

Review article

## Influence of lifestyle factors on menstrual disorders

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### Abstract

Menstrual disorders, including dysmenorrhea, amenorrhea, and premenstrual syndrome (PMS), significantly impact the quality of life of many women. These disorders can be influenced by various lifestyle factors such as diet, physical activity, stress, body weight, and substance use. This review examines the existing literature on the impact of these lifestyle factors on menstrual health. Nutrient deficiencies and imbalanced diets, especially those low in magnesium, vitamin B6, and vitamin D, are associated with increased severity of PMS and dysmenorrhea. Conversely, diets rich in fruits, vegetables, and whole grains are linked to more regular menstrual cycles. Regular physical activity is beneficial, often reducing menstrual pain and promoting cycle regularity. However, excessive exercise, particularly in athletes, can lead to energy deficits and hypothalamic amenorrhea. Stress is another crucial factor, with chronic stress elevating cortisol levels and disrupting the hypothalamic-pituitary-ovarian axis, leading to irregular cycles and exacerbated PMS symptoms. Body weight also plays a significant role; both obesity and being underweight can disrupt hormonal balance, with obesity leading to excess estrogen and heavy bleeding, and low body weight resulting in reduced estrogen production and amenorrhea. Substance use, including high intake of alcohol and caffeine, is linked to an increased risk of PMS and irregular cycles, while smoking exacerbates dysmenorrhea and accelerates menopause. Addressing these lifestyle factors through balanced nutrition, regular physical activity, effective stress management, and maintaining a healthy body weight is essential for improving menstrual health and overall well-being. Further research is needed to fully understand the complex interactions between lifestyle factors and menstrual health.

### Introduction

Diet significantly affects menstrual health, influencing the severity and occurrence of menstrual disorders. Nutritional deficiencies and imbalances are linked to various menstrual issues. Magnesium plays a role in muscle relaxation and reducing menstrual cramps found that magnesium supplementation significantly alleviates dysmenorrhea and PMS symptoms. Magnesium's muscle-relaxing and anti-inflammatory properties contribute to its effectiveness in reducing menstrual pain [1]. Vitamin B6 is involved in neurotransmitter synthesis; affecting mood and pain perception that vitamin B6 supplementation is associated

with a reduction in PMS symptoms, highlighting its role in managing mood swings and physical discomfort during menstruation. Vitamin D is essential for hormone regulation and immune function. A deficiency in vitamin D has been linked to more severe PMS and menstrual irregularities Adequate vitamin D levels contribute to hormonal balance and reduced inflammation [2].

### Dietary patterns and menstrual health *High-fat and high-sugar diets*

Diets high in saturated fats and sugars can disrupt hormonal balance and exacerbate menstrual disorders reported that

high-fat diets increase estrogen levels, leading to heavier menstrual bleeding and more severe PMS symptoms. High-sugar diets contribute to insulin resistance, affecting hormonal balance and menstrual health [3].

### ***Healthy diets***

Diets rich in fruits, vegetables, and whole grains support hormonal balance and promote regular menstrual cycles demonstrated that higher intake of these foods is associated with reduced menstrual pain and more regular cycles [3].

### **Glycemic index and menstrual health**

#### ***Insulin resistance***

High-glycemic index (GI) foods cause rapid spikes in blood sugar, leading to increased insulin production and potential hormonal imbalances found that a higher dietary glycemic load is linked to an increased risk of anovulation, underscoring the importance of low-GI diets in maintaining menstrual health [4].

### **Fatty acids**

#### ***Omega-3 fatty acids***

Omega-3 fatty acids, found in fatty fish and flaxseeds, have anti-inflammatory properties that reduce menstrual pain and improve cycle regularity found that omega-3 intake is associated with reduced dysmenorrhea symptoms [4].

#### ***Trans fats and saturated fats***

Trans fats and saturated fats promote inflammation and hormonal imbalances, exacerbating menstrual symptoms. Reducing intake of these fats can improve menstrual health and reduce the severity of menstrual disorders.

### **Physical activity**

#### ***Benefits of regular exercise***

Regular physical activity offers numerous benefits for menstrual health, including reduction in menstrual pain, improved cycle regularity, and overall physical well-being.

#### ***Reduction in menstrual pain***

Regular aerobic exercise increases endorphin levels, which act as natural painkillers reviewed literature on exercise and primary dysmenorrhea, concluding that regular physical activity significantly reduces menstrual pain and improves quality of life [5].

#### ***Cycle regularity***

Exercise promotes hormonal balance and regular menstrual cycles by enhancing blood circulation and reducing stress. Regular physical activity supports the hypothalamic-pituitary-ovarian axis, leading to more regular ovulation and menstrual cycles.

### **Risks of excessive exercise**

#### ***Energy deficits***

Athletes and women engaged in high-intensity training may experience energy deficits, leading to hypothalamic amenorrhea. This condition results from insufficient energy availability, disrupting menstrual cycles and causing amenorrhea [6].

#### ***Luteinizing hormone pulsatility***

Excessive exercise can disrupt luteinizing hormone (LH) pulsatility, which is essential for ovulation. Research indicates that energy deficits from excessive physical activity impair LH pulsatility, leading to menstrual irregularities [6].

### **Types of exercise**

#### ***Aerobic exercise***

Aerobic exercises such as running and swimming effectively reduce menstrual pain and promote overall health. These exercises improve cardiovascular health and reduce stress, contributing to better menstrual health [7].

#### ***Strength training and yoga***

Strength training and yoga enhance muscle strength and flexibility, reduce stress, and promote hormonal balance found that yoga significantly reduced dysmenorrhea symptoms, highlighting the benefits of incorporating mind-body exercises into physical activity routines [7].

### **Stress and psychological factors**

#### ***Impact of stress on menstrual health***

Chronic stress can disrupt menstrual health by elevating cortisol levels and interfering with the hypothalamic-pituitary-ovarian axis, leading to irregular menstrual cycles and exacerbation of PMS symptoms.

#### ***Cortisol levels***

Chronic stress results in sustained elevations in cortisol, affecting gonadotropin-releasing hormone (GnRH) production. This disruption impairs luteinizing hormone (LH) and follicle-stimulating hormone (FSH) release, leading to menstrual irregularities [8].

#### ***PMS symptoms***

Psychological conditions such as anxiety and depression are associated with more severe PMS symptoms. High levels of anxiety and depression can worsen menstrual pain and irregularities [9].

### **Stress management techniques**

Effective stress management techniques, including mindfulness, meditation, and cognitive-behavioral therapy (CBT), can mitigate the impact of stress on menstrual health.

#### ***Mindfulness and meditation***

Mindfulness and meditation promote relaxation, reduce cortisol levels, and improve overall well-being. These

techniques can help manage stress and alleviate menstrual symptoms.

### ***Cognitive-Behavioural Therapy (CBT)***

CBT is effective in managing menstrual disorders demonstrated that CBT improved ovarian activity and regular menstrual cycles in women with functional hypothalamic amenorrhea, highlighting the role of psychological interventions in managing menstrual disorders [10].

### **Body weight and composition**

#### ***Impact of obesity***

Obesity significantly impacts menstrual health through hormonal imbalances and increased estrogen production.

#### ***Excess estrogen***

Obesity leads to increased aromatase activity in adipose tissue, resulting in excess estrogen production. This can cause heavy menstrual bleeding, irregular cycles, and an increased risk of endometrial hyperplasia [11].

#### ***Insulin resistance***

Obesity is associated with insulin resistance, further disrupting hormonal balance and menstrual regularity. Weight management through diet and exercise is crucial for improving menstrual health in obese women [11].

### **Impact of being underweight**

Low body weight and insufficient body fat can lead to reduced estrogen production and menstrual irregularities.

### ***Hypothalamic amenorrhea***

Women with low body weight often experience hypothalamic amenorrhea due to reduced estrogen production. This condition results from insufficient energy availability and leads to amenorrhea and other menstrual irregularities [12].

### **Body composition**

Maintaining a healthy body composition, with a balanced ratio of fat to lean muscle mass, is essential for menstrual health.

### **Critical body fat percentage**

A critical body fat percentage is necessary for the initiation and maintenance of regular menstrual cycles) found that women with a body fat percentage below the critical threshold often experience menstrual irregularities.

### ***Substance use***

#### ***Impact of alcohol***

#### ***Hormonal disruption***

High alcohol intake can disrupt hormone metabolism and increase the risk of PMS and menstrual irregularities. Alcohol consumption leads to increased levels of estrogen

and testosterone, which can cause menstrual irregularities [13].

### ***Impact of caffeine***

#### **PMS and menstrual irregularities**

High caffeine consumption is linked to an increased risk of PMS and irregular menstrual cycles. Caffeine disrupts sleep patterns and increases stress levels, leading to hormonal imbalances and exacerbated menstrual symptoms [14].

### **Impact of tobacco**

#### ***Dysmenorrhea and menopause***

Smoking exacerbates dysmenorrhea and accelerates menopause. Nicotine and other chemicals in tobacco disrupt hormone production and metabolism, leading to menstrual irregularities and more severe menstrual pain [15].

### ***Substance use and menstrual disorders***

Substance use significantly impacts menstrual health, influencing both the regularity and severity of menstrual cycles. Various substances, including alcohol, caffeine, nicotine, and recreational drugs, interact with hormonal systems and can exacerbate or contribute to menstrual disorders [16].

### **Alcohol**

#### ***Hormonal disruption***

Alcohol consumption can interfere with the endocrine system, leading to hormonal imbalances that affect menstrual cycles. Chronic alcohol use has been linked to altered levels of estrogen and progesterone, which can lead to irregular menstrual cycles and more severe menstrual symptoms [15].

### ***Menstrual irregularities***

Studies have shown that women who consume alcohol regularly may experience more frequent and severe menstrual irregularities, including heavier bleeding and increased incidence of amenorrhea (absence of menstruation) Alcohol can also impact liver function, which plays a critical role in metabolizing sex hormones [16].

### **PMS and PMDD**

Alcohol consumption is associated with the exacerbation of premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD). Excessive drinking can worsen mood swings, irritability, and physical symptoms associated with PMS and PMDD [17].

### **Caffeine**

#### ***Hormonal effects***

Caffeine, a central nervous system stimulant found in coffee, tea, and energy drinks, can impact menstrual health through its effects on hormonal regulation. Excessive caffeine intake has been associated with higher levels of estrogen and disrupted menstrual cycles [18].

### ***Menstrual pain***

High caffeine consumption has been linked to increased severity of menstrual cramps and discomfort. Caffeine can exacerbate symptoms of dysmenorrhea by increasing levels of prostaglandins, which are chemicals that cause uterine contractions [20].

### ***Fluid retention***

Caffeine can contribute to fluid retention and bloating, common symptoms of PMS. Reducing caffeine intake may help alleviate these symptoms and improve overall menstrual health [18].

### **Nicotine and tobacco**

#### ***Impact on menstrual cycles***

Nicotine and other chemicals in tobacco smoke can disrupt the menstrual cycle by affecting hormonal balance. Smoking has been linked to irregular menstrual cycles, heavier bleeding, and increased risk of early menopause [21].

#### ***Reproductive health***

Tobacco use can negatively impact reproductive health by reducing estrogen levels and affecting ovarian function. Women who smoke may experience more severe menstrual symptoms and a greater risk of conditions such as endometriosis [22].

#### ***Premature menopause***

Long-term smoking has been associated with an earlier onset of menopause. The harmful chemicals in tobacco can accelerate the depletion of ovarian reserves, leading to premature menopause and associated symptoms [23].

### **Recreational drugs**

#### ***Marijuana***

The use of marijuana can affect menstrual health through its impact on the endocannabinoid system, which plays a role in regulating hormonal balance. Research suggests that marijuana use can lead to alterations in menstrual cycles, including irregular periods and changes in menstrual flow [14].

#### ***Cocaine and Amphetamines***

Use of stimulant drugs like cocaine and amphetamines can disrupt menstrual cycles by affecting the hypothalamic-pituitary-ovarian axis. These substances can lead to menstrual irregularities and an increased risk of reproductive health issues [24].

### **Over-the-counter and prescription medications**

#### ***Hormonal contraceptives***

While hormonal contraceptives are used to regulate menstrual cycles and alleviate symptoms of menstrual disorders, their use can sometimes cause side effects such as breakthrough bleeding and irregular cycles. Proper

management and consultation with healthcare providers are essential for minimizing adverse effects [25].

#### ***Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)***

NSAIDs, commonly used to relieve menstrual pain, can impact menstrual health by affecting prostaglandin levels. While they are effective in reducing menstrual cramps, overuse can lead to gastrointestinal issues and other side effects [26].

### **Socioeconomic and behavioural factors**

#### ***Access to healthcare***

Socioeconomic factors can influence substance use patterns and access to healthcare. Individuals with limited access to healthcare may be more likely to use substances that negatively impact menstrual health and have less access to interventions and support for managing menstrual disorders [27].

#### ***Behavioural patterns***

Behavioural patterns associated with substance use, such as stress and poor diet, can further exacerbate menstrual disorders. Addressing underlying behavioural factors and promoting healthy lifestyle choices can help mitigate the impact of substance use on menstrual health [28].

### **Sleep patterns**

#### ***Impact of sleep on hormones***

Adequate sleep is crucial for hormonal regulation and menstrual health. Poor sleep quality and irregular sleep patterns can disrupt the secretion of reproductive hormones.

#### ***Sleep and hormonal regulation***

Sleep plays a critical role in regulating hormones, including those involved in the menstrual cycle. Poor sleep quality and insufficient sleep can lead to disruptions in GnRH, LH, and FSH production, leading to irregular menstrual cycles and increased severity of menstrual symptoms.

#### ***Impact of sleep on hormones and menstrual health***

Sleep plays a crucial role in maintaining hormonal balance and overall menstrual health. Disruptions in sleep patterns can significantly affect the menstrual cycle, exacerbate menstrual disorders, and contribute to broader health issues.

### **Hormonal regulation**

#### ***Circadian rhythm and hormones***

Sleep is regulated by the body's circadian rhythm, which influences the release of various hormones, including melatonin, cortisol, and sex hormones like estrogen and progesterone. Disruptions in sleep patterns can disturb the circadian rhythm, leading to hormonal imbalances that impact menstrual health for instance, irregular sleep patterns can alter the secretion of reproductive hormones, potentially leading to menstrual irregularities [29].

### ***Melatonin***

Melatonin, often referred to as the "sleep hormone," is produced in response to darkness and regulates the sleep-wake cycle. Adequate melatonin levels support healthy sleep patterns, and its imbalance can affect reproductive hormone levels, leading to irregular menstrual cycles. Melatonin has also been linked to the regulation of the menstrual cycle, with low levels associated with irregular menstruation and increased menstrual pain [30].

### **Sleep disorders and menstrual health**

#### ***Insomnia***

Chronic insomnia can lead to elevated levels of cortisol, the stress hormone, which may disrupt the balance of reproductive hormones. Elevated cortisol levels can lead to symptoms such as irregular menstrual cycles and increased severity of premenstrual syndrome (PMS). Insomnia can also exacerbate symptoms of dysmenorrhea, including pain and discomfort [31].

#### ***Sleep apnea***

Sleep apnea, a condition characterized by repeated interruptions in breathing during sleep, has been associated with hormonal imbalances. Research indicates that sleep apnea can lead to disruptions in the luteinizing hormone (LH) and follicle-stimulating hormone (FSH) levels, which are critical for regulating the menstrual cycle. This can result in irregular menstrual cycles and other menstrual disorders [32].

### **Impact of sleep duration**

#### ***Short sleep duration***

Insufficient sleep has been linked to a range of health issues, including menstrual disorders. Studies have shown that women who get less than 6 hours of sleep per night are more likely to experience menstrual irregularities, including amenorrhea and heavy menstrual bleeding. Short sleep duration can affect the hypothalamic-pituitary-ovarian axis, which regulates menstrual function [32].

#### ***Long sleep duration***

Conversely, excessive sleep can also negatively affect menstrual health. Women who sleep more than 9 hours per night may experience hormonal imbalances that contribute to menstrual disorders. Long sleep durations can be associated with conditions such as obesity, which can further impact menstrual health and lead to irregular cycles [33].

### **Sleep quality and menstrual health**

#### ***Sleep quality***

The quality of sleep, including factors like sleep continuity and depth, is critical for hormonal regulation. Poor sleep quality, characterized by frequent awakenings or disrupted sleep patterns, can lead to increased levels of stress hormones and negatively affect menstrual health. Improved

sleep quality is associated with more regular menstrual cycles and reduced menstrual symptoms [34].

### **Sleep hygiene**

Good sleep hygiene practices, such as maintaining a consistent sleep schedule, creating a restful sleep environment, and avoiding stimulants like caffeine close to bedtime, can improve sleep quality and, consequently, menstrual health. Proper sleep hygiene helps regulate the hormonal balance necessary for a healthy menstrual cycle [35].

### **Impact of shift work and jet lag**

#### ***Shift work***

Shift work, especially rotating shifts or night shifts, can disrupt natural sleep patterns and circadian rhythms. This disruption can lead to hormonal imbalances, including altered levels of estrogen and progesterone, which can contribute to menstrual irregularities and other reproductive health issues. Women working irregular hours may experience more severe menstrual symptoms and disruptions in their cycle [36].

#### ***Jet lag***

Traveling across time zones can cause temporary sleep disturbances and affect circadian rhythms. Jet lag has been associated with hormonal imbalances and menstrual irregularities, as the body adjusts to new time zones and disrupted sleep patterns. Managing jet lag through gradual adjustment of sleep schedules and exposure to natural light can help mitigate its impact on menstrual health [37].

### **Stress and sleep**

#### ***Stress-induced sleep disruptions***

Stress can affect sleep patterns and contribute to hormonal imbalances. Chronic stress can lead to insomnia or fragmented sleep, which in turn can exacerbate menstrual symptoms and contribute to menstrual disorders. Effective stress management techniques, such as relaxation exercises and cognitive-behavioural therapy, can improve both sleep quality and menstrual health [38].

### **Long-term effects of poor sleep**

#### ***Chronic sleep disturbance***

Long-term sleep disturbances can lead to persistent hormonal imbalances and exacerbate menstrual disorders. Chronic poor sleep can contribute to conditions such as PCOS, which is characterized by irregular menstrual cycles and hormonal imbalances. Addressing sleep issues and improving overall sleep health is essential for managing long-term menstrual health.

### **Sleep disorders**

#### ***Insomnia***

Insomnia can increase stress levels and disrupt hormonal balance, contributing to menstrual irregularities and PMS.

Research found that women with insomnia reported more severe menstrual symptoms, highlighting the importance of addressing sleep issues for menstrual health [39].

#### ***Sleep apnea***

Sleep apnea is associated with metabolic disturbances and hormonal imbalances, which can exacerbate menstrual disorders. Studies have shown that women with sleep apnea experience more severe menstrual symptoms and irregularities [39].

#### **Socioeconomic and environmental influences**

##### ***Socioeconomic status***

Socioeconomic factors, including income, education, and access to healthcare, impact menstrual health.

##### ***Access to healthcare***

Limited access to healthcare services can affect the management of menstrual disorders. Women with lower socioeconomic status may have less access to medical care, resulting in delayed diagnosis and treatment of menstrual disorders [40].

##### ***Education and awareness***

Education and awareness about menstrual health are crucial for effective management and prevention of menstrual disorders. Higher levels of education are associated with better understanding and management of menstrual health [40].

#### **Environmental factors**

Environmental factors, such as exposure to endocrine-disrupting chemicals and pollutants, can impact menstrual health.

##### ***Endocrine-disrupting chemicals***

Exposure to chemicals such as phthalates, bisphenol A (BPA), and pesticides can disrupt endocrine function and menstrual health. Research highlighted the impact of these chemicals on reproductive health, including menstrual disorders [41].

##### ***Phthalates***

Phthalates, commonly found in plastics and personal care products, are known to interfere with endocrine function. Exposure to phthalates has been associated with hormonal imbalances, which can disrupt menstrual cycles and contribute to conditions like polycystic ovary syndrome (PCOS) [42].

##### ***Bisphenol A (BPA)***

BPA, used in the manufacture of many plastics and resins, has been shown to mimic estrogen and interfere with hormonal regulation. Research suggests that BPA exposure can lead to menstrual irregularities and exacerbate symptoms of menstrual disorders [43].

#### **Heavy metals**

##### ***Lead***

Lead exposure, often from contaminated water or soil, has been linked to reproductive health issues. Studies indicate that lead can affect menstrual function by altering hormonal levels and disrupting menstrual cycles [43].

##### ***Mercury***

Mercury, found in certain fish and industrial pollutants, can also impact menstrual health. Mercury exposure has been associated with hormonal disruption and increased risk of menstrual irregularities [44].

#### **Pesticides and herbicides**

##### ***Agricultural chemicals***

Pesticides and herbicides used in agriculture can disrupt endocrine function. Chronic exposure to these chemicals has been linked to hormonal imbalances and increased risk of menstrual disorders, including irregular cycles and heavier bleeding [45].

#### **Air pollution**

##### ***Particulate Matter (PM)***

Exposure to air pollutants, such as particulate matter (PM), can affect menstrual health by inducing oxidative stress and inflammation. Studies have suggested that long-term exposure to air pollution may lead to menstrual irregularities and increased symptoms of menstrual disorders [46].

##### ***Nitrogen Dioxide (NO<sub>2</sub>)***

High levels of nitrogen dioxide, a common air pollutant, have been associated with hormonal disruptions and adverse effects on menstrual health [47].

#### **Climate Change**

##### ***Temperature fluctuations***

Climate change and associated temperature fluctuations can impact menstrual health by affecting hormone levels and menstrual cycle regularity. Extreme heat or cold can disrupt normal menstrual function and exacerbate existing menstrual disorders [48].

#### **Socioeconomic factors**

##### ***Access to healthcare***

Socioeconomic factors influence exposure to environmental hazards and access to healthcare. Individuals in lower socioeconomic conditions may experience higher levels of exposure to environmental toxins and have limited access to healthcare services for managing menstrual disorders [49].

#### **Urbanization and industrialization**

##### ***Living conditions***

Urbanization and industrialization increase exposure to environmental pollutants and chemicals. Cities often have higher levels of air and water pollution, which can contribute to menstrual disorders and other health issues [50].

## **Environmental toxins and hormonal health**

### ***Synthetic chemicals***

Exposure to synthetic chemicals, including those found in household products, cleaning agents, and personal care items, can disrupt hormonal balance and impact menstrual health. Reducing exposure to these chemicals can help mitigate their effects on menstrual disorders [51].

## **Environmental health policies**

### ***Regulation and policy***

Effective environmental health policies and regulations are essential for reducing exposure to harmful chemicals and pollutants. Implementing stricter regulations on industrial emissions, pesticide use, and chemical safety can contribute to improved menstrual health and overall public health [52].

## **Depressive symptoms during the menstrual cycle**

Depressive symptoms are common during the menstrual cycle, particularly in the luteal phase, which is the time between ovulation and the start of menstruation. This period is often associated with premenstrual syndrome (PMS) or the more severe premenstrual dysphoric disorder (PMDD). Hormonal fluctuations, particularly changes in estrogen and progesterone levels, are believed to influence neurotransmitter activity, leading to mood disturbances. Women with a history of depression or other mood disorders are more susceptible to experiencing severe depressive symptoms during this time [53].

Depressive symptoms during the menstrual cycle can include feelings of sadness, irritability, anxiety, and fatigue. These symptoms can significantly impair daily functioning and quality of life. The cyclical nature of these symptoms highlights the importance of understanding the underlying hormonal and neurobiological mechanisms.

## **Wealth index and its impact on menstrual health and mental well-being**

The wealth index, a composite measure of a household's cumulative living standard, is an important determinant of health outcomes, including menstrual health and mental well-being. Women from lower socio-economic backgrounds often have limited access to healthcare resources, including mental health services, and may experience higher levels of stress due to financial instability. This socio-economic disadvantage can exacerbate depressive symptoms during the menstrual cycle [54].

Socio-economic status, as measured by the wealth index, is associated with disparities in the prevalence and severity of menstrual-related mood disorders. Women from wealthier backgrounds are more likely to have access to effective treatments, including pharmacotherapy and counselling, which can mitigate the impact of depressive symptoms. Conversely, women from lower socio-economic strata may have limited access to such resources, leading to a higher burden of untreated depressive symptoms [54].

## **Interaction between depressive symptoms and wealth index during the menstrual cycle**

The interaction of depressive symptoms and the wealth index during the menstrual cycle is a critical area of study. Women with lower socio-economic status are at a double disadvantage: they are more likely to experience severe depressive symptoms due to stress and lack of resources, and they have less access to healthcare services to manage these symptoms. The relationship between socio-economic status and menstrual-related depressive symptoms is complex, with factors such as education, employment, and social support playing crucial roles. Interventions aimed at improving mental health during the menstrual cycle should consider socio-economic disparities. Public health policies that increase access to mental health services and provide support for low-income women could help reduce the burden of depressive symptoms associated with the menstrual cycle [55].

## **Current statistical data on menstrual disorders in India**

### ***Prevalence of menstrual disorders***

Menstrual disorders are highly prevalent in India, with a significant portion of the female population experiencing issues such as dysmenorrhea (painful menstruation), menorrhagia (heavy menstrual bleeding), oligomenorrhea (infrequent menstruation), and amenorrhea (absence of menstruation). A study conducted among adolescent girls found that dysmenorrhea affects approximately 70-90% of menstruating women, with about 10-20% experiencing severe pain that interferes with daily activities [56].

### ***Socio-economic disparities***

There are significant socio-economic disparities in the prevalence and management of menstrual disorders in India. Women from lower socio-economic backgrounds often have limited access to healthcare services, menstrual hygiene products, and education about menstrual health. Studies indicate that women in rural areas are more likely to experience untreated menstrual disorders due to these barriers [57].

## ***Polycystic Ovary Syndrome (PCOS) and menstrual irregularities***

Polycystic Ovary Syndrome (PCOS) is a leading cause of menstrual irregularities in India, affecting approximately 9-22% of women of reproductive age. PCOS is associated with a range of symptoms including oligomenorrhea, amenorrhea, and menorrhagia. The increasing prevalence of PCOS is linked to lifestyle factors such as diet, physical inactivity, and stress [57].

## **Conclusion**

Lifestyle factors play a critical role in the onset and severity of menstrual disorders. Diet, physical activity, stress, body

weight, substance use, sleep patterns, and socioeconomic and environmental influences all interact to affect menstrual health. Lifestyle factors have a profound impact on menstrual disorders, influencing both their onset and severity. Diet is a crucial component, as deficiencies in key nutrients such as magnesium, vitamin B6, and vitamin D are linked to increased severity of menstrual symptoms. Conversely, diets high in saturated fats and sugars can exacerbate menstrual issues, while a balanced intake of fruits, vegetables, and whole grains supports menstrual health and hormonal balance. Regular physical activity is beneficial in reducing menstrual pain and promoting cycle regularity; however, excessive exercise can disrupt menstrual cycles. Psychological factors and stress levels also play a critical role. Chronic stress can lead to hormonal imbalances and worsen menstrual symptoms, highlighting the importance of effective stress management techniques. Body weight significantly impacts menstrual health, with both obesity and underweight conditions linked to menstrual irregularities and disorders. Additionally, substance use, including alcohol, caffeine, and tobacco, negatively affects menstrual health, increasing symptom severity and irregularities. Adequate sleep is essential for maintaining hormonal balance, as poor sleep patterns can exacerbate menstrual disorders.

Socioeconomic and environmental factors further contribute to menstrual health, with limited access to healthcare and exposure to endocrine-disrupting chemicals being notable influence. Addressing these lifestyle factors through targeted interventions and lifestyle modifications can significantly improve menstrual health and overall well-being. Continued research and public health initiatives are essential for developing effective strategies to manage and prevent menstrual disorders, ensuring comprehensive care and improved quality of life for affected individuals.

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#### Data availability

All data generated or analyzed during this study are included in this published article.

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