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Association of Dysmenorrhea and Lifestyle factors among young females: A Comprehensive review

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Abstract

Dysmenorrhea, characterized by recurrent cramping pain in the lower abdomen during menstruation in the absence of identifiable pelvic pathology, is highly prevalent among adolescents and young adult females and constitutes a significant public health concern. The condition is frequently associated with functional impairment, including reduced academic performance, absenteeism, and compromised psychosocial well-being. Although the pathophysiology of primary dysmenorrhea is largely attributed to increased endometrial prostaglandin production and consequent uterine hypercontractility, accumulating evidence indicates that modifiable lifestyle factors may influence both its occurrence and severity. This review critically synthesizes current literature examining the association between dysmenorrhea and lifestyle-related determinants among young females.

Available data from observational and interventional studies suggest that insufficient physical activity and prolonged sedentary behaviour are positively associated with increased pain intensity, whereas regular moderate aerobic exercise may exert protective effects, potentially through improved pelvic blood flow and modulation of inflammatory mediators. Dietary patterns characterized by high intake of saturated fats, refined carbohydrates, caffeine, and sodium, combined

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with inadequate consumption of fruits, vegetables, and micronutrient-rich foods, have been correlated with greater symptom severity, possibly due to their influence on inflammatory pathways and prostaglandin synthesis. Sleep disturbances and reduced sleep duration have also been linked to heightened pain perception, likely mediated through alterations in neuroendocrine regulation and central pain processing mechanisms. Psychological stress represents another significant correlate, with evidence suggesting that hypothalamic–pituitary–adrenal axis activation and increased sympathetic activity may exacerbate uterine contractility and pain sensitivity. Furthermore, deviations from normal body mass index, including both underweight and overweight status, appear to be associated with dysmenorrhea, indicating a potential nonlinear relationship. Substance use, particularly tobacco smoking and alcohol consumption, has similarly been implicated in increased prevalence and severity of menstrual pain.

Collectively, current findings underscore the potential contribution of modifiable behavioural and lifestyle factors to the burden of dysmenorrhea among young females. However, most available evidence is derived from cross-sectional studies, limiting causal inference. Rigorous longitudinal and randomized interventional research is warranted to elucidate underlying mechanisms and to inform evidence-based preventive and therapeutic strategies.

Key words : Primary dysmenorrhea, menstrual pain, lifestyle factors, adolescents, young women, physical activity, dietary patterns, sleep quality, psychological stress.

Dysmenorrhea, defined as cyclic menstrual pain occurring in the absence of identifiable pelvic pathology, constitutes one of the most prevalent gynaecological disorders among adolescents and young adult women[6]. It is broadly categorized into primary dysmenorrhea, which arises without underlying structural abnormalities[10], and secondary dysmenorrhea, which is attributable to pelvic pathology such as endometriosis, adenomyosis, or uterine anomalies. Primary dysmenorrhea typically manifests within the early post-menarcheal years and is characterized by recurrent, spasmodic lower abdominal pain coinciding with the onset of menstruation[9]. The pain may radiate to the lumbosacral region or thighs and is frequently accompanied by systemic manifestations including gastrointestinal disturbances, fatigue, dizziness, and headache[8]. Beyond its clinical presentation, dysmenorrhea represents a significant public health concern due to its association with impaired academic performance, reduced productivity, absenteeism, and compromised health-related quality of life.

The pathogenesis of primary dysmenorrhea is principally attributed to excessive synthesis and release of endometrial prostaglandins, particularly prostaglandin F2α, during the luteal phase and menstruation[5]. Elevated prostaglandin concen-trations induce increased myometrial contractility, vasoconstriction, and reduced uterine blood flow, resulting in transient ischemia and activation of peripheral nociceptors. In addition to prostaglandins, other mediators—including leukotrienes, vasopressin, and inflammatory cytokines—have been implicated in amplifying uterine hyperactivity and pain perception. Nevertheless, substantial interindividual variability in symptom severity and frequency suggests that biological mechanisms alone do not fully account for the clinical heterogeneity observed, thereby highlighting the potential influence of modifiable behavioural and environmental determinants.

In recent years, increasing attention has been directed toward the role of lifestyle-related factors in shaping reproductive health outcomes[2,3]. Behavioural determinants such as dietary composition, physical activity level, sleep quality and duration, psychosocial stress exposure, body mass index, and substance use are known to modulate endocrine homeostasis, inflammatory signalling pathways, oxidative stress, and central pain processing mechanisms. These pathways may interact with the established pathophysiological processes of dysmenorrhea, potentially influencing both its onset and severity. For instance, physical inactivity and sedentary behaviour may exacerbate inflammatory responses and impair pelvic circulation, whereas suboptimal dietary patterns may alter prostaglandin metabolism and micronutrient status. Similarly, chronic psychological stress and sleep disturbances may dysregulate hypothalamic–pituitary–adrenal axis activity and autonomic balance, thereby enhancing pain sensitivity and uterine contractility.

Adolescence and early adulthood represent critical developmental periods characterized by hormonal maturation and the establishment of long-term health behaviours. During this transitional stage, irregular routines, academic demands, and evolving psychosocial environments may predispose young females to adverse lifestyle patterns that could influence menstrual health. A comprehensive understanding of the association between dysmenorrhea and modifiable lifestyle factors is therefore essential to inform preventive strategies and integrative management approaches. Accordingly, this review aims to critically evaluate current evidence regarding the relationship between dysmenorrhea and lifestyle determinants among young females, with emphasis on underlying biological mechanisms and implications for future research and clinical practice.

Objective :

The principal objective of this review is to systematically analyse and consolidate contemporary evidence regarding the influence of modifiable lifestyle factors on the occurrence and severity of primary dysmenorrhea in adolescent and young adult females. The review specifically seeks to:

1. Identify and categorize lifestyle determinants —including physical activity, dietary patterns, sleep behaviour, psychological stress, body mass index, and substance use—that are associated with the prevalence, intensity, and duration of primary dysmenorrhea.
2. Explore mechanistic pathways through which these lifestyle factors may modulate

menstrual pain, including hormonal, inflammatory, and neuroendocrine processes.

3. Highlight gaps and methodological limitations in the current body of literature to inform the design of future research.
4. Provide evidence-based insights for clinical and public health practice, with the aim of informing non-pharmacological preventive strategies and interventions to reduce symptom burden and enhance quality of life in young females.

Through a synthesis of epidemiological and mechanistic evidence, this review aims to clarify the complex interactions between lifestyle behaviours and menstrual health, there by supporting the development of targeted, evidence-informed strategies for the management and prevention of dysmenorrhea.

This review employed a systematic approach to evaluate the association between primary dysmenorrhea and lifestyle determinants among adolescent and young adult females. A structured literature search was conducted across PubMed, Scopus, Web of Science, and Google Scholar to identify relevant studies published in English within the last 15 years. The search strategy utilized a combination of Medical Subject Headings (MeSH) and free-text terms, including "primary dysmenorrhea," "menstrual pain," "lifestyle factors," "physical activity," "dietary intake," "sleep quality," "psychological stress," "body mass index," "smoking," "alcohol consumption," "adolescents," and "young women," applying Boolean operators (AND, OR) to optimize retrieval.

Eligible studies included observational (cross-sectional, case–control, cohort) and interventional designs that investigated the relationship between lifestyle behaviours and primary dysmenorrhea in females aged 10–25 years. Studies were excluded if they focused exclusively on secondary dysmenorrhea, underlying pelvic pathology, pharmacological interventions without assessment of lifestyle factors, or populations outside the specified age range.

Screening of titles and abstracts was performed to identify potentially relevant studies, followed by full-text evaluation to confirm eligibility. Data extraction was standardized and included the following parameters: author(s), year of publication, study design, sample size and characteristics, methods of dysmenorrhea assessment, specific lifestyle exposures examined, and principal findings. The methodological quality of included studies was critically appraised with respect to sample representativeness, measurement reliability and validity, control of confounding variables, and overall study rigor.

Findings were synthesized narratively and organized according to key lifestyle domains: physical activity, dietary habits, sleep patterns, psychological stress, body mass index, and substance use. Due to heterogeneity in study designs, outcome measures, and exposure assessments, meta-analysis was not feasible. This review aims to provide a comprehensive, mechanistic, and evidence-based evaluation of lifestyle influences on dysmenorrhea, while identifying gaps for future research and clinical intervention strategies.

The synthesized literature indicates that modifiable lifestyle factors exert a considerable influence on the prevalence, intensity, and clinical manifestation of primary dysmenorrhea among adolescent and young adult females. Evidence from observational, cohort, and interventional studies consistently highlights associations between menstrual pain and behaviours related to physical activity, dietary intake, sleep, psychological stress, body composition, and substance use.

Physical Activity : Regular engagement in physical activity, including moderate-intensity aerobic exercise, resistance training, and mind–body practices such as yoga, is inversely associated with dysmenorrhea severity. Mechanistic explanations include enhanced uterine perfusion, attenuation of prostaglandin-induced myometrial hypercontractility, and modulation of nociceptive signalling through endogenous opioid release. Sedentary behaviour, conversely, is linked to increased pain intensity and longer duration of symptoms.

Dietary Patterns : Nutritional intake significantly impacts menstrual pain, likely through inflammatory and hormonal pathways. Diets high in saturated fats, refined sugars, caffeine, and ultra-processed foods are associated with greater dysmenorrhea severity, whereas consumption of fruits, vegetables, whole grains, and omega-3 fatty acids correlates with reduced pain. Micronutrients such as magnesium, vitamin B1, and vitamin E have been shown to alleviate uterine contractility and oxidative stress, contributing to symptomatic relief.

Sleep Quality : Impaired sleep, including reduced duration and poor quality, is associated with exacerbation of dysmenorrhea. Sleep disturbances may enhance pain perception via dysregulation of the hypothalamic–pituitary–adrenal axis and heightened central sensitization, leading to increased uterine contractility and nociceptive signalling.

Psychological Stress : Elevated stress levels are strongly associated with both the prevalence and severity of dysmenorrhea[1,7]. Stress-induced activation of the sympathetic nervous system and HPA axis may amplify uterine hyperactivity and central pain sensitivity, establishing a bidirectional relationship between menstrual pain and psychological well-being[4].

Body Mass Index : Both low and high BMI values have been implicated in increased risk and severity of dysmenorrhea, indicating a non-linear (U-shaped) relationship. Altered adiposity can influence sex hormone metabolism, inflammatory cytokine expression, and prostaglandin synthesis, thereby modulating the intensity of menstrual pain.

Substance Use : Tobacco, smoking and alcohol consumption are associated with heightened dysmenorrhea prevalence and severity. Nicotine-induced vasoconstriction and alcohol-related hormonal and inflammatory dysregulation may exacerbate uterine ischemia and nociceptive processing.

Collectively, these findings underscore that primary dysmenorrhea is a multifactorial condition influenced by modifiable lifestyle behaviours. However, the predominance of cross-sectional designs, reliance on self-reported measures, and heterogeneity in study methodologies limit causal inference. Future longitudinal and interventional studies are warranted to delineate mechanistic pathways and inform evidence-based lifestyle interventions aimed at prevention and symptom mitigation.

Primary dysmenorrhea is a highly prevalent gynaecological condition among adolescents and young adult females, exerting significant effects on physical functioning, psychosocial well-being, and overall quality of life. Evidence from current literature indicates that modifiable lifestyle factors—including structured physical activity, dietary composition, sleep hygiene, psychological stress, body mass index, and substance use—have a considerable impact on the onset, severity, and duration of menstrual pain. Regular engagement in exercise, adherence to a nutrient-dense and anti-inflammatory diet, maintenance of adequate sleep patterns, effective stress regulation, and avoidance of tobacco and alcohol are consistently associated with reductions in dysmenorrhea severity and improvements in quality-of-life metrics.

Nevertheless, most studies to date are observational and cross-sectional in design, often relying on self-reported measures of pain and lifestyle exposures, which limits the ability to establish causal relationships. Future research employing longitudinal, interventional, and mechanistic approaches is essential to delineate the underlying biological pathways, quantify the efficacy of specific lifestyle interventions, and inform evidence-based clinical and public health strategies. Integrating lifestyle modification with standard therapeutic approaches may provide a comprehensive framework for mitigating symptom burden, optimizing reproductive health outcomes, and promoting holistic well-being in young female populations.

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