

**HYGIENE DURING MENSTRUATION AND MENOPAUSE: THE START TO CLOSURE OF WOMANHOOD****<sup>1</sup>\*Kushal Nandi, <sup>1</sup>Dr. Dhruvo Jyoti Sen and <sup>2</sup>Dr. Dhananjay Saha**<sup>1</sup>Department of Pharmaceutical Chemistry, School of Pharmacy, Techno India University, Salt Lake City, Sector-V, EM-4, Kolkata-700091, West Bengal, India.<sup>2</sup>Deputy Director, Directorate of Technical Education, Bikash Bhavan, Salt Lake City, Kolkata-700091, West Bengal, India.**\*Corresponding Author: Kushal Nandi**Department of Pharmaceutical Chemistry, School of Pharmacy, Techno India University, Salt Lake City, Sector-V, EM-4, Kolkata-700091, West Bengal, India. DOI: <https://doi.org/10.17605/OSF.IO/8EHP2>

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**ABSTRACT**

Menstruation, also known as a period or monthly, is the regular discharge of blood and mucosal tissue (known as menses) from the inner lining of the uterus through the vagina. The first period usually begins between twelve and fifteen years of age, a point in time known as menarche. However, periods may occasionally start as young as eight years old and still be considered normal. The average age of the first period is generally later in the developing world, and earlier in the developed world. The typical length of time between the first day of one period and the first day of the next is 21 to 45 days in young women, and 21 to 31 days in adults (an average of 28 days). Bleeding usually lasts around 2 to 7 days. Menstruation stops occurring after menopause, which usually occurs between 45 and 55 years of age. Periods also stop during pregnancy and typically do not resume during the initial months of breastfeeding. Up to 80% of women report having some symptoms prior to menstruation. Common signs and symptoms include acne, tender breasts, bloating, feeling tired, irritability, and mood changes. These may interfere with normal life, therefore qualifying as premenstrual syndrome, in 20 to 30% of women. In 3 to 8%, symptoms are severe. A lack of periods, known as amenorrhea, is when periods do not occur by age 15 or have not occurred in 90 days. Other experiences during the menstrual cycle include painful periods and abnormal bleeding such as bleeding between periods or heavy bleeding. Menstruation in other animals occur in primates (apes and monkeys).

**KEYWORDS:** Menstrual Cycle, Menstrual Bleeding, Sanitary Napkin, Menopause.**INTRODUCTION**

The menstrual cycle occurs due to the rise and fall of hormones. This cycle results in the thickening of the lining of the uterus, and the growth of an egg, (which is required for pregnancy). The egg is released from an ovary around day fourteen in the cycle; the thickened lining of the uterus provides nutrients to an embryo after implantation. If implantation does not occur, the lining is released in what is known as menstruation.

The first menstrual period occurs after the onset of pubertal growth, and is called menarche. The average age of menarche is 12 to 15 years. However, it may start as early as eight. The average age of the first period is generally later in the developing world, and earlier in the developed world. The average age of menarche has changed little in the United States since the 1950s.

Menstruation is the most visible phase of the menstrual cycle and its beginning is used as the marker between cycles. The first day of menstrual bleeding is the date

used for the last menstrual period (LMP). The typical length of time between the first day of one period and the first day of the next is 21 to 45 days in young women, and 21 to 31 days in adults. The average length is 28 days; one study estimated it at 29.3 days.

Perimenopause is when a woman's fertility declines, and menstruation occurs less regularly in the years leading up to the final menstrual period, when a woman stops menstruating completely and is no longer fertile. The medical definition of menopause is one year without a period and typically occurs between 45 and 55 in Western countries.<sup>[1]</sup>

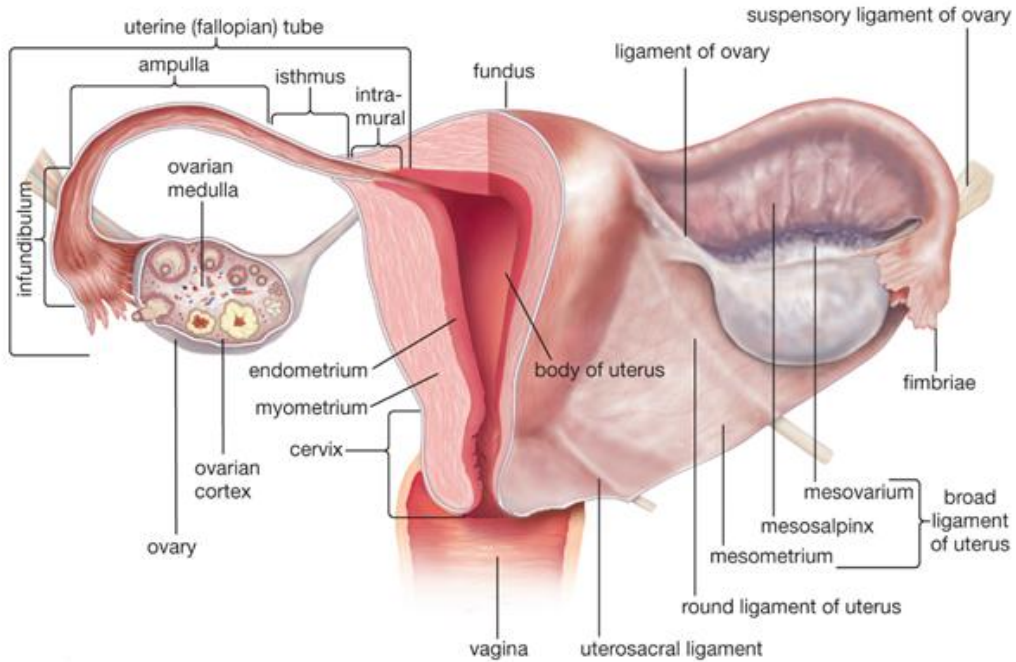
During pregnancy and for some time after childbirth, menstruation does not occur. The average length of postpartum amenorrhoea is longer when breastfeeding; this is termed lactational amenorrhoea.

**Health effects:** In most women, various physical changes are brought about by fluctuations in hormone levels during the menstrual cycle. This includes muscle

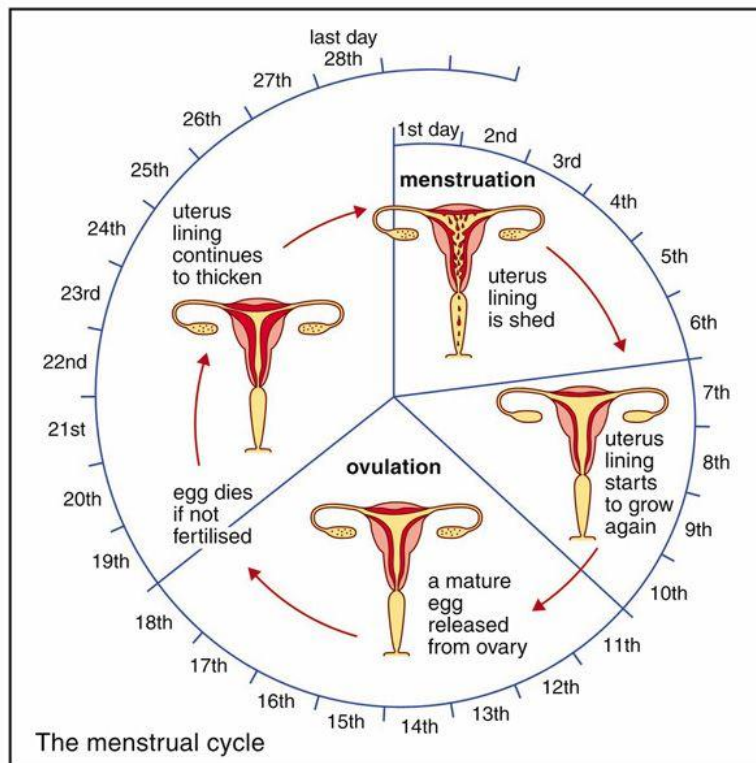
contractions of the uterus (menstrual cramping) that can precede or accompany menstruation. Some may notice bloating, changes in sex drive, fatigue, breast tenderness, headaches, or irritability before the onset of their period. It is unclear if the breast discomfort and bloating is related to electrolyte changes or water retention. Some women have mild or no symptoms before the onset of

their periods. A healthy diet, reduced consumption of salt, caffeine and alcohol, and regular exercise may be effective for women in controlling water retention. Severe symptoms that disrupt daily activities and functioning may be diagnosed as premenstrual dysphoric disorder.

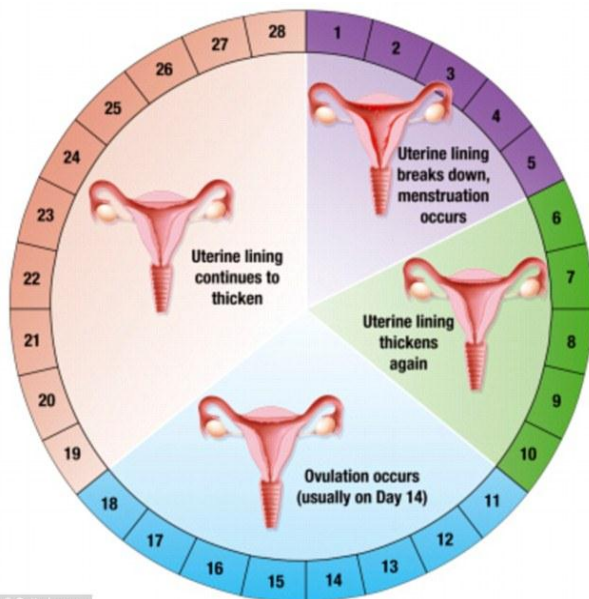
**Onset and frequency**



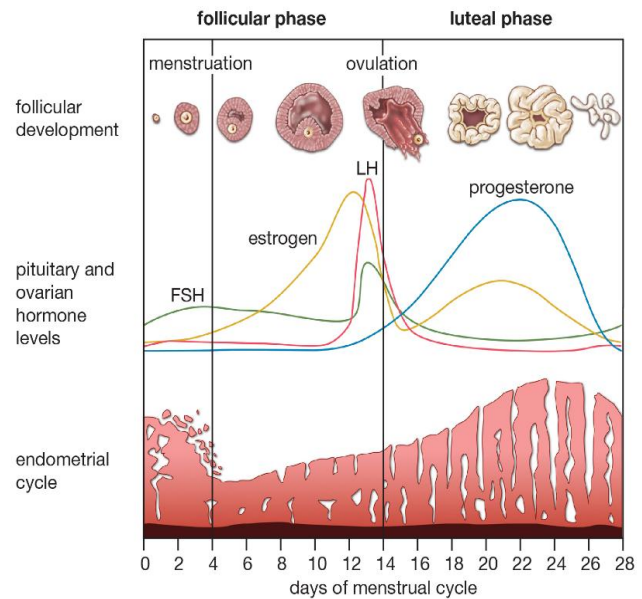
**Figure-1: Anatomy of Uterus.**



**Figure-2: Diagram illustrating how the uterus lining builds up and breaks down during the menstrual cycle.**



The menstrual cycle



**Figure-3: Different Phase Of Menstrual Cycle Shown In Pie Diagram (Left) & Graphical Representation (Right).**

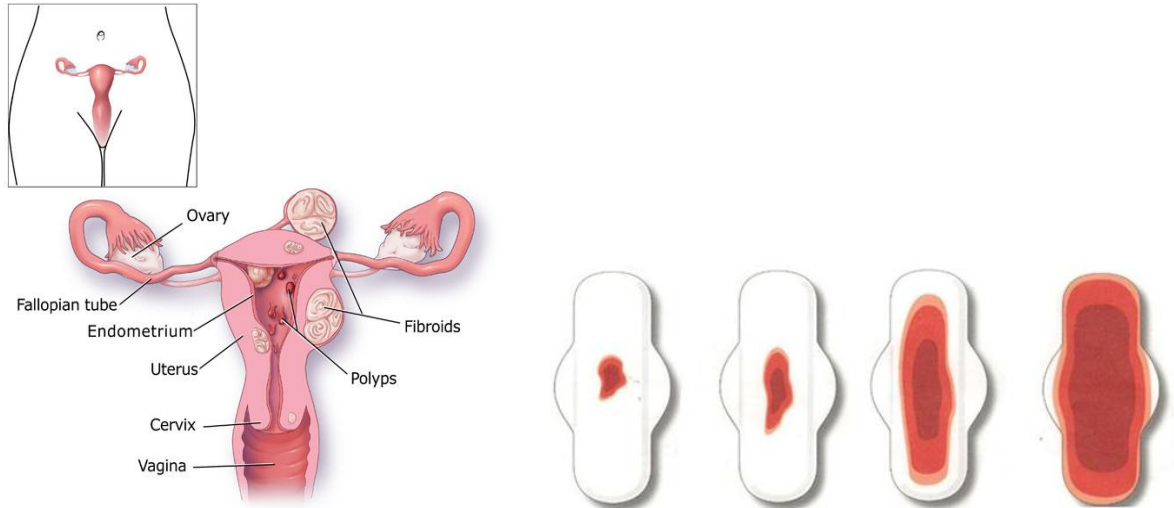
**Cramps:** Many women experience painful cramps, also known as dysmenorrhea, during menstruation. Painful menstrual cramps that result from an excess of prostaglandin release are referred to as primary dysmenorrhea. Primary dysmenorrhea usually begins within a year or two of menarche, typically with the onset of ovulatory cycles. Treatments that target the mechanism of pain include non-steroidal anti-inflammatory drugs (NSAIDs) and hormonal contraceptives. NSAIDs inhibit prostaglandin production. With long-term treatment, hormonal birth control reduces the amount of uterine fluid/tissue expelled from the uterus. Thus, resulting in shorter, less painful menstruation. These drugs are typically more effective than treatments that do not target the source of the pain (e.g. acetaminophen). Risk factors for primary dysmenorrhea include: early age at menarche, long or heavy menstrual periods, smoking, and a family history of dysmenorrhea. Regular physical activity may limit the severity of uterine cramps. For many women, primary dysmenorrhea gradually subsides in late second generation. Pregnancy has also been demonstrated to lessen the severity of dysmenorrhea, when menstruation resumes. However, dysmenorrhea can continue until menopause. 5–15% of women with dysmenorrhea experience symptoms severe enough to interfere with daily activities. Secondary dysmenorrhea is the diagnosis given when menstruation pain is a secondary cause to another disorder. Conditions causing secondary dysmenorrhea include endometriosis, uterine fibroids, and uterine adenomyosis. Rarely, congenital malformations, intrauterine devices, certain cancers, and pelvic infections cause secondary dysmenorrhea. If the pain occurs between menstrual periods, lasts longer than the first few days of the period, or is not adequately relieved by the use of non-steroidal anti-inflammatory drugs (NSAIDs) or hormonal contraceptives, women

should be evaluated for secondary causes of dysmenorrhea. When severe pelvic pain and bleeding suddenly occur or worsen during a cycle, the woman or girl should be evaluated for ectopic pregnancy and spontaneous abortion. This evaluation begins with a pregnancy test and should be done as soon as unusual pain begins, because ectopic pregnancies can be life-threatening. In some cases, stronger physical and emotional or psychological sensations may interfere with normal activities, and include menstrual pain (dysmenorrhea), migraine headaches, and depression. Dysmenorrhea, or severe uterine pain, is particularly common for girls and young women (one study found that 67.2% of girls aged 13–19 have it).

**Mood and behavior:** Some women experience emotional disturbances starting one or two weeks before their period, and stopping within a few days of the period starting. Symptoms may include mental tension, irritability, mood swings, and crying spells. Problems with concentration and memory may occur. There may also be depression or anxiety. These symptoms can be severe enough to impact a person's performance at work, school, and in everyday activities. Greater loss in workplace productivity, quality of life, and greater healthcare costs occur in those with moderate to severe symptoms in comparison to those without these symptoms. This is part of premenstrual syndrome (PMS) and is estimated to occur in 20 to 30% of women. In 3 to 8% it is severe. More severe symptoms of anxiety or depression may be signs of premenstrual dysphoric disorder (PMDD). This disorder is listed in the DSM-5 as a depressive disorder. Rarely, in individuals who are susceptible, menstruation may be a trigger for menstrual psychosis. Extreme psychological stress can also result in periods stopping.

**Bleeding:** The average volume of menstrual fluid during a monthly menstrual period is 35 milliliters (2.4 tablespoons of menstrual fluid) with 10–80 milliliters (1–6 tablespoons of menstrual fluid) considered typical. Menstrual fluid is the correct name for the flow, although many people prefer to refer to it as menstrual blood. Menstrual fluid is reddish-brown, a slightly darker color than venous blood. About half of menstrual fluid is

blood. This blood contains sodium, calcium, phosphate, iron, and chloride, the extent of which depends on the woman. As well as blood, the fluid consists of cervical mucus, vaginal secretions, and endometrial tissue. Vaginal fluids in menses mainly contribute water, common electrolytes, organ moieties, and at least 14 proteins, including glycoproteins.



**Figure-4: Menstrual bleeding.**

Many women and girls notice blood clots during menstruation. These appear as clumps of blood that may look like tissue. If there was a miscarriage or a stillbirth, examination under a microscope can confirm if it was endometrial tissue or pregnancy tissue (products of conception) that was shed. Sometimes menstrual clots or shed endometrial tissue is incorrectly thought to indicate an early-term miscarriage of an embryo. An enzyme called plasmin – contained in the endometrium – tends to

inhibit the blood from clotting. The amount of iron lost in menstrual fluid is relatively small for most women. In one study, premenopausal women who exhibited symptoms of iron deficiency were given endoscopies. 86% of them actually had gastrointestinal disease and were at risk of being misdiagnosed simply because they were menstruating. Heavy menstrual bleeding, occurring monthly, can result in anemia.<sup>[2]</sup>

**Menstrual disorders:** There is a wide spectrum of differences in how women experience menstruation. There are several ways that someone's menstrual cycle can differ from the norm, any of which should be discussed with a doctor to identify the underlying cause:

Term	Meaning
Oligomenorrhea	Infrequent periods
Hypomenorrhea	Short or light periods
Polymenorrhea	Frequent periods (more frequently than every 21 days)
Hypermenorrhea	Heavy or long periods (soaking a sanitary napkin or tampon every hour, menstruating longer than 7 days)
Dysmenorrhea	Painful periods
Intermenstrual bleeding	Breakthrough bleeding (also called spotting)
Amenorrhea	Absent periods

There is a movement among gynaecologists to discard the terms noted above, which although they are widely used, do not have precise definitions. Many now argue to describe menstruation in simple terminology, including:

- Cycle regularity (irregular, regular, or absent)
- Frequency of menstruation (frequent, normal, or infrequent)

- Duration of menstrual flow (prolonged, normal, or shortened)
- Volume of menstrual flow (heavy, normal, or light)

Dysfunctional uterine bleeding is a hormonally caused bleeding abnormality. Dysfunctional uterine bleeding typically occurs in premenopausal women who do not ovulate normally (i.e. are anovulatory). All these



bleeding abnormalities need medical attention; they may indicate hormone imbalances, uterine fibroids, or other problems. As pregnant women may bleed, a pregnancy test forms part of the evaluation of abnormal bleeding.

Women who had undergone female genital mutilation (particularly type III- infibulation) a practice common in parts of Africa, may experience menstrual problems, such as slow and painful menstruation, that is caused by the near-complete sealing off of the vagina. Premature or delayed menarche should be investigated if menarche begins before 9 years, if menarche has not begun by age 15, if there is no breast development by age 13, or if there is no period by 3 years after the onset of breast development.<sup>[3]</sup>

**Sexual activity:** Sexual intercourse during menstruation does not cause damage in and of itself, but the woman's body is more vulnerable during this time. Vaginal pH is higher and thus less acidic than normal, the cervix is lower in its position, the cervical opening is more dilated, and the uterine endometrial lining is absent, thus allowing organisms direct access to the bloodstream through the numerous blood vessels that nourish the uterus. All these conditions increase the chance of infection during menstruation.

**There are disposable products**



**Figure-5: Disposable sanitary napkin.**



**Figure-6: The elements of a tampon with applicator. Left: the bigger tube ("penetrator"). Center: cotton tampon with attached string. Right: the narrower tube.**

- **Sanitary napkins (also called sanitary towels or pads)** – Rectangular pieces of material worn attached to the underwear to absorb menstrual flow, often with an adhesive backing to hold the pad in place. Disposable pads may contain wood pulp or gel products, usually with a plastic lining and bleached.
- **Tampons** – Disposable cylinders of treated rayon/cotton blends or all-cotton fleece,

usually bleached, that are inserted into the vagina to absorb menstrual flow.

- Disposable menstrual cups made of soft plastic – A firm, flexible cup-shaped device worn inside the vagina to collect menstrual flow.

#### Reusable products include



Figure-7: Menstrual cup.



Figure-8: Cloth menstrual pad.

- **Menstrual cups** – A firm, flexible bell-shaped device worn inside the vagina to collect menstrual flow. Menstrual cups are usually made of silicone and can last 5 years or longer.
- **Reusable cloth pads** – Pads that are made of cotton (often organic), terrycloth, or flannel, and may be handsewn (from material or reused old clothes and towels) or storebought.
- **Padded panties or period-proof underwear** – Reusable cloth (usually cotton) underwear with extra absorbent layers sewn in to absorb flow. Some also use patented technology to be leak resistant, such as the brand THINX.
- **Sea sponges** – Natural sponges, worn internally like a tampon to absorb menstrual flow.
- **Blanket, towel** – (also known as a draw sheet) – large reusable piece of cloth, most often used at night, placed between legs to absorb menstrual flow.

the United States as "tangible individual property" resulting in additional sales tax. This additional tax increases the overall price and further limits accessibility to menstrual hygiene products to lower income women. These products are classified as medical devices but are not eligible for purchase through government funded assistance programs. The Scottish government have in 2019 begun providing free sanitary products for poorer students at schools, with hopes that this will be rolled out across the entire nation.

The Period Products (Free Provision) (Scotland) Act passed unanimously and it is in its final stage on November 24, 2020. The bill was passed after 4 years of campaign spearheaded by Monica Lennon. The act will impose legal duty on the local authorities to make period products available for free of cost. With this act Scotland became the first country in the world to provide universal access to free period products.<sup>[4]</sup>

**United States and the United Kingdom:** Menstrual hygiene products are considered by many states within

**Lower- and middle-income countries:** In developing countries, women experience the lack of access to affordable menstrual hygiene products in addition to a lack of access to other services such as sanitation and waste disposal systems needed to manage their menstrual cycles. Lack of access to waste disposal leads women to throw used products in toilet systems, pit latrines, or discarded in to open areas such as bodies of water. These practices pose dangers to workers who handle these wastes as it increases possible exposure to bloodborne infections in soaked menstrual products and exposure to chemicals found in menstrual hygiene products. Inappropriate disposal also creates pressures on sanitation systems as menstrual hygiene products create sewage blockages. The effects of these inadequate facilities has been shown to have social effects on girls in developing countries leading to school absenteeism.

**Pain management:** The most common treatment for menstrual cramps are non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs can be used to reduce moderate to severe pain, and all appear similar. About 1 in 5 women do not respond to NSAIDs and require alternative therapy, such as simple analgesics or heat pads. Other medications for pain management include aspirin or paracetamol and combined oral contraceptives. Although combined oral contraceptives may be used, there is insufficient evidence for the efficacy of intrauterine progestogens.

One review found tentative evidence that acupuncture may be useful, at least in the short term. Another review found insufficient evidence to determine an effect.

### Diet Chart During Period



**Figure-9: Diet Planning during period.**

Cramps, mood swings, crappy food cravings, headaches ... need I say more? Besides some Midol and hot compresses, there's not much we can do to minimize period pain; *but* what if our diet, no matter where we're at in our cycle, could curb some of these unwelcome symptoms? Today, we'll discuss just that—nutrition tips to promote balance and well-being throughout a woman's monthly cycle. Let it be known I think the female body is one of the most amazing things in existence. No, I don't rejoice when Aunt Flo arrives, but when you stop to consider the complexities that occur inside your body leading menstruation, it can be quite eye-opening. Below you'll find a review of each phase of the menstrual cycle, with nutrition tips to follow along the way. (Days are based on an average 28-day cycle).

**Follicular Phase (days 1-12):** The follicular phase starts on the first day of your period (some call the actual period portion the "menstrual phase," but technically menstruation marks the beginning of the follicular phase). Throughout the follicular phase, your brain releases hormones that both stimulate the production of eggs in your ovaries while also increasing estrogen production. With period-related blood loss, it's important to up the iron, vitamin C and B vitamins to help promote blood cell production and prevent anemia. Low levels of vitamin B12 can contribute to fatigue, dizziness and nervousness. If you happen to take the pill, I'd recommend adding B complex to your daily regimen as these contraceptives have been shown to deplete vitamins B1, B2 & B6.<sup>[5]</sup>





**Figure-10: Foods need to be taken during menstruation time period.**

#### **Eat More**

**Iron** – chicken, turkey, dried beans, leafy greens, egg yolks, fortified cereals

**Vitamin C** – citrus fruits, kiwi, pineapple, cantaloupe, kale, yellow peppers, broccoli

**B12** – clams, salmon, tuna, fortified cereals, fortified plant-milks and some fortified soy products

**B6** – turkey, fish, potatoes, starchy vegetables, non-citrus fruits

**Anti-inflammatory herbs and spices** – ginger, turmeric, cinnamon, cilantro, garlic parsley ... incorporate these herbs into fresh, plant-based meals to help combat cramping and inflammation.

**Ovulatory Phase (days 12-14):** Eggs are released from the ovary (aka ovulation) into the fallopian tube. You'll notice a change or increase in your cervical mucus, which would eventually help to capture and nourish sperm for fertilization.

Some people notice a heightened sense of smell or breast tenderness around this time. Many women also experience increased energy (and libido, hey-o) so make sure you're not countering all that extra energy expenditure with junk food. Hormone shifts around ovulation have been known to increase sugar cravings so prepare yourself and keep plenty of healthy, easy-to-grab sweet snacks at hand. Make sure you're getting plenty of fiber to prevent bloating and ensure bowel regularity (gals, we recommend 25 grams of fiber a day). Fermented foods can also help promote gut health, bowel regularity and fluid balance, so consider incorporating kombucha, kefir, yogurt or raw apple cider vinegar into your daily regimen.<sup>[6]</sup>

#### **Eat more**

**Fiber** – fresh fruits and veggies, whole grains, seeds, nuts, beans (real foods are always preferred over fiber-supplements).

**Healthy sweet fixes** – dark chocolate, fresh, in-season fruits, Greek yogurts, dates, apple chips ... or check out any of the RD approved weekday recipes in Weekday Weekend.

**Luteal Phase (days 14-28):** This phase begins right after ovulation. Estrogen and progesterone levels increase which prepare the egg for implantation. A non-fertilized egg will pass through the uterus until the uterine lining sheds and ... voila, you have a period and find yourself back at day 1 of the follicular phase.

Ladies, this is the time to really up your game in preparation for your monthly stay at the Red Roof Inn. Research reveals women who experience greater pain during periods have higher levels of prostaglandins (a chemical released to stimulate contraction and breakdown of the uterine lining). This prostaglandin production is directly related to the amount of omega-3 fatty acids in one's body—in other words, the more omega-3 rich foods you eat (in conjunction with a decrease in omega-6 rich foods) will theoretically lower prostaglandin production, in turn, improving period cramps. You may want to consider taking a fish oil supplement if you consistently battle PMS-related cramping (shoot for at least 1500 mg DHA/EPA per day).

#### **Eat more**

**Omega-3 fatty acids** – coconut oils, olive oils, grass-fed butter and beef, salmon, leafy greens, avocados, walnuts



**Eat less**

**Omega-6 fatty acids** – vegetable oils, processed foods, mayonnaise, salad dressings

Ancient Ayurvedic medicine believes your period acts similarly to a built-in detox system. So, if you've had a stressful month of junk food, boozing and little exercise, the thought is that your period will be pretty brutal. On the contrary, if you've taken good care of yourself, chances are your period will be much lighter. Speaking of booze, consider avoiding alcohol if you're experiencing PMS symptoms. Sources say drinking alcohol can actually worsen symptoms of headaches, breast tenderness and mood swings. Of course, moderation throughout the rest of your cycle is generally okay, but I would suggest avoiding alcohol altogether towards the start of your period.

Bloating is common during the follicular and luteal phases, as are food cravings, thanks to fluctuations in hormones like estradiol and leptin. Besides avoiding salty, processed foods, make sure you're drinking plenty of water to help combat the bloat and stay hydrated. Read more about how much water you should be drinking here or, in a pinch, try to drink half your body weight in ounces of water each day! Fruit- or herb-infused waters are a great way to add some pizzazz to plain old water.<sup>[7]</sup>

**MENOPAUSE**

**Menopause**, also known as the **climacteric**, is the time in women's lives when menstrual periods stop permanently, and they are no longer able to bear children. Menopause typically occurs between 49 and 52 years of age. Medical professionals often define menopause as having occurred when a woman has not had any menstrual bleeding for a year. It may also be defined by a decrease in hormone production by the ovaries. In those who have had surgery to remove their uterus but still have ovaries, menopause may be considered to have occurred at the time of the surgery or when their hormone levels fell. Following the removal of the uterus, symptoms typically occur earlier, at an average of 45 years of age.

**Causes:** Menopause can be induced or occur naturally. Induced menopause occurs as a result of medical treatment such as chemotherapy, radiotherapy, oophorectomy, or complications of tubal ligation, hysterectomy, unilateral or bilateral salpingo-oophorectomy or leuprorelin usage.

**Age:** Menopause typically occurs between 49 and 52 years of age. Half of women have their last period between the ages of 47 and 55, while 80% have their last period between 44 and 58. The average age of the last period in the United States is 51 years, in the United Kingdom is 52 years, in Ireland is 50 years and in Australia is 51 years. In India and the Philippines, the median age of natural menopause is considerably earlier, at 44 years. The menopausal transition or perimenopause

leading up to menopause usually lasts 7 years (sometimes as long as 14 years). In rare cases, a woman's ovaries stop working at a very early age, ranging anywhere from the age of puberty to age 40. This is known as premature ovarian failure and affects 1 to 2% of women by age 40. Undiagnosed and untreated coeliac disease is a risk factor for early menopause. Coeliac disease can present with several non-gastrointestinal symptoms, in the absence of gastrointestinal symptoms, and most cases escape timely recognition and go undiagnosed, leading to a risk of long-term complications. A strict gluten-free diet reduces the risk. Women with early diagnosis and treatment of coeliac disease present a normal duration of fertile life span. Women who have undergone hysterectomy with ovary conservation go through menopause on average 3.7 years earlier than the expected age. Other factors that can promote an earlier onset of menopause (usually 1 to 3 years early) are smoking cigarettes or being extremely thin.

**Premature ovarian failure:** Premature ovarian failure (POF) is when the ovaries stop functioning before the age of 40 years. It is diagnosed or confirmed by high blood levels of follicle stimulating hormone (FSH) and luteinizing hormone (LH) on at least three occasions at least four weeks apart. Known causes of premature ovarian failure include autoimmune disorders, thyroid disease, diabetes mellitus, chemotherapy, being a carrier of the fragile X syndrome gene, and radiotherapy. However, in about 50–80% of spontaneous cases of premature ovarian failure, the cause is unknown, i.e., it is generally idiopathic. Women who have a functional disorder affecting the reproductive system (e.g., endometriosis, polycystic ovary syndrome, cancer of the reproductive organs) can go into menopause at a younger age than the normal timeframe. The functional disorders often significantly speed up the menopausal process. An early menopause can be related to cigarette smoking, higher body mass index, racial and ethnic factors, illnesses, and the surgical removal of the ovaries, with or without the removal of the uterus. Rates of premature menopause have been found to be significantly higher in fraternal and identical twins; approximately 5% of twins reach menopause before the age of 40. The reasons for this are not completely understood. Transplants of ovarian tissue between identical twins have been successful in restoring fertility.<sup>[8]</sup>

**Surgical menopause:** Menopause can be surgically induced by bilateral oophorectomy (removal of ovaries), which is often, but not always, done in conjunction with removal of the Fallopian tubes (salpingo-oophorectomy) and uterus (hysterectomy). Cessation of menses as a result of removal of the ovaries is called "surgical menopause". Surgical treatments, such as the removal of ovaries, might cause periods to stop altogether. The sudden and complete drop in hormone levels usually produces extreme withdrawal symptoms such as hot

flashes, etc. The symptoms of early menopause may be more severe. Removal of the uterus *without* removal of the ovaries does *not* directly cause menopause, although pelvic surgery of this type can often precipitate a

somewhat earlier menopause, perhaps because of a compromised blood supply to the ovaries. The time between surgery and possible early menopause is due to the fact that ovaries are still producing hormones.

### Mechanism

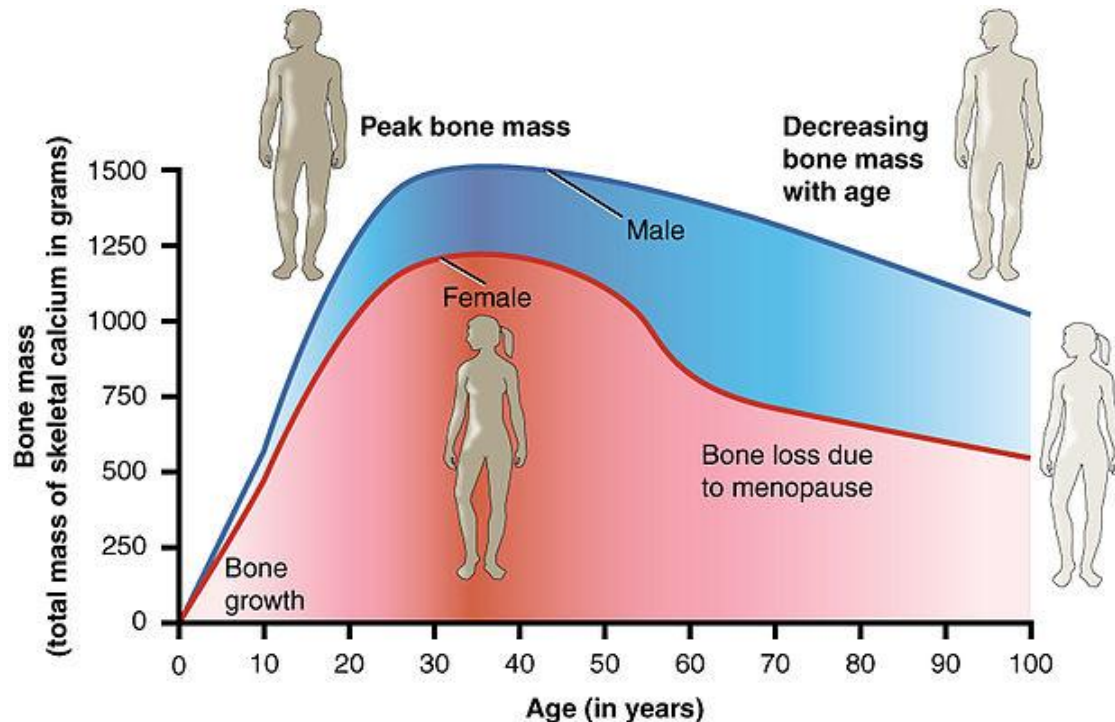


Figure-11: Bone loss due to menopause occurs due to changes in a woman's hormone levels.

The menopausal transition, and post menopause itself, is a natural change, not usually a disease state or a disorder. The main cause of this transition is the natural depletion and aging of the finite number of oocytes (ovarian reserve). This process is sometimes accelerated by other conditions and is known to occur earlier after a wide range of gynecologic procedures such as hysterectomy (with and without ovariectomy), endometrial ablation and uterine artery embolisation. The depletion of the ovarian reserve causes an increase in circulating follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels because there are fewer oocytes and follicles responding to these hormones and producing estrogen. The transition has a variable degree of effects. The stages of the menopause transition have been classified according to a woman's reported bleeding pattern, supported by changes in the pituitary follicle-stimulating hormone (FSH) levels. In younger women, during a normal menstrual cycle the ovaries produce estradiol, testosterone and progesterone in a cyclical pattern under the control of FSH and luteinizing hormone (LH), which are both produced by the pituitary gland. During perimenopause (approaching menopause), estradiol levels and patterns of production remain relatively unchanged or may increase compared to young women, but the cycles become frequently shorter or irregular. The often observed increase in estrogen is presumed to be in response to elevated FSH levels that, in turn, is hypothesized to be caused by decreased

feedback by inhibin. Similarly, decreased inhibin feedback after hysterectomy is hypothesized to contribute to increased ovarian stimulation and earlier menopause. The menopausal transition is characterized by marked, and often dramatic, variations in FSH and estradiol levels. Because of this, measurements of these hormones are *not* considered to be reliable guides to a woman's exact menopausal status. Menopause occurs because of the sharp decrease of estradiol and progesterone production by the ovaries. After menopause, estrogen continues to be produced mostly by aromatase in fat tissues and is produced in small amounts in many other tissues such as ovaries, bone, blood vessels, and the brain where it acts locally. The substantial fall in circulating estradiol levels at menopause impacts many tissues, from brain to skin. In contrast to the sudden fall in estradiol during menopause, the levels of total and free testosterone, as well as dehydroepiandrosterone sulfate (DHEAS) and androstenedione appear to decline more or less steadily with age. An effect of natural menopause on circulating androgen levels has not been observed. Thus, specific tissue effects of natural menopause cannot be attributed to loss of androgenic hormone production. Hot flashes and other vasomotor symptoms accompany the menopausal transition. While many sources continue to claim that hot flashes during the menopausal transition are caused by low estrogen levels, this assertion was shown incorrect in 1935, and, in most cases, hot flashes

are observed despite elevated estrogen levels. The exact cause of these symptoms is not yet understood, possible factors considered are higher and erratic variation of estradiol level during the cycle, elevated FSH levels which may indicate hypothalamic dysregulation perhaps caused by missing feedback by inhibin. It has been also observed that the vasomotor symptoms differ during early perimenopause and late menopausal transition and it is possible that they are caused by a different mechanism. Long-term effects of menopause may include osteoporosis, vaginal atrophy as well as changed metabolic profile resulting in cardiac risks.<sup>[9]</sup>

**Ovarian aging:** Decreased inhibin feedback after hysterectomy is hypothesized to contribute to increased ovarian stimulation and earlier menopause. Hastened ovarian aging has been observed after endometrial ablation. While it is difficult to prove that these surgeries are causative, it has been hypothesized that the endometrium may be producing endocrine factors contributing to the endocrine feedback and regulation of the ovarian stimulation. Elimination of these factors contributes to faster depletion of the ovarian reserve. Reduced blood supply to the ovaries that may occur as a consequence of hysterectomy and uterine artery embolization has been hypothesized to contribute to this effect. Impaired DNA repair mechanisms may contribute to earlier depletion of the ovarian reserve during aging. As women age, double-strand breaks accumulate in the DNA of their primordial follicles. Primordial follicles are immature primary oocytes surrounded by a single layer of granulosa cells. An enzyme system is present in oocytes that ordinarily accurately repairs DNA double-strand breaks. This repair system is called "homologous recombinational repair", and it is especially effective during meiosis. Meiosis is the general process by which germ cells are formed in all sexual eukaryotes; it appears to be an adaptation for efficiently removing damages in germ line DNA. Human primary oocytes are present at an intermediate stage of meiosis, termed prophase I. Expression of four key DNA repair genes that are necessary for homologous recombinational repair during meiosis (BRCA1, MRE11, Rad51, and ATM) decline with age in oocytes. This age-related decline in ability to repair DNA double-strand damages can account for the accumulation of these damages, that then likely contributes to the depletion of the ovarian reserve.

**Management:** Perimenopause is a natural stage of life. It is not a disease or a disorder. Therefore, it does not automatically require any kind of medical treatment. However, in those cases where the physical, mental, and emotional effects of perimenopause are strong enough that they significantly disrupt the life of the woman experiencing them, palliative medical therapy may sometimes be appropriate.

**Hormone replacement therapy:** In the context of the menopause, hormone replacement therapy (HRT) is the

use of estrogen in women without a uterus and estrogen plus progestin in women who have an intact uterus. HRT may be reasonable for the treatment of menopausal symptoms, such as hot flashes. It is the most effective treatment option, especially when delivered as a skin patch. Its use, however, appears to increase the risk of strokes and blood clots. When used for menopausal symptoms some recommend it be used for the shortest time possible and at the lowest dose possible. Evidence to support long-term use, however, is poor. It also appears effective for preventing bone loss and osteoporotic fracture, but it is generally recommended only for women at significant risk for whom other therapies are unsuitable. HRT may be unsuitable for some women, including those at increased risk of cardiovascular disease, increased risk of thromboembolic disease (such as those with obesity or a history of venous thrombosis) or increased risk of some types of cancer. There is some concern that this treatment increases the risk of breast cancer. Adding testosterone to hormone therapy has a positive effect on sexual function in postmenopausal women, although it may be accompanied by hair growth, acne and a reduction in high-density lipoprotein (HDL) cholesterol. These side effects diverge depending on the doses and methods of using testosterone.

**Selective estrogen receptor modulators:** SERMs are a category of drugs, either synthetically produced or derived from a botanical source, that act selectively as agonists or antagonists on the estrogen receptors throughout the body. The most commonly prescribed SERMs are raloxifene and tamoxifen. Raloxifene exhibits oestrogen agonist activity on bone and lipids, and antagonist activity on breast and the endometrium. Tamoxifen is in widespread use for treatment of hormone sensitive breast cancer. Raloxifene prevents vertebral fractures in postmenopausal, osteoporotic women and reduces the risk of invasive breast cancer.

**Other medications:** Some of the SSRIs and SNRIs appear to provide some relief from vasomotor symptoms. Low dose paroxetine is the only non-hormonal medication that was FDA-approved to treat moderate-to-severe vasomotor symptoms associated with menopause as of 2016. They may, however, be associated with appetite and sleeping problems, constipation and nausea. Gabapentin or clonidine may help but do not work as well as hormone therapy. Gabapentin can decrease the amount of hot flashes. Side effects associated with its use include drowsiness and headaches. Clonidine is used to improve vasomotor symptoms and may be associated with constipation, dizziness, nausea and sleeping problems.

**Therapy:** One review found mindfulness and cognitive behavioural therapy decreases the amount women are affected by hot flashes. Another review found not enough evidence to make a conclusion.



**Exercise:** Exercise has been thought to reduce postmenopausal symptoms through the increase of endorphin levels, which decrease as estrogen production decreases. Additionally, high BMI is a risk factor for vasomotor symptoms in particular. However, there is insufficient evidence to support the benefits of weight loss for symptom management. There are mixed perspectives on the benefits of physical exercise. While one review found that there was a lack of quality evidence supporting a benefit of exercise, another review recommended regular healthy exercise to reduce comorbidities, improve mood and anxiety symptoms, enhance cognition, and decrease the risk of fractures. Yoga may help with postmenopausal symptoms similar to other exercise.<sup>[10]</sup>

**Alternative medicine:** There is no evidence of consistent benefit of alternative therapies for menopausal symptoms despite their popularity. The effect of soy isoflavones on menopausal symptoms is promising for reduction of hot flashes and vaginal dryness. Evidence does not support a benefit from phytoestrogens such as coumestrol, femarelle, or the non-phytoestrogen black cohosh. As of 2011 there is no support for herbal or dietary supplements in the prevention or treatment of the mental changes that occur around menopause. Hypnosis may reduce the severity of hot flashes. In addition, relaxation training with at-home relaxation audiotapes such as deep breathing, paced respiration, and guided imagery may have positive effects on relaxing muscles and reducing stress. There is no evidence to support the efficacy of acupuncture as a management for menopausal symptoms. A 2016 Cochrane review found not enough evidence to show a difference between Chinese herbal medicine and placebo for the vasomotor symptoms.

**Other efforts:** Lack of lubrication is a common problem during and after perimenopause. Vaginal moisturizers can help women with overall dryness, and lubricants can help with lubrication difficulties that may be present during intercourse. It is worth pointing out that moisturizers and lubricants are different products for different issues: some women complain that their genitalia are uncomfortably dry all the time, and they may do better with moisturizers. Those who need only lubricants do well using them only during intercourse.

Low-dose prescription vaginal estrogen products such as estrogen creams are generally a safe way to use estrogen topically, to help vaginal thinning and dryness problems while only minimally increasing the levels of estrogen in the bloodstream. In terms of managing hot flashes, lifestyle measures such as drinking cold liquids, staying in cool rooms, using fans, removing excess clothing, and avoiding hot flash triggers such as hot drinks, spicy foods, etc., may partially supplement (or even obviate) the use of medications for some women. Individual counseling or support groups can sometimes be helpful to handle sad, depressed, anxious or confused feelings women may be having as they pass through what can be

for some a very challenging transition time. Osteoporosis can be minimized by smoking cessation, adequate vitamin D intake and regular weight-bearing exercise. The bisphosphonate drug alendronate may decrease the risk of a fracture, in women that have both bone loss and a previous fracture and less so for those with just osteoporosis. A surgical procedure where a part of one of the ovaries is removed earlier in life and frozen and then over time thawed and returned to the body has been tried. While at least 11 women have undergone the procedure and paid over £6,000, there is no evidence it is safe or effective.

## CONCLUSION

*Period poverty* is a global issue affecting women and girls who do not have access to safe, hygienic sanitary products. Menstruation education is frequently taught in combination with sex education at school in Western countries, although girls may prefer their mothers to be the primary source of information about menstruation and puberty. Information about menstruation is often shared among friends and peers, which may promote a more positive outlook on puberty. The quality of menstrual education in a society determines the accuracy of people's understanding of the process. In many Western countries where menstruation is a taboo subject, girls tend to conceal the fact that they may be menstruating and struggle to ensure that they give no sign of menstruation. Effective educational programs are essential to providing children and adolescents with clear and accurate information about menstruation. Schools can be an appropriate place for menstrual education to take place. Programs led by peers or third-party agencies are another option. Low-income girls are less likely to receive proper sex education on puberty, leading to a decreased understanding of why menstruation occurs and the associated physiological changes that take place. This has been shown to cause the development of a negative attitude towards menstruation. Most female mammals have an estrous cycle, yet only ten primate species, four bat species, the elephant shrew and the spiny mouse have a menstrual cycle. The lack of immediate relationship between these groups suggests that four distinct evolutionary events have caused menstruation to arise. Some anthropologists have questioned the energy cost of rebuilding the endometrium every fertility cycle. It has proposed that the energy savings of not having to continuously maintain the uterine lining more than offsets energy cost of having to rebuild the lining in the next fertility cycle, even in species such as humans where much of the lining is lost through bleeding (overt menstruation) rather than reabsorbed (covert menstruation). Many have questioned the evolution of overt menstruation in humans and related species, speculating on what advantage there could be to losing blood associated with dismantling the endometrium, rather than absorbing it, as most mammals do. Humans do, in fact, reabsorb about two-thirds of the endometrium each cycle. Some work asserts that overt menstruation does not occur because partial endometrial loss is

beneficial in itself. Rather, the foetal development of these species requires a more developed endometrium, one which is too thick to reabsorb completely. There is a correlation between species that have overt menstruation and those that have a large uterus relative to the adult female body size. Recent reviews suggest that menstruation itself is not an evolved, adaptive trait. Rather, it is an inherent consequence of spontaneous decidualization evolving as a derived trait from non-spontaneous decidualization. Two possible explanations for why some species show spontaneous decidualization are either that it protects the mother against an aggressive foetus, or that it allows the female to "test" the viability of the conceptus. Beginning in 1971, some research suggested that menstrual cycles of cohabiting women and girls became synchronized (menstrual synchrony). However, there is currently significant dispute as to whether menstrual synchrony exists. A 2013 review concluded that menstrual synchrony likely does not exist.

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