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DYSMENORRHEA: CLINICAL MANIFESTATIONS, PATHOGENESIS AND CONTEMPORARY TREATMENT STRATEGIES

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Abstract

Dysmenorrhea is one of the most frequent gynecological complaints among adolescents and women of reproductive age. It is often normalized as a routine part of menstruation, yet recurrent menstrual pain may substantially reduce educational participation, work productivity, sleep quality, mental well-being, and social functioning. This article provides an IMRAD-based analytical review of dysmenorrhea with emphasis on clinical phenotypes, prostaglandin-centered pathogenesis, differential diagnosis, contemporary treatment strategies, real-world evidence, artificial intelligence, pharmacovigilance, and implementation perspectives for Uzbekistan.

Evidence was synthesized from PubMed-indexed reviews, Cochrane evidence, WHO menstrual health materials, ACOG and ESHRE guidance, and regulatory sources from FDA and EMA on real-world evidence and AI-enabled health technologies. The review highlights that primary dysmenorrhea is mainly driven by increased endometrial production of prostaglandin F2α and prostaglandin E2, which induce myometrial hypercontractility, vasoconstriction, ischemia, and pain. Secondary dysmenorrhea requires active evaluation for endometriosis, adenomyosis, fibroids, pelvic inflammatory disease, and structural anomalies. NSAIDs, hormonal therapy, heat therapy, exercise, patient education, and timely referral form the core of modern management.

The article argues that modern dysmenorrhea care should combine pathophysiological reasoning with real-world evidence, patient-reported outcomes, pharmacovigilance, and ethically governed artificial intelligence. Such an approach is especially important for health systems developing electronic prescriptions, registries, and digital clinical decision support. For Uzbekistan, structured menstrual health documentation may create a foundation for safer analgesic use, earlier detection of secondary dysmenorrhea, and locally relevant research.

Keywords: dysmenorrhea, primary dysmenorrhea, secondary dysmenorrhea, prostaglandins, NSAIDs, endometriosis, menstrual health, real-world evidence, artificial intelligence, pharmacovigilance, Uzbekistan.

Introduction

Dysmenorrhea refers to painful menstruation of uterine origin. Clinically, it is divided into primary dysmenorrhea, where no identifiable pelvic pathology is present, and secondary dysmenorrhea, where pain is caused by conditions such as endometriosis, adenomyosis, fibroids, pelvic inflammatory disease, congenital obstructive anomalies, or intrauterine pathology. Primary

dysmenorrhea usually begins after ovulatory cycles have been established and is commonly most severe during the first 24 to 72 hours of menstrual bleeding.

The public health relevance of dysmenorrhea is frequently underestimated. Menstrual pain is not merely a short-lived symptom; in moderate and severe cases it may result in school absenteeism, loss of work productivity, reduced physical activity, impaired sleep, emotional distress, and repeated use of analgesics without medical supervision. The WHO menstrual health framework stresses that menstrual difficulties should be recognized as legitimate reasons to seek health care, rather than being dismissed as unavoidable discomfort.

Modern clinical research increasingly combines randomized controlled trials with real-world evidence. RCTs remain essential for estimating efficacy under controlled conditions, yet dysmenorrhea care often occurs outside trial-like settings: patients self-medicate, delay NSAID intake, use different doses, combine analgesics, or avoid consultation because of stigma. Real-world data from electronic health records, e-prescriptions, registries, pharmacovigilance systems, mobile diaries, and wearable devices can therefore complement trial evidence and illuminate effectiveness in routine practice.

Artificial intelligence may further strengthen dysmenorrhea research by identifying high-risk phenotypes, extracting symptom patterns from clinical notes, predicting poor response to NSAIDs, detecting adverse drug reaction signals, and supporting referral decisions when secondary dysmenorrhea is suspected. However, AI tools must be transparent, validated, clinically supervised, and ethically governed, particularly because menstrual and reproductive data are sensitive personal health information.

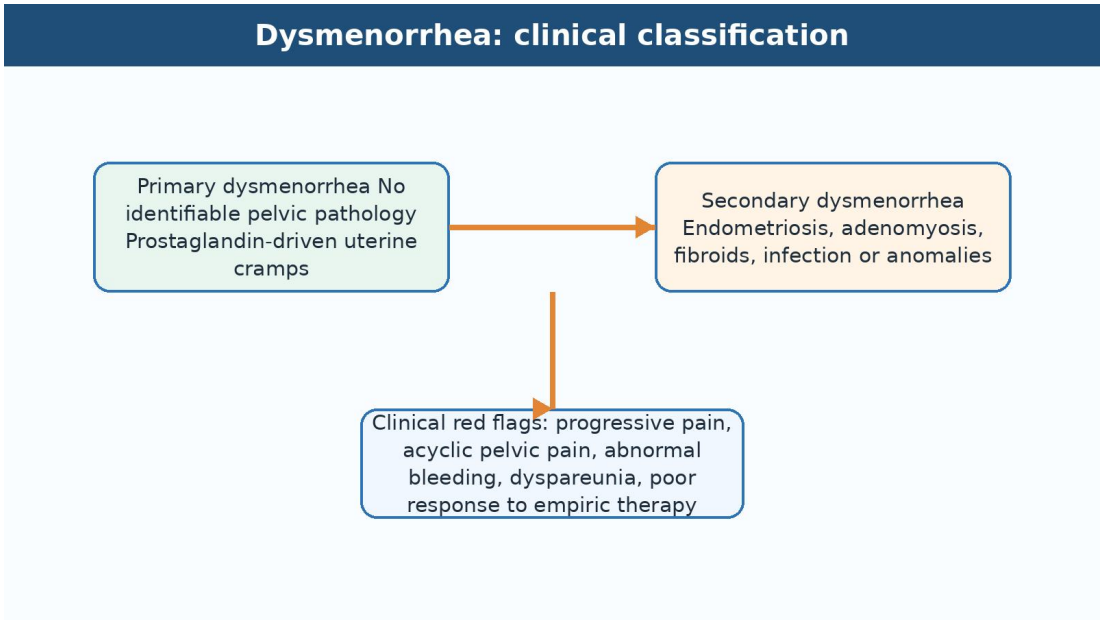

Figure 1. Clinical classification and red flags in dysmenorrhea.

Materials and Methods

This article was prepared as an analytical narrative review with elements of a scoping review. Evidence was searched and synthesized from PubMed, Scopus, Web of Science, Embase, Cochrane Library, WHO, FDA, EMA, ESHRE, and methodological literature on real-world evidence and artificial intelligence in health care. The search strategy combined terms related to dysmenorrhea,

primary dysmenorrhea, prostaglandins, NSAIDs, menstrual pain, endometriosis, real-world data, pharmacovigilance, machine learning, natural language processing, and clinical decision support.

The inclusion criteria covered clinical guidelines, systematic reviews, meta-analyses, randomized controlled trials, pharmacoepidemiological studies, regulatory documents, and high-quality narrative reviews relevant to dysmenorrhea, menstrual health, prostaglandin biology, anti-inflammatory therapy, real-world evidence, and AI-based clinical analytics. Publications with unclear methodology, unsupported claims, purely promotional content, or duplicated data were excluded from the core synthesis.

The methodological framework distinguished efficacy from effectiveness. Efficacy was interpreted as benefit under controlled conditions, mostly from randomized trials, whereas effectiveness was interpreted as benefit in routine care, where treatment timing, adherence, self-medication, comorbidity, access to care, and patient education modify outcomes. For observational evidence, the review discusses Propensity Score Matching, Inverse Probability Weighting, Cox regression, Kaplan-Meier analysis, target trial emulation, causal inference, survival analysis, machine learning, deep learning, natural language processing, and large language models.

Analytical framework for RWD, RWE and AI methods

Real-world data were interpreted as routinely collected health data generated outside the narrow architecture of a randomized trial. In the context of dysmenorrhea, this includes electronic health records, outpatient records, emergency visits, e-prescriptions, pharmacy dispensing data, imaging reports, laboratory information systems, school or workplace absence records when ethically available, pharmacovigilance reports, menstrual tracking applications, and wearable-derived physiological measures. Real-world evidence was defined as clinically interpretable evidence produced from RWD through transparent epidemiological, statistical, and computational methods.

The review treats RCTs and RWE as complementary rather than competing forms of evidence. RCTs protect internal validity through randomization, protocolized therapy, and close follow-up; however, they often underrepresent adolescents, patients using over-the-counter analgesics, women with irregular access to care, and those whose treatment behavior is shaped by stigma or cost. RWE can address these implementation questions, but it requires active control of confounding, missingness, misclassification, immortal time bias, and selection bias.

Propensity score matching can create more comparable treatment groups by matching patients with similar baseline probability of receiving a given therapy. Inverse probability weighting uses the propensity score to weight observations and estimate an average treatment effect in a pseudo-population. Cox regression and Kaplan-Meier curves are useful when the outcome is time-dependent, such as time to reconsultation, time to therapy switching, or time to suspected endometriosis referral. Target trial emulation strengthens observational studies by forcing investigators to specify eligibility, treatment strategies, assignment time, follow-up, outcome, and estimand before analyzing routine data.

Causal inference was considered essential because observational associations can easily be misread as treatment effects. For example, women receiving stronger analgesics may appear to have worse outcomes not because the drugs are harmful, but because baseline pain severity is higher. Machine learning, deep learning, natural language processing, reinforcement learning, and large language models were evaluated as tools for prediction, classification, signal detection, and

evidence synthesis. They were not treated as substitutes for clinical judgment, biological plausibility, or regulatory oversight.

Results

Clinical manifestations and phenotypes

Primary dysmenorrhea classically presents as cramping lower abdominal pain beginning shortly before or at the onset of menses. Pain may radiate to the lower back, groin, or thighs and may be accompanied by nausea, vomiting, diarrhea, fatigue, headache, dizziness, sleep disturbance, and mood irritability. The cyclical pattern and absence of alarming pelvic symptoms support the primary diagnosis, but the clinical assessment should always include severity, duration, functional impairment, and treatment response.

Secondary dysmenorrhea should be suspected when pain is progressive, acyclic, associated with dyspareunia, dyschezia, urinary symptoms, abnormal bleeding, infertility, pelvic mass, fever, or poor response to empiric NSAID and hormonal therapy. Endometriosis is a particularly important cause in adolescents and young adults with severe or treatment-resistant dysmenorrhea. A structured red-flag approach helps prevent diagnostic delay.

Pathogenesis

The dominant mechanism in primary dysmenorrhea is excessive production of prostaglandin F2α and prostaglandin E2 during endometrial shedding. Prostaglandin F2α increases uterine tone and high-amplitude contractions, whereas PGE2 contributes to inflammatory signaling and pain sensitization. The resulting vasoconstriction and reduced uterine perfusion lead to ischemia, anaerobic metabolites, and activation of nociceptive pathways.

The prostaglandin model does not exclude other mechanisms. Vasopressin, leukotrienes, inflammatory cytokines, oxidative stress, altered pain modulation, sleep disturbance, anxiety, and central sensitization may modify symptom intensity. Secondary dysmenorrhea adds lesion-specific mechanisms such as inflammatory peritoneal activity, neuroangiogenesis, deep infiltrating lesions, adenomyotic myometrial remodeling, or pelvic adhesions.

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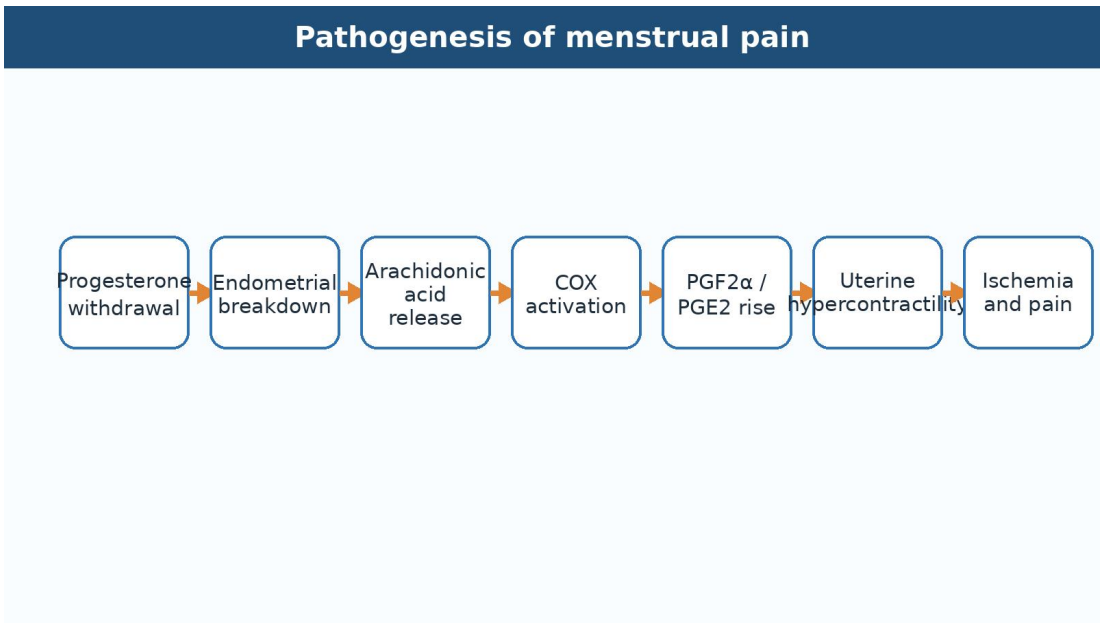

Figure 2. Prostaglandin-centered pathogenesis of primary dysmenorrhea.

Contemporary treatment

NSAIDs are first-line therapy for typical primary dysmenorrhea because they inhibit cyclooxygenase enzymes and reduce prostaglandin synthesis. Clinical benefit depends not only on the molecule but also on timing. A planned short course initiated at the onset of bleeding or early symptoms is usually more rational than delayed rescue intake after severe pain has already developed. Safety assessment should include gastrointestinal, renal, cardiovascular, allergy, pregnancy-related, and drug-interaction risks.

Hormonal therapy reduces menstrual pain by suppressing ovulation, stabilizing the endometrium, and decreasing menstrual prostaglandin production. Combined hormonal contraceptives, progestin-only methods, implants, and levonorgestrel-releasing intrauterine systems may be considered when NSAIDs are insufficient, contraception is desired, or menstrual suppression is clinically useful. Non-pharmacological measures such as heat therapy, exercise, sleep hygiene, stress reduction, and menstrual education improve patient autonomy and may reduce reliance on analgesics.

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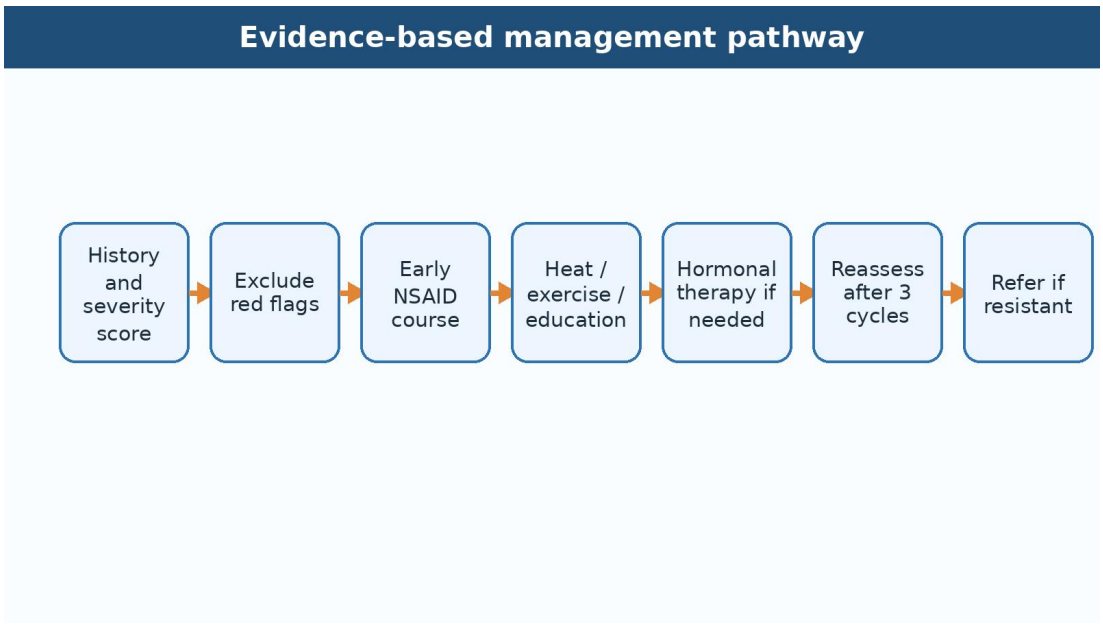

Figure 3. Practical management pathway for dysmenorrhea.

RWD, RWE and AI in dysmenorrhea care

Electronic health records, e-prescriptions, laboratory databases, national registries, pharmacovigilance reports, insurance claims, wearable sensors, and mobile applications can capture the real course of dysmenorrhea. These data sources make it possible to study treatment switching, repeated consultations, adverse reactions, missed school or work, and long-term trajectories toward endometriosis diagnosis.

Machine learning can classify patients likely to respond to NSAIDs, deep learning can support imaging-related research, NLP can extract menstrual pain signals from clinical notes, and large language models can assist in literature screening or patient-facing educational material. Nevertheless, algorithmic bias, missing data, poor coding, lack of explainability, and privacy concerns remain central limitations.

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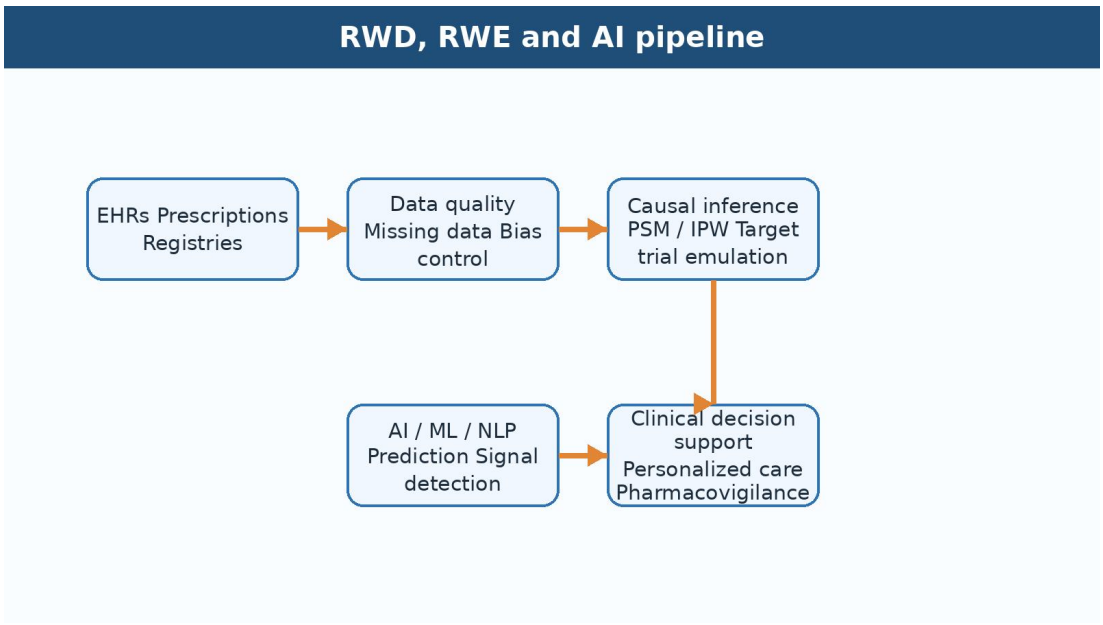

Figure 4. Real-world evidence and artificial intelligence pipeline for menstrual pain research.

Table 1. Differential features of primary and secondary dysmenorrhea

Feature	Primary dysmenorrhea	Secondary dysmenorrhea
Onset	After ovulatory cycles, often adolescence	May appear later or progressively worsen
Pain pattern	Cyclic, strongest first 1-2 days	Acyclic pain or pain outside menses may occur
Pelvic pathology	Absent	Endometriosis, adenomyosis, fibroid, infection, anomaly
Response	Often improves with NSAIDs or hormonal therapy	Often incomplete or transient

Table 2. Real-world data sources for dysmenorrhea research

Source	Main content	Research value
EHR	Diagnosis, symptoms, imaging, treatment	Longitudinal clinical pathway
E-prescription	Drug name, dose, refill	Treatment patterns and safety
Mobile diary	Pain score, timing, adherence	Patient-reported outcomes
Pharmacovigilance	Adverse drug reactions	Safety signal detection

Real-world data sources for dysmenorrhea research

Electronic health records are the most practical backbone for dysmenorrhea RWE because they contain diagnostic codes, narrative symptoms, examination notes, ultrasound referrals, prescriptions, comorbidities, and repeated visits over time. Their value increases when menstrual pain is coded consistently and when clinicians record pain severity, cycle timing, functional impairment, treatment exposure, red flags, and follow-up response. Without these structured fields, dysmenorrhea may remain hidden in free text or be reduced to nonspecific abdominal pain.

Electronic prescription systems are particularly important for evaluating NSAID effectiveness and safety. They allow researchers to observe which agents are prescribed, whether treatment is repeated monthly, whether gastroprotective therapy is added, and when a patient switches from NSAIDs to hormonal therapy. In countries where over-the-counter NSAID use is common, pharmacy dispensing and patient-reported data are needed to complement prescription databases; otherwise, exposure misclassification may be substantial.

Laboratory databases and imaging repositories do not diagnose primary dysmenorrhea directly, but they help distinguish primary pain from anemia, inflammatory disease, pregnancy-related problems, pelvic inflammatory disease, ovarian pathology, adenomyosis, and endometriosis-related findings. National registries can support long-term monitoring of endometriosis diagnosis, surgical treatment, infertility care, and recurrent pelvic pain. Pharmacovigilance databases are useful for adverse drug reaction detection, especially when NSAIDs are used repeatedly without direct clinician supervision.

Wearable devices and mobile applications introduce a patient-centered layer of evidence. Menstrual diaries can capture pain onset, pain intensity, analgesic timing, bleeding pattern, nausea, diarrhea, sleep disturbance, mood, school absence, and activity restriction. Wearables may add sleep duration, heart rate variability, activity change, and physiological stress measures. These sources are promising, but they raise major questions about representativeness, data ownership, consent, commercial influence, and the clinical validity of consumer-generated metrics.

Artificial intelligence in evaluation of treatment effectiveness

Machine learning can support dysmenorrhea care by identifying patterns that are difficult to detect through routine consultation alone. Supervised models may predict response to NSAIDs or hormonal therapy using baseline pain score, age at menarche, cycle regularity, bleeding intensity, gastrointestinal symptoms, family history, comorbid migraine, sleep measures, anxiety symptoms, previous analgesic exposure, and treatment timing. These models are clinically useful only if they are externally validated and calibrated for the population in which they are deployed.

Deep learning may contribute to image-intensive domains, particularly when secondary dysmenorrhea is suspected. Ultrasound and MRI-based models could assist research into adenomyosis, endometriosis-related lesions, or structural pelvic abnormalities, although clinical use requires careful validation against expert interpretation. Natural language processing is highly relevant because menstrual pain is often documented in narrative language. NLP can extract symptom duration, cyclicity, severity, treatment response, and red flags from clinical notes, but free-text analysis must protect privacy and avoid amplifying documentation bias.

Reinforcement learning is less mature in gynecological pain care, but conceptually it could model sequential treatment choices across cycles: education, NSAID timing optimization, hormonal suppression, imaging, referral, or multidisciplinary pain management. Large language models may help screen literature, draft patient education, or structure clinical documentation. Their outputs require source verification because fabricated references, overconfident advice, and hidden bias are unacceptable in clinical decision-making.

Prediction of drug effectiveness across clinical domains

The methodological lessons from diabetes, cardiovascular disease, oncology, infectious diseases, and neurology are relevant for dysmenorrhea. In diabetes, RWE studies evaluate

medication persistence, hypoglycemia, cardiovascular outcomes, and treatment intensification. In cardiovascular disease, survival analysis and target trial emulation are used to compare drug strategies when long-term outcomes are essential. In oncology, biomarkers and registries support precision medicine, but confounding by indication remains a major problem.

In infectious diseases, real-world effectiveness may differ from trial efficacy because adherence, resistance, timing of therapy, and population vulnerability change outcomes. Neurology illustrates the importance of patient-reported outcomes and fluctuating symptoms, which is directly relevant to recurrent menstrual pain. Dysmenorrhea research can borrow these methodological tools: repeated monthly outcomes, patient diaries, treatment adherence, safety monitoring, and individualized response prediction should become routine endpoints rather than secondary afterthoughts.

Pharmacovigilance and adverse drug reaction detection

NSAIDs are familiar drugs, but familiarity should not be confused with absence of risk. Gastrointestinal pain, dyspepsia, ulceration, renal effects, hypersensitivity, bronchospasm in aspirin-sensitive patients, drug interactions, and inappropriate use in possible pregnancy are clinically meaningful. A dysmenorrhea pharmacovigilance system should therefore capture drug name, dose, duration, timing relative to menstruation, co-medication, adverse reaction, dechallenge, rechallenge, and outcome.

Drug safety signal detection can use disproportionality analysis, temporal pattern discovery, clustering, and NLP-assisted extraction from spontaneous reports. The main limitation is underreporting: young patients may not report adverse effects, clinicians may not ask about over-the-counter NSAID use, and menstrual pain may not be considered a formal indication. Public education and pharmacist involvement can improve the signal quality of pharmacovigilance systems.

Personalized medicine and biomarkers

Personalized care in dysmenorrhea does not begin with expensive genomics; it begins with careful phenotyping. Pain intensity, onset, duration, systemic symptoms, functional impairment, family history, bowel or urinary symptoms, dyspareunia, bleeding pattern, and previous treatment response already separate patients into clinically meaningful subgroups. Pharmacogenomics and pharmacogenetics may eventually help predict NSAID metabolism, adverse reaction risk, or response to hormonal therapy, but current clinical implementation remains limited.

Biomarker research may include inflammatory mediators, prostaglandin metabolites, pain sensitization markers, imaging features, and endometriosis-associated signatures. The challenge is that a biomarker must improve decision-making beyond history and examination. Precision medicine is therefore most credible when molecular data, patient-reported outcomes, imaging, and routine clinical records are integrated into a transparent decision pathway.

Discussion

The synthesis confirms that dysmenorrhea is a biologically plausible, clinically measurable, and socially meaningful disorder. The prostaglandin pathway explains why NSAIDs are effective in many patients, but it does not explain all treatment failures. Poor timing of medication, inadequate

dosing, central sensitization, psychosocial stress, or unrecognized secondary pathology may lead to persistent symptoms. Therefore, treatment failure should trigger reassessment rather than dismissal.

Real-world evidence is particularly useful in dysmenorrhea because much of the burden occurs outside specialist clinics. RCTs show efficacy, but RWD reveals whether patients actually receive, afford, understand, and tolerate therapy. For Uzbekistan, the expansion of electronic prescription and digital health systems creates an opportunity to build structured menstrual health data, monitor NSAID use, detect adverse reactions, and design national clinical pathways.

AI-enabled tools should be implemented cautiously. Explainable AI, ethical governance, data quality control, and local validation are mandatory. A model trained in one population may not perform well in another because of differences in health-seeking behavior, documentation style, medication access, stigma, and cultural interpretation of menstrual pain.

Global regulatory and ethical context

International regulatory science increasingly recognizes RWD and RWE as important complements to traditional clinical trials. The FDA has developed programs and guidance around the use of RWD and RWE in regulatory decision-making, particularly for post-marketing safety and effectiveness questions. EMA's DARWIN EU initiative illustrates a European model for federated real-world data analysis, in which evidence can be generated from multiple data partners while preserving governance standards.

WHO guidance on artificial intelligence in health emphasizes ethics, transparency, human oversight, equity, data protection, and accountability. These principles are directly relevant to menstrual health because reproductive data are sensitive and because algorithmic systems may reproduce existing gender, socioeconomic, linguistic, or documentation bias. An AI model that underestimates pain in groups who seek care less frequently would worsen inequity rather than improve care.

Explainable AI is not a decorative requirement; it is a clinical safety condition. Clinicians need to know whether a model recommends referral because of progressive pain, repeated treatment failure, abnormal bleeding, or a pattern suggesting secondary dysmenorrhea. Ethical AI also requires clear consent, data minimization, audit trails, local validation, and mechanisms for correcting erroneous outputs.

Clinical decision support systems should be evaluated not only for accuracy but also for workflow fit. A technically accurate alert that appears too late, interrupts routine care, or produces too many false positives will be ignored. The best systems provide short, specific recommendations at the point of decision: optimize NSAID timing, screen for contraindications, ask about red flags, consider hormonal therapy, or refer for suspected endometriosis.

Uzbekistan-specific considerations

Uzbekistan's digital health reforms, including e-prescription initiatives and the development of electronic health infrastructure, can support menstrual health research if data are standardized. A practical minimum dataset for dysmenorrhea should include pain score, cycle day, functional impairment, NSAID timing, adverse effects, red flags, imaging results, and referral decisions.

Clinical pharmacology services may contribute by developing NSAID safety algorithms, educational leaflets for patients, pharmacist counseling tools, and pharmacovigilance pathways.

Menstrual health education in schools and universities would reduce stigma and encourage timely care-seeking for severe or atypical pain.

Critical interpretation of the evidence base

The evidence base for dysmenorrhea is broad but uneven. NSAIDs are supported by a clear biological rationale and systematic review evidence, yet many trials are small, heterogeneous, and focused on short-term pain reduction rather than functional recovery. Hormonal therapies are clinically useful, particularly when menstrual suppression is desired, but comparative evidence across different regimens is complicated by contraception preference, bleeding tolerance, contraindications, and adherence. Non-pharmacological interventions such as heat and exercise are attractive because they are accessible and generally safe, but the quality and comparability of trials vary.

A major weakness in dysmenorrhea research is the insufficient measurement of real-life impairment. Pain scores are necessary, but they do not fully describe missed school, reduced concentration, sleep disruption, avoidance of physical activity, emotional distress, or family and workplace consequences. A woman whose pain score decreases modestly but who returns to school or work may experience a clinically meaningful benefit. Conversely, a patient with lower reported pain but repeated vomiting, exhaustion, and absenteeism may remain undertreated.

The separation between primary and secondary dysmenorrhea is useful for teaching and clinical triage, but real patients do not always fit neatly into categories. A young patient may initially present with symptoms consistent with primary dysmenorrhea and later be diagnosed with endometriosis. This does not mean the original assessment was negligent; it means dysmenorrhea is a dynamic clinical problem that requires follow-up. Guidelines therefore emphasize reassessment when empiric therapy fails or when red flags emerge.

The clinical pathway should also account for stigma. Many adolescents and young women delay care because menstrual pain is normalized by family members, peers, or even health professionals. This delay may lead to prolonged self-medication and later diagnosis of secondary causes. A modern approach should validate symptoms, provide practical pain management, and define clear thresholds for further assessment.

Another limitation of the evidence base is the underrepresentation of low-resource and middle-income health system contexts. Studies from highly digitized systems may not generalize to settings where electronic records are incomplete, over-the-counter analgesic use is common, and gynecological consultation is delayed. This is precisely where local RWE becomes important: it can identify the actual pathways through which patients obtain care.

Menstrual health research should also avoid reducing dysmenorrhea to reproductive biology alone. Pain is shaped by neurophysiology, sleep, stress, social support, educational expectations, access to medication, and cultural meaning. Multidisciplinary management is not required for every patient, but severe and persistent cases may benefit from gynecology, adolescent medicine, pain medicine, psychology, physiotherapy, and clinical pharmacology working together.

Implementation framework for clinical practice

A pragmatic clinical algorithm begins with history. The clinician should record age at menarche, cycle regularity, pain onset relative to bleeding, pain duration, radiation, systemic symptoms, bleeding volume, sexual history when appropriate, bowel and urinary symptoms,

medication use, contraindications to NSAIDs or hormonal therapy, and functional impact. A short validated pain score and a functional question, such as missed school or work, are often more useful than a long unstructured interview.

The first treatment decision should be accompanied by precise instructions. For suspected primary dysmenorrhea, NSAIDs should be taken early and regularly for the painful window when not contraindicated. The patient should know the maximum daily dose, what combinations to avoid, what adverse symptoms require discontinuation, and when to seek care. Heat therapy and activity modification should be presented as legitimate adjuncts, not as a dismissal of pain.

Follow-up after two or three cycles is clinically important. If the response is good, the plan can continue with periodic safety review. If response is partial, the clinician should check timing, dose, adherence, vomiting, drug interactions, and patient expectations. If response remains poor despite correct use, or if red flags are present, pelvic examination when appropriate, ultrasound, laboratory tests, hormonal therapy, or referral should be considered.

For health systems, a standardized dysmenorrhea template could improve both care and research. The template should include pain severity, cycle day, suspected type, red flags, treatment plan, NSAID contraindications, adverse reactions, and follow-up decision. This small documentation change would make future RWE studies far more reliable than retrospective extraction from vague notes.

Table 3. Minimum clinical dataset for dysmenorrhea RWE

Domain	Suggested variables	Purpose
Symptoms	Pain score, cycle day, duration, radiation, systemic symptoms	Phenotyping and severity assessment
Function	School/work absence, sleep disturbance, activity limitation	Outcome beyond pain score
Treatment	NSAID name, dose, timing, hormonal therapy, heat/exercise	Effectiveness and adherence analysis
Safety	Contraindications, adverse reactions, comedications	Pharmacovigilance and stewardship
Referral	Red flags, imaging, suspected endometriosis	Detection of secondary dysmenorrhea

Uzbekistan: practical roadmap

For Uzbekistan, the immediate priority is not an expensive AI platform but consistent clinical data capture. Electronic health records and e-prescription systems can support dysmenorrhea care if the required fields are simple enough for routine use. A national approach could begin with outpatient clinics, student health services, and pharmacies, where menstrual pain is commonly managed.

Clinical pharmacology services could develop national NSAID counseling standards. These standards should explain early use, dosing limits, contraindications, gastrointestinal and renal risks, interactions with anticoagulants or corticosteroids, and the importance of avoiding duplicate NSAIDs. Pharmacists can play a major role because many patients first seek over-the-counter relief rather than specialist care.

Digital tools should be multilingual and culturally acceptable. Patient-facing materials in Uzbek, Russian, and other locally relevant languages could improve health literacy. A mobile diary does not need to be complex: cycle day, pain score, medication timing, adverse effects, and activity limitation may be enough to guide consultation and generate useful anonymized evidence.

The longer-term roadmap includes national registries for endometriosis and chronic pelvic pain, integration of e-prescription data with adverse reaction reporting, and locally validated clinical decision support. Any AI model should be trained and tested on representative local data, with explicit evaluation for bias by age, region, language, socioeconomic status, and access to gynecological care.

Conclusion

Dysmenorrhea should be approached as a clinically important condition rather than a normal inconvenience. Primary dysmenorrhea is largely prostaglandin-mediated and often responds to early NSAID therapy, hormonal suppression, heat, exercise, and education. Secondary dysmenorrhea requires active detection of red flags and timely referral.

The future of dysmenorrhea care lies in integrating molecular pathophysiology, patient-reported outcomes, real-world evidence, AI-supported risk stratification, and ethically governed digital health systems. For Uzbekistan, digital prescription and electronic health records can become the foundation for national menstrual health evidence.

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1. World Health Organization. Menstrual health. Geneva: WHO; 2026. Available from: https://www.who.int/news-room/fact-sheets/detail/menstrual-health

2. Itani R, Soubra L, Karout S, Rahme D, Karout L, Khojah HMJ. Primary dysmenorrhea: pathophysiology, diagnosis, and treatment updates. Korean J Fam Med. 2022;43(2):101-108. doi:10.4082/kjfm.21.0103

3. Marjoribanks J, Ayeleke RO, Farquhar C, Proctor M. Nonsteroidal anti-inflammatory drugs for dysmenorrhoea. Cochrane Database Syst Rev. 2015;(7):CD001751. doi:10.1002/14651858.CD001751.pub3

4. American College of Obstetricians and Gynecologists. Committee Opinion No. 760: Dysmenorrhea and endometriosis in the adolescent. Obstet Gynecol. 2018;132(6):e249-e258. doi:10.1097/AOG.0000000000002978

5. Becker CM, Bokor A, Heikinheimo O, Horne A, Jansen F, Kiesel L, et al. ESHRE guideline: endometriosis. Hum Reprod Open. 2022;2022(2):hoac009. doi:10.1093/hropen/hoac009

6. Gutman G, Nunez AT, Fisher M. Dysmenorrhea in adolescents. Curr Probl Pediatr Adolesc Health Care. 2022;52(5):101186. doi:10.1016/j.cppeds.2022.101186

7. Osayande AS, Mehulic S. Diagnosis and initial management of dysmenorrhea. Am Fam Physician. 2014;89(5):341-346.

8. Smith RP. Dysmenorrhea and menorrhagia. In: Berek JS, editor. Berek & Novak's Gynecology. 16th ed. Philadelphia: Wolters Kluwer; 2020.

9. Dawood MY. Primary dysmenorrhea: advances in pathogenesis and management. Obstet Gynecol. 2006;108(2):428-441. doi:10.1097/01.AOG.0000230214.26638.0c

10. Akerlund M. Pathophysiology of dysmenorrhea. Acta Obstet Gynecol Scand Suppl. 1979;87:27-32.

11. Pulkkinen MO. Prostaglandins and the non-pregnant uterus: the pathophysiology of primary dysmenorrhea. Acta Obstet Gynecol Scand Suppl. 1983;113:63-67. doi:10.3109/00016348309155200

12. Zheng Q, Huang G, Cao W, Zhao Y. Comparative effectiveness of exercise interventions for primary dysmenorrhea: a systematic review and network meta-analysis. BMC Womens Health. 2024;24:610. doi:10.1186/s12905-024-03453-w

13. Tsai IC, Hsu CW, et al. Comparative effectiveness of different exercises for reducing pain intensity in primary dysmenorrhea: a systematic review and network meta-analysis of randomized controlled trials. Sports Med Open. 2024;10:63. doi:10.1186/s40798-024-00718-4

14. Sharma S, Ali K, Narula H. Exercise therapy and electrotherapy as an intervention for primary dysmenorrhea: a systematic review and meta-analysis. J Lifestyle Med. 2023;13(1):16-26. doi:10.15280/jlm.2023.13.1.16

15. Heat therapy for primary dysmenorrhea: a systematic review and meta-analysis. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC12876241/

16. Damm T, Lamvu G, Carrillo J, Ouyang C, Feranec J. Continuous vs. cyclic combined hormonal contraceptives for treatment of dysmenorrhea: a systematic review. Contracept X. 2019;1:100002. doi:10.1016/j.conx.2019.100002

17. Shi J, Leng J. Effect and safety of drospirenone and ethinylestradiol tablets (II) for dysmenorrhea: a systematic review and meta-analysis. Front Med (Lausanne). 2022;9:938606. doi:10.3389/fmed.2022.938606

18. Naz MSG, Kiani Z, Rashidi Fakari F, Ozgoli G. The effect of micronutrients on pain management of primary dysmenorrhea: a systematic review and meta-analysis. J Caring Sci. 2020;9(1):47-56. doi:10.34172/jcs.2020.008

19. Harel Z. Dysmenorrhea in adolescents and young adults: etiology and management. J Pediatr Adolesc Gynecol. 2006;19(6):363-371. doi:10.1016/j.jpag.2006.09.001

20. French L. Dysmenorrhea. Am Fam Physician. 2005;71(2):285-291.

21. Food and Drug Administration. Real-world evidence. Silver Spring: FDA. Available from: https://www.fda.gov/science-research/science-and-research-special-topics/real-world-evidence

22. Food and Drug Administration. Use of real-world evidence to support regulatory decision-making for medical devices: guidance for industry and FDA staff. Silver Spring: FDA; 2025.

23. European Medicines Agency. Real-world evidence. Amsterdam: EMA; 2026. Available from: https://www.ema.europa.eu/

24. European Medicines Agency. Data Analysis and Real World Interrogation Network (DARWIN EU). Amsterdam: EMA; 2026.

25. European Medicines Agency. Guide on real-world evidence provided by EMA: support for regulatory decision-making. Amsterdam: EMA; 2024.

26. World Health Organization. Ethics and governance of artificial intelligence for health. Geneva: WHO; 2021.

27. World Health Organization. Ethics and governance of artificial intelligence for health: guidance on large multi-modal models. Geneva: WHO; 2024.

28. Food and Drug Administration. Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device Action Plan. Silver Spring: FDA; 2021.

29. Food and Drug Administration, Health Canada, Medicines and Healthcare products Regulatory Agency. Good machine learning practice for medical device development: guiding principles. 2021.

30. International Council for Harmonisation. ICH E9(R1): Addendum on estimands and sensitivity analysis in clinical trials. Geneva: ICH; 2019.

31. International Council for Harmonisation. Reflection paper on real-world evidence terminology and convergence of general principles regarding planning and reporting of studies using real-world data. Geneva: ICH; 2023.

32. Hernán MA, Robins JM. Using big data to emulate a target trial when a randomized trial is not available. Am J Epidemiol. 2016;183(8):758-764. doi:10.1093/aje/kwv254

33. Austin PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behav Res. 2011;46(3):399-424. doi:10.1080/00273171.2011.568786

34. Kaplan EL, Meier P. Nonparametric estimation from incomplete observations. J Am Stat Assoc. 1958;53(282):457-481.

35. Cox DR. Regression models and life-tables. J R Stat Soc Series B. 1972;34(2):187-220.

36. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi:10.1136/bmj.n71

37. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The STROBE statement: guidelines for reporting observational studies. Lancet. 2007;370(9596):1453-1457. doi:10.1016/S0140-6736(07)61602-X

38. Sterne JAC, Savovic J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomized trials. BMJ. 2019;366:l4898. doi:10.1136/bmj.l4898

39. O‘zbekiston Respublikasi Prezidentining PQ-140-son qarori. Sog‘liqni saqlash tizimini raqamlashtirishga doir qo‘shimcha chora-tadbirlar to‘g‘risida. Toshkent; 2023.

40. O‘zbekiston Respublikasi Sog‘liqni saqlash vazirligi. Elektron retsept tizimini joriy etish bo‘yicha axborot. Toshkent; 2025.

41. UzDaily. Uzbekistan launches Electronic Prescription system from 10 December. Tashkent; 2025.

42. Spot. Sog‘liqni saqlash tizimi qanday raqamlashtiriladi? Toshkent; 2023.