinary problem treatment) to control PCOS[4,19]. Ayurvedic management of PCOS follow these protocols:

- Ayurvedic detoxification of the system
- Strengthening and rejuvenating the female reproductive system
- Correcting a hormonal imbalance
- Regulating insulin resistance and obesity
- Yoga and meditation are also essential parts of the Ayurvedic management of PCOS.

TABLE 02 Herbs used in PCOS and its uses

Herbs used in PCOS	Correct menstrual disorders and hormonal imbalances.
Kanchnar guggul	Reduce cyst size and normalise the menstrual cycle.
Varuna	Prevent the oxidation of healthy cells in the reproductive system and balance hormone levels.
Pippali	Reduce the size of cysts and treat dysfunctional uterine bleeding due to PCOS.
Bilva	Reduce the size of cysts and treat dysfunctional uterine bleeding due to PCOS.
Shatavari	Maintain the duration of the menstrual cycle (3–7 days).
Gudichi	regulate the menstrual cycle and boost the health of the female reproductive system.
Punarnava	stimulate the production of reproductive hormones in women.

P. Herbs secondary metabolites: We think that the aforementioned flavonoids, and glycosides that they

contain play a key role in managing PCOS through a variety of methods after examining the chemical

composition of the medicines that are effective in treating PCOS. steroid medications, such as steroid saponins and cycloartane instruments such as derivatives terpenoids and phenolics, catechins, also resins, lignans, and the curcuminoids are other plant substances with anti-PCOS activity. The addition of flavonoids, the aforementioned and other substances with different modes of action in a polyherbal formulation, in our opinion, may be helpful in managing PCOS. PCOS responds well to polyherbal preparations that include at least three medicines in a tablet form, capsule, or pill. After three months of treatment, extremely significant improvements in period discomfort, monthly irregularity, normalising follicular development and ovulation, and significantly reduced obesity were seen in PCOS patients. A polyherbal mixture will therefore have a stronger effect on reducing the symptoms and managing PCOS in a less invasive way. Herbs can be

used regularly to treat PCOS and decrease the factors that lead to cyst development in PCOS, and they are safer and more effective at doing so. Currently, herbal treatments are widely used to treat a variety of chronic illnesses, including PCOS. Changing one's diet and taking natural medications could assist with treat PCOS more successfully.

II. MATERIALS AND METHODS

In light of the importance of botanical products in the treatment of PCOS, the Scopus, PubMed, Google Scholar, Crossref and Hinari databases are used to explore the chemical components, mechanisms of action, and therapeutic applications of a few herbal medications against PCOS. The list of herbal medications that are beneficial against PCOS via different pathways is discussed in depth below[20-30].

TABLE 03: Herbal remedies in the treatment of PCOS

SL NO	HERBS	SECONDARY METABOLITES	ACTIONS
1.	<i>Vitex agnus castus</i>	Monoterpenoid - bornyl acetate, limonene, 1,8-cineol, α -pinene and β -pinene labdane-typediterpenoids, viteagnusin, vitexilactone, rotundifuran and vitex lactam flavonoids-luteolin, apigenin, 3-methylkaempferol, casticin, chrysoplenetin and chrysosplenol D, iridoids - cynaroside	Apigenin will also help in increasing the ovulatory cycles
2.	<i>Curcuma longa</i>	carbohydrates (60–70%), proteins (5–10%), terpenes (1.5–5%). Resins-curcuminoids (2.5–8%), curcumin(diferuloylmethane)(71.50–94%), desmethoxycurcumin(6–19.4%) and bisdemethoxycurcumin (0.30–9.10%). Phenols - curcumins, curcuminoids, ferulic acid, eugenol, ascorbic acid, vanillic acid, caffeic acid, syringic acid, protocatechuic acid, and p- coumaric acid, terpenoids - turmerone, α -turmerone, camphene, β -sesquiphellandrene, γ -terpinene and carotene.	They reduce the follicular sheath and improve the formation of the corpus luteum and the ovulation process. Antihyperlipidemic
3.	<i>Glycyrrhiza glabra</i>	2–9% of glycyrrhizin, glycyrrhizin acid, flavonoids, isoflavonoids, carbohydrates, amino acids and triterpenoidsaponins. Liquiritigenin, isoliquiritigenin, liquiritin, isoliquiritin, glabridin and glabrene are the major phytoestrogens	It possesses estrogenic activity; it results in their anti-androgenic effect. flavonoids can help in the secretion of insulin, which reduces blood sugar levels
4	<i>Linum usitatissimum</i>	30–40% of fixed oils, 6–10% mucilage, 25% proteins, saturated and unsaturated fatty acids and lignans include secoisolaricresinol and secoisolaricresinol diglycoside-SDG, and the mucilage of fiber is rich in l-galactose, d-xylose, d- galacturonic acid and l-rhamnose.	they decrease androgen levels and considerably reduce elevated levels of testosterone in the blood, which is useful for treating PCOS
5.	<i>Mentha spicata</i>	carotenoids, - lutein, flavonoids and their analogs- catechin, rutin, xanthomicrol, quercetin-4-glucoside, 5,6-dihydroxy-7,8,3,4-tetramethoxyflavone, sorbifolin, thymosin, hesperidin, gallocatechin-gallate, thymonin, sideritoflavone, ladanein, narirutin, luteolin -7-O- rutinoside, isorhoifolin, eriodictyol-7-O-glucoside and 5-O-demethylnobiletin	Mentha regulates the blood ratio of LH and FSH

		phenolic compounds - rosmarinic acid, caffeic acid, salvianolic, dehydro-salvianolic acids and cinnamic acids.	
7.	<i>Cocos nucifera</i>	alpha-tocopherol and lauric acid, phenolic compounds, such as flavonoids and saponins, lupeol methyl ether, skimmiwallin and isoskimmiwallin, <i>C. nucifera</i> contains twenty-five volatile and semi-volatile phytoconstituents.	It has hypoglycemic effects and reduces blood glucose levels. The lipid methyl (9Z,12Z)-9,12-octadecadienoate present in this plant possesses anti- androgenic properties, regulates the blood levels of sex hormones such as FSH and LH.
8.	<i>Punica granatum</i>	folic acid, vitamins (B2, C and B1), sugars, organic acids and pantothenic acid. Unsaturated and saturated fatty acids, phenolic compounds (catechins and flavonoids and phytosterols.	The blood levels of free testosterone, serum estrogen and androstenedione hormone were normalized.
9.	<i>Aloe vera</i>	Anthraquinone derivatives, flavonoids, phytosterols, polyphenols and other nutrients. Aloe emodin and barbaloin.	It increased estrogen synthesis by stimulating the flux of the steroidogenesis pathway. It can restore glucose sensitivity, the estrus cycle and the plasma levels of lipoproteins, besides suppressing the biogenesis of cholesterol in the liver.
10.	<i>Cinnamomum cassia</i>	Cinnamyl alcohol, linalool, eugenol, eugenol acetate, methyl eugenol and benzaldehyde, along with procyanidins such as cinnamaldehyde, cinnamyl acetate, caryophyllene, monoterpene, pinene, hydrocarbon, benzyl benzoate, phellandrene, safrole, cymene and cineol. <i>Cinnamomum</i> contains 80.59% carbohydrates, 59.55–53.1% dietary fiber, 9.5–10.5% moisture, 3.89–4.65% protein, 3.55% ash and vitamins.	It regulates blood insulin levels, as well as promoting glucose uptake and the synthesis of glycogen in the liver. Cinnamon extract improves insulin selectivity in women with PCOS. The procyanidins and polyphenols in cinnamon are responsible for the hypoglycemic effect by stimulating the insulin signaling pathway
11.	<i>Foeniculum vulgare</i>	Trans-anethole, α -pinene estragole, fenchone, 1,8-cineole, β -carotene, myristicin, limonene, β -sitosterol, cinnamic acid, caffeic acid, ferulic acid, fumaric acid, benzoic acid, p-coumaric acid, vanillic acid, kaempferol, quercetin, rutin and vanillin. Fennel contain 50–60% of anethole, phenolic esters, 18–22% of fenchone, fixed oils and proteins, vitamins such as α -tocopherol, ascorbic acid, β - tocopherol, γ - tocopherol and δ -tocopherol.	Anethole promotes menstruation, facilitates birth and also induces estrogenic properties in the ovarian follicle.
12.	<i>Panax ginseng</i>	Ginsenoside Rb1, Rb2, Rc, Rd, Re, Ro and Ra, and minor ginsenosides	This can significantly elevate serum estradiol while suppressing follicle-stimulating hormone (FSH) and luteinizing hormone (LH). A significant decrease in plasma LH levels may be beneficial and effective for improving the fertility rate in PCOS anovulation patients
13.	<i>Cimicifuga racemosa</i>	Triterpene glycosides and phenolic acids, phenolic components of black cohosh include hydroxycinnamic acids, ferulic acid, isoferulic acid and caffeic acid, as well as their condensation products with glycolyl phenylpropanoids, commonly known as cimicifugic acids.	These are responsible for the suppression of cysts in the ovary. The flavonoids decreased the blood levels of LH
14.	<i>Pimpinella anisum</i> L.	The major constituents of aniseed oil are trans- anethole (90%), anisketone, anisaldehyde and methyl chavicol. Other minor constituents present in anisum include γ -himachalene (2–4%), trans-pseudo isoeugenol 2-methylbutyrate (1.3%), p-anisaldehyde (1%) and methyl chavicol (0.9–1.5%)	Anethole helps to relieve oligomenorrhea. The phenolic ingredients possess phytoestrogenic features, which may play a greater role in the regulation and improvement of menstrual cycles and LH/FSH secretion in women with PCOS.
15.	<i>Trigonella foenum- graecum</i>	It contains phytosterols, terpenoids, flavonoids (naringenin, saponaretin, lilyn, kaempferol, isovitexin, orientin, vitexin, isoorientin, luteolin and quercetin) alkaloids (choline, trigonelline and carpaine) and saponins (fenugrin, foenugracin, trigonoesides,	Anisum reduced the cyst size, as well as ovary volume. Similarly, it also decreases the LH/FSH ratio.

		glycoside, yamogenin, smilagenin, yuccagenin, sarsasapogenin, hederagin, tigonenin, diosgenin)	
16.	<i>Zingiber officinalis</i>	Geraniol, gingerol, curcumin, α -curcumene, geranial, neral, borneol, linalool, β -sesquiphellandrene, afarnesene, sabinene, camphene, gamma-terpinene and terpinen-4-ol. The resin - paradol, zingerol, zingiberene, zingiberon, shogaol, ascorbic acid, β - carotene, p-coumaric acid and caffeic acid. It also contains flavonoids and phenolics	The flavonoids and phenolic compounds in ginger could maintain the balance of estrogen and progesterone.
17.	<i>Tribulus terrestris</i>	Furostanol and spirostanol, and saponins such as tigogenin, diosgenin, gitogenin, hecogenin, neogitogenin, neohecogenin, chlorogenin, ruscogenin, protodioscin and protogracillin. Kaempferol, kaempferol-3-glucoside, kaempferol-3-rutinoside and tribuloside	It normalized estrous cyclicality, steroidal hormonal levels and ovarian follicular growth. Many compounds from Tribulus are effective ovarian stimulants and act as fertility tonics for women, making it a good choice for women with polycystic ovaries.

A. *Alternative for sanitary napkins:* Superabsorbent polymer (SAP) is the material that commercial sanitary pads are most frequently made of. In high-income nations (Japan and the US), this substance was first applied to the production of sanitary pads and diapers in the 1970s. The cost of SAP and the more technical nature of the manufacture make them challenging[31-35]. They also require expensive machinery and a high degree of capital.

B. *Alternate for superabsorbent polymers:* Common SAPs include sodium polyacrylate and Naturally plant fibres were cellulose-based which is more absorbent than SAP because they draw water[10]. The cell wall of plants includes hydroxyl and other oxygen-containing groups that draw moisture through hydrogen bonding, hence that the structure inside plant fibres changes size with variations in moisture concentration. The cell wall swells as a result of moisture, and the fibre grows until the interior of the cell is completely saturated with water. Moisture in the absence of structure continues to exist as free water after this saturation point and does not support further expansion. Up to 200 times what it weighs in water can be absorbed by a superabsorbent polymer. Typically, cotton fibres from cotton plants can hold up to 24-27 double their own weight in water. Cotton fibres are more absorbent than linens fibres, which are made from the flax plant.

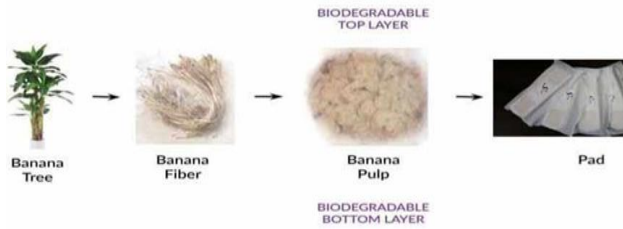
More absorbent than regular cotton is cotton terry cloth, which has loops of cotton fibre woven into the fabric. The total surface area that comprises loops is aimed at absorbing liquids, and fabric weight, the thickness, and heap yarn twist all affect how well they can do so. The cannabis sativa species produces hemp, often known as

industrial hemp, which is a natural fibre. Hemp is a good absorbent material and has antimicrobial qualities. Cotton cannot absorb as much water as hemp[36]. Another substance that is extremely absorbent is bamboo fibre or bamboo cloth. Additionally, bamboo fibre is more absorbing than cotton. Unlike other natural materials, the cellulose in bamboo fibres has crystalline and hierarchical structures.

A special bio-agent known as "Bamboo Kun" that inhibits bacteria growth and is antibacterial has also been discovered in bamboo. As bamboo fibre is extremely absorbent and recyclable, has great ventilation, and has various anti-bacterial qualities, it seems to be a great SAP replacement[37]. Sanitary products made from banana fibre are plant-based, compostable, sustainable, and biodegradable. Natural superabsorbent and particularly effective at securing menstruation fluid is banana fibre.

Due to the abundance of sterols, terpenoids, alkaloids, flavonoids, and tanins found in the plant, Mimosa pudica (MP) has been used to cure a variety of illnesses, including inflammation, ulcers, constipation, malaria, respiratory issues, depression, and snake bites. Glucuronoxylan (GX), a hemicellulosic botanical cell wall polysaccharide primarily made of glucuronic acid and xylose, is the primary ingredient in this Mimosa pudica hydrogel (MPH). If Mimosa pudica fruit is steeped in water, a hydrogel might be extruded. At pH 6.8 and 7.4, it has an elevated swelling capacity, whereas at pH 1.2, it has a low swelling capacity. The hydrogel's sensitivity makes it appropriate for prolonged drug release. In comparison to the seeds themselves and chia flour, MPH was shown to have the maximum absorption capacity at 5.225 g/g. MPH as an alternative to SAP,

which is commonly used in sanitary napkins[38]. Milkweed fibre exhibits a very high index of absorption. Polyethylene and polypropylene were used for the bottom and top levels, respectively, in the construction of the pads with the milkweed fibre core[39]. In order to make the outer barrier and absorbant core of sanitary napkins extremely absorbent, jute fibre, an organic and sustainable fibre, has also gained popularity[40].



Biodegradable banana fiber sanitary pads



Jute fibre



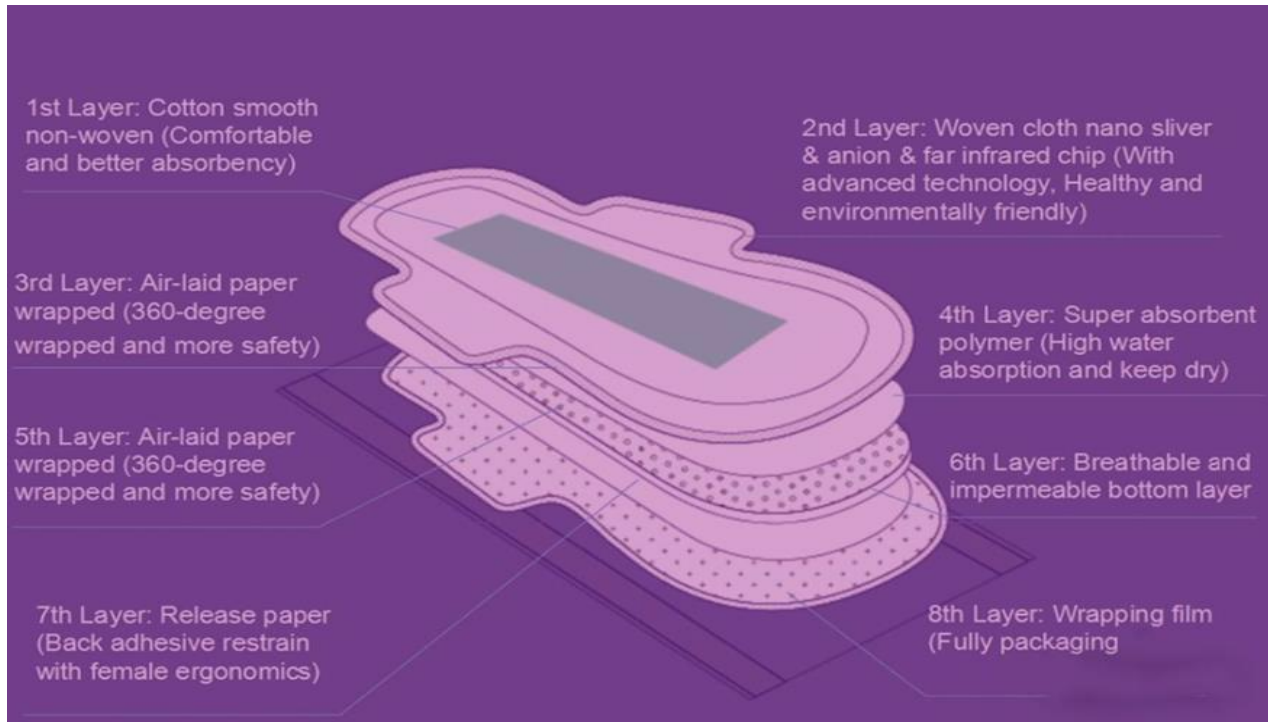
Fig 08 Chia seed and mimosa pads

- Sanitary towel coatings: Mint and aloe vera are used to

give sanitary towels their antibacterial qualities. Orange peel, jasmine, rose, and other naturally occurring volatile substances can be used to cover up the unpleasant scent of blood.

- Novel substances and biodegradable materials the plastic layer found in single-use, discarded sanitary products can be replaced with lactic acid (PLA) fibres since it degrades more quickly. Antibacterial and non-toxic properties are further PLA benefits. The sole plant-protein man-made fibre produced in China is soy protein fibre (SPF). After the oil is extracted from the soybean, a liquid soy protein is extruded, and utilising bioengineering technology. The fibre has yarn qualities like toughness, fineness, and moisture recovery. One of the most prevalent natural polymers is cellulose, which makes up the majority of plants in the world. In addition, cellulose-based hydrogels are widely known for their ability to absorb large amounts of water and other aqueous fluids, making them superabsorbent materials. Combining sodium alginate with CMC results in significantly improved absorbency in the napkins. development of inexpensive, high-quality, biodegradable pads for women and girls. The utilisation of cotton fluff, a loom waste product, was the pièce de resistance. The resulting cotton web had an extremely high absorbancy of 470%. The sanitary pads were coated with "Neem and oranges peel-based nanocolorants" to increase their antibacterial properties. cellulose acetate biopolymer nanofibers are used as the main component of sanitary napkins. According to testing, the napkins' increased absorption was caused by their larger surface area[31].

C. Newly developed anionic sanitary pad: Anion advantages include pain relief, hormone balance improvement, smell reduction, stress reduction, infection risk reduction, and increased circulation. Some types have a top layer made of plant components like sapidilla, etc. Aloe vera is employed as the superabsorbent, and reclaimed paper, which is permeable and better for airways, is used for the other layer[41].



Anionic sanitary pad

D. Other ecofriendly devices: It is well known that sanitary pads are constructed of plastic, that is not only not renewable but also harmful to human health[42-43]. This means that a single feminine hygiene product could take 500–800 years to degrade.

1. *Menstrual cups:* Rubber and silicone were used to create the compact, flexible funnel-shaped cup. To catch your flow, it can be put into the vagina. It is reusable and offers leak-free security for as long as 12 hours. One cup is supposed to last for around 10 years, making both of them cost-effective. One about two ounces of blood from your period can fit in a menstrual cup. Contrarily, tampons are only capable of holding one third of a single ounce. When used with an IUD, these are safer and more environmentally friendly[44-45].



Menstrual cups

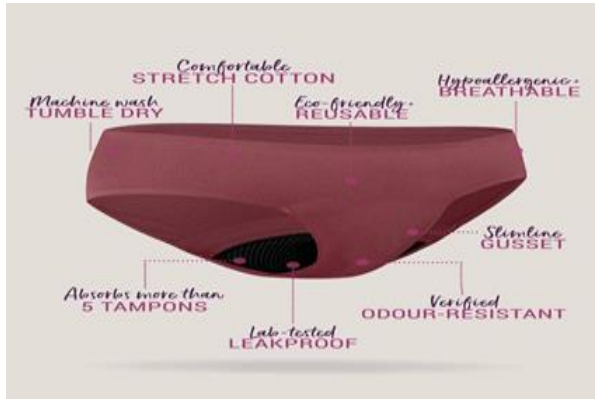
2. *Cloth pads:* Cloth pads function in the same way that disposable ones do, but the former are comprised of layers of cotton that are enclosed in a water-resistant material that can be laundered and reused. They are lightweight, cosy, and environmentally beneficial. Menstrual pads that may be used repeatedly are known as reusable menstrual pads. Depending on your monthly flow, they absorb the blood from your period, and the pad itself should remain in place for roughly 4-5 hours. After use, you must thoroughly wash the cloth to get rid of all blood stains before using the same pad again[46-47].



Cloth pads

3. *Period panties:* Pants that can be worn as regular knickers but have built-in period protection. This substitute is built of numerous layers to avoid leaks and

is very cosy, user-friendly, and environmentally beneficial. They come in a variety of designs, sizes, materials, and holding options and are reusable as well, washable, and durable. Period pants has extra layers and extremely absorbent textiles in the region of the crotch to absorb period blood, but it is still made to appear and behave like regular pants. Period knickers often has more than three layers, which helps with effective absorption. Invest in period pants of the highest calibre that totally absorbed menstrual blood and dries off the moisture. Additionally, it can catch tiny urine leaks, vaginal discharge, and sweat.



Period pantie

4. *Menstrual sponges:* These natural, renewable resources can be utilised as a replacement to tampons and are also referred to as sea sponges tampons or period sponges. They are ocean-derived, all-natural sea sponges that can be used again for as long as six months. They are free of synthetic materials, chemicals, bleach, chlorine, scent, and dyes. A sustainable substitute for common hygiene items like feminine products or tampons is the menstrual sponge. It is a reusable natural product. It is incredibly absorbent and gentle on the skin, therefore using it during menstruation is not an issue.



Menstrual sponges

5. *Menstrual disc:* The disc is put into the womb to collect blood from the period similarly to the menstruation cup, however it is different in shape and location. The menstrual disc is located at the uterine fornix, which is further down the vaginal canal than cups and tampons are. It provides protection for as long as 12 hours and has a five-tampon capacity. At first, inserting the disc might seem challenging, but after you get settled in of it, it's considerably safer and more dependable. While discs appear to be discs, cups appear to be cups. According to which kind or brand you select, a cup fits in the vagina behind the cervical region and expands into your canal. In contrast, a disc slips back into the fornix of your vagina, where the vaginal canal crosses your cervix.



Menstrual disc

III. DISCUSSION

A hormonal imbalance is the cause of PCOS. Follicular boosting hormone secretion declines in PCOS conditions, along with high levels of androgens and elevated insulin levels. Period irregularities, uneven hair development, acne, obesity, skin discoloration, cysts, tattoos, thin hair, infertility, and hirsutism are all symptoms of PCOS. Stress, excessive body heat generation, vaginal imbalance, overweight and obesity, an insufficient amount of movement, and inadequate uterine blood flow are some of the potential causes of PCOS. Use of sanitary napkins has the potential to result in hormonal imbalance. A single woman uses 5,000–10,000 pads on average during her reproductive years in her lifetime. The health of women may be significantly impacted by this. The monthly discharge of uterine linings by women is known as menstruation. Every woman who is of reproductive age has menstrual cycles at some point in her life. Periods typically begin between the ages of 11 and 14 and last until menopause, which occurs at around age 51. Typically, they last between three and five days. Between adolescence and

menopause, regular cycles indicate that the body is functioning normally. Period issues, such as inconsistent or painful periods, could indicate a major health issue. A healthy cycle of menstruation is necessary for regular cycles.

The hormone mechanism a woman's body experiences each month to get ready for a potential pregnancy is called the menstrual cycle. Despite each woman's menstrual cycle is different in duration, most women get periods around 28 days on average. It is usual to have regular cycles that range in length from 23 to 35 days. The interval between a woman's first day of period and the day preceding her next periods is known as the menstrual cycle. Migratory blood, which is a mixture of blood and tissue, leaves your uterus through the cervix and emerges through your vagina. Hormones affect the starting point of menstruation.

In the body, hormones behave as chemical messengers. During the period known as the menstrual cycle, the ovary and pituitary gland produce and release particular chemicals at specific periods. The inner membrane of the uterus thickens as a result of these hormones. This develops so that, in the event of pregnancy, an egg can be inserted into the lining of the abdominal cavity. Hormones also trigger ovulation, the release of an egg from the ovaries. The egg passes via your fallopian tubes and waits for sperm there. Birth is impossible if the male hormone testosterone does not fertilise that egg. The uterine lining degrades and sheds. The time period is presently. The phases of your menstrual cycle are influenced by an upsurge and lower hormone levels.

The menses phase is when the specific menstrual cycle events take place: If pregnancy has not yet taken place, the uterine lining sheds during this period, which normally lasts between day 1 through day five. The average person bleeds for up to five days, however bleeding that lasts only three days or up to seven days is typically not concerning. The phase of follicles Usually, rounds 6 to 14 make up this phase. The endometrium, the covering of your uterus, grows and thickens at this time as the hormone oestrogen levels rise. Follicle-stimulating hormone (FSH), an additional hormone, also promotes the growth of follicles in the ovaries.

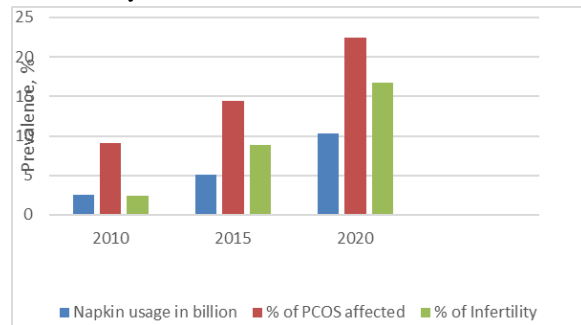
One of the growing follicles will develop into a completely mature egg (ovum) between days 10 and 14. Ovulation: In a 28-day menstrual cycle, this phase usually takes place on day 14. The ovary releases its egg in response to a sudden rise in luteinizing hormone (LH), another hormone. This process is known as ovulation.

Luteinizing phase: This stage lasts for approximately 15 to 28 days. The egg exits the ovary and starts to make its way to the uterus through the fallopian tubes. To aid in preparing the membrane of the uterus for pregnancy, progesterone levels increase. You become pregnant if the egg is fertilized by the sperm and fuses to your uterine cavity (implantation). If conception is unsuccessful, levels of estrogen and progesterone fall, and the thick lining of your uterus sheds during your period. Tampons, sanitary pads, pantyliners, cups for menstruation and period pants are among the feminine sanitation items. Menstrual blood is absorbed by sanitary pads, which additionally protect garments from stains. They incorporate plastic, phthalates, volatile organic pollutants, dioxins, and highly absorbed materials. Phthalate damages the endocrine system and inhibits the female reproductive system, leading to hormonal imbalance. Assault of the intestinal microbiota by plastic.

The reproductive health of females is affected by plasticizers. Diabetes and infertility are both brought on by dioxins and furans. Menstrual periods may seem unpredictable because of volatile molecules of organic matter. The risk of uterine and cervical cancer grows by phthalates. Nowadays, polycystic ovarian syndrome is the primary health problem that many women deal on. Consequently, you may decrease its impact on the environment by converting to an eco-friendly substitute sanitary napkin. The ecologic alternatives include using the fiber of jute in place of the cotton fabric layer in napkins, milkweed plants fiber for its high absorbency capacity, banana fibre for its extremely absorbent attributes, bamboo fiber for its antibacterial capabilities, corn starch as a layer with antileak characteristics, and tulsi, aloe vera, curcuma and the plant for their antibacterial qualities in napkins. Period pants, menstruation discs, menstrual cups, cloth pads and menstruation sponges offer additional green choices. You can use a cup for your menstrual cycle for 10 to 12 years. likewise free from chemicals materials are available to produce period knickers, a product that provides excellent user comfort.

Menstrual sponges are suitable for all age groups, are reusable, eco-friendly, and soothing on the skin. Because seaweed involves bacteria, yeast, and mould, menstrual sponges may lead to infections. Since they have been consistently in use for an extended period of time, cloth pads are a great substitute. Textile use may minimize pollution from the environment while remaining people

safe. Major illnesses like those in the present generation have not been detected in generations prior to them since in previous generations women used linen for menstruation. Vaginal and gastrointestinal microorganisms can be employed as supplements to effectively treat uterine instability. Women who dress leggings stand the danger of restricting permeation of air and affecting blood flow to the female reproductive systems and lower limbic system. Good air permeability supports both the development of organs and the efficiency of their activities. Legging jeans transfer sweat into their fabric, which could contribute to greater problems with the skin. Many feminine nylon cloth underpants nowadays could expose the vagina to excessive heat, leading to a discrepancy in the vaginal the microbiota. The balance of hormonal can be affected by this microbiota, in either a direct or indirect way. Therefore, using a green, sustainable feminine hygiene product alternative may help treat menstruation more successfully.



Incidents rates of PCO'S and Female infertility (2010-2020)

IV. CONCLUSION

We continue to stick to the alternative to cope on menstruation regardless being mindful we must be aware of the detrimental effects of artificial sanitary towels. In that situation, the consumption of synthetic toilet paper is to blame for the imbalance in hormones and subsequent ailments. Synthetic feminine hygiene products have increased fertility over the past few years, in either the direct or indirect way. With the advent of recently created recyclable sanitary towels, hormone imbalances can now be treated, and the damage to the environment is also lessened. Every woman encounters to recognise the significance of women's health, the negative aspects of period products, and other options to preserve excellent menstrual hygiene. Using environmentally friendly products can benefit us and the

natural world.

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