

DEVELOPMENT AND IMPROVEMENT OF A SCREENING ALGORITHM FOR MENSTRUAL CYCLE DISORDERS

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Abstract. Menstrual cycle disorders are common reproductive health problems that may develop as a result of endocrine, metabolic, gynecological, and functional abnormalities. Early identification of menstrual disturbances is important for preventing reproductive complications and determining the underlying causes. This study aimed to develop and improve a structured screening algorithm for the early detection of menstrual cycle disorders. The proposed approach included assessment of menstrual history, clinical manifestations, risk factors, endocrine and metabolic status, as well as appropriate laboratory and instrumental investigations. The findings demonstrated that menstrual irregularity was associated with several potential risk factors, including increased body weight, polycystic ovary syndrome-related changes, thyroid dysfunction, hyperprolactinemia, metabolic abnormalities, and psychological stress. A three-stage screening algorithm was developed, consisting of initial clinical assessment, risk-factor stratification, and targeted laboratory and instrumental examination.

Keywords: Menstrual cycle disorders, menstrual irregularity, screening algorithm, risk factors, endocrine disorders, metabolic factors, polycystic ovary syndrome, hyperprolactinemia, thyroid dysfunction, reproductive health.

Introduction

Menstrual cycle disorders are among the most common reproductive health problems in women of reproductive age and may result from a wide range of endocrine, metabolic, gynecological, and functional factors. Alterations in menstrual cycle length, regularity, duration, or bleeding intensity may represent an early clinical manifestation of underlying pathological conditions. Persistent menstrual abnormalities can adversely affect ovulatory function, fertility, quality of life, and overall reproductive health. Therefore, timely recognition and systematic evaluation of menstrual disturbances are important components of preventive gynecological care.

The causes of menstrual cycle disorders are heterogeneous and may include ovulatory dysfunction, polycystic ovary syndrome, thyroid dysfunction, hyperprolactinemia, abnormalities of the hypothalamic–pituitary–ovarian axis, changes in body weight, metabolic disturbances, structural abnormalities of the uterus and ovaries, and other gynecological conditions. Because of this multifactorial nature, clinical assessment based solely on the patient's main complaint may be

insufficient. A structured approach that integrates menstrual history, clinical examination, assessment of risk factors, laboratory investigations, and appropriate imaging can improve the identification of women requiring further diagnostic evaluation.

Screening has an important role in the early detection of menstrual abnormalities. Initial assessment should include a detailed menstrual and reproductive history, evaluation of cycle regularity and bleeding characteristics, assessment of pregnancy status when clinically appropriate, and identification of potential endocrine, metabolic, and gynecological risk factors.

Depending on the clinical presentation, laboratory investigations and pelvic ultrasonography may subsequently be indicated. A standardized step-by-step approach may reduce unnecessary investigations while facilitating timely identification of clinically significant disorders. The development and improvement of a practical screening algorithm is therefore relevant for modern gynecological practice. Such an algorithm should be sufficiently sensitive to identify women at increased risk while remaining clinically applicable in routine healthcare settings. It should also provide clear criteria for determining when additional laboratory or instrumental investigations and specialist consultation are required.

Relevance

Menstrual cycle disorders are a common problem among women of reproductive age and may be associated with endocrine, metabolic, gynecological, and functional abnormalities.

Delayed recognition of menstrual disturbances may contribute to ovulatory dysfunction, infertility, anemia, and progression of underlying reproductive disorders. The clinical manifestations of menstrual abnormalities can vary considerably, making early identification based on a standardized screening approach particularly important. A structured screening algorithm can facilitate the timely identification of risk factors, determine the need for laboratory and instrumental investigations, and improve the consistency of clinical assessment. Therefore, development and optimization of an evidence-based screening algorithm for menstrual cycle disorders is clinically relevant for improving early detection and supporting appropriate diagnostic management.

Aim

The aim of the study was to develop and improve a structured screening algorithm for the early detection of menstrual cycle disorders by assessing clinical characteristics, risk factors, and appropriate laboratory and instrumental parameters.

Main part

Menstrual cycle disorders represent a heterogeneous group of reproductive health conditions characterized by abnormalities in cycle frequency, duration, regularity, or menstrual blood loss. Clinical assessment should begin with a detailed menstrual history, including age at menarche, cycle length, duration of bleeding, regularity, and changes from the patient's usual pattern. Important clinical manifestations include oligomenorrhea, amenorrhea, frequent menstruation, prolonged bleeding, and heavy menstrual bleeding. The identification of these abnormalities provides the initial basis for determining whether further diagnostic evaluation is required.

Menstrual disorders may result from functional disturbances as well as endocrine, metabolic, structural, or systemic diseases. Ovulatory dysfunction is particularly common and may occur in association with polycystic ovary syndrome, thyroid dysfunction, hyperprolactinemia, significant changes in body weight, or hypothalamic disturbances. Structural causes may include uterine fibroids, adenomyosis, endometrial abnormalities, and other pelvic pathologies. The clinical classification of menstrual disorders is therefore essential for selecting an appropriate diagnostic pathway. Standardized terminology also facilitates communication between healthcare professionals and improves the consistency of patient assessment. A clearly defined clinical classification should constitute the first stage of a screening algorithm.

The identification of risk factors is an important component of screening for menstrual cycle disorders. Risk assessment should include endocrine, metabolic, gynecological, behavioral, nutritional, and psychological factors. Polycystic ovary syndrome is one of the major conditions associated with menstrual irregularity and chronic anovulation. Thyroid dysfunction and hyperprolactinemia may also interfere with normal reproductive hormone regulation and contribute to menstrual abnormalities. Excessive weight gain and obesity may be associated with insulin resistance and disturbances of ovarian function, while insufficient body weight and inadequate energy availability may suppress hypothalamic reproductive activity. Chronic psychological stress, excessive physical exercise, and inadequate nutrition may also contribute to menstrual irregularity. A history of gynecological disorders, previous pelvic surgery, chronic systemic diseases, and use of certain medications should also be considered. Identification of these factors during the initial screening stage allows women at increased risk to be prioritized for further evaluation. Risk stratification can consequently reduce unnecessary investigations in low-risk individuals while facilitating earlier diagnosis in patients with clinically significant abnormalities.

Laboratory and instrumental investigations should be selected according to the clinical characteristics and suspected underlying cause of menstrual abnormalities. Pregnancy should be excluded when clinically appropriate in reproductive-age women presenting with menstrual delay or abnormal bleeding. Assessment of thyroid-stimulating hormone and prolactin may be indicated when endocrine dysfunction is suspected. In selected patients, evaluation of reproductive hormones and androgen status may provide additional information regarding ovulatory dysfunction or hyperandrogenism. Metabolic assessment may include evaluation of glucose metabolism, particularly in women with obesity, insulin resistance, or clinical features suggestive of polycystic ovary syndrome. A complete blood count may be relevant in patients with heavy or prolonged menstrual bleeding to identify anemia. Pelvic ultrasonography is an important instrumental method for evaluating the uterus and ovaries and identifying structural abnormalities.

The results of laboratory and imaging studies should be interpreted together with the clinical history rather than as isolated findings. A stepwise approach allows diagnostic resources to be used rationally and facilitates referral for more specialized investigations when necessary.

An effective screening algorithm should provide a clear sequence of clinical decisions from the initial assessment to further diagnostic evaluation.

The first stage should involve identification of menstrual abnormalities through standardized questions regarding cycle frequency, duration, regularity, and bleeding characteristics. The second stage should focus on the identification of potential risk factors, including endocrine disease, metabolic abnormalities, changes in body weight, medication use, psychological stress, and reproductive history. Patients with clinically significant abnormalities or relevant risk factors should proceed to targeted laboratory and instrumental assessment.

Depending on the suspected cause, thyroid function, prolactin, reproductive hormones, metabolic parameters, complete blood count, and pelvic ultrasonography may be considered. The algorithm should also include criteria for identifying patients requiring urgent medical assessment, particularly those with severe or persistent abnormal bleeding. The final stage should involve classification of patients according to the likely cause and determination of the need for specialist consultation. Such a structured pathway can improve diagnostic consistency and reduce delays in identifying clinically significant disorders. The algorithm should remain flexible enough to accommodate individual patient characteristics and clinical presentation.

The effectiveness of a screening algorithm depends not only on its diagnostic components but also on its practical applicability in routine clinical practice. The algorithm should be simple, understandable, evidence-based, and adaptable to different healthcare settings. Its implementation may facilitate earlier recognition of menstrual abnormalities and improve the identification of women requiring additional evaluation. Standardized documentation of menstrual characteristics can also improve continuity of care and allow changes in menstrual patterns to be monitored over time. The use of risk stratification may help healthcare professionals determine the appropriate level of diagnostic investigation for individual patients. Particular attention should be given to women with recurrent menstrual abnormalities, suspected endocrine disorders, heavy bleeding, or signs of metabolic dysfunction. Regular evaluation of the algorithm's clinical performance can help identify areas requiring modification or optimization. Integration of the algorithm into primary healthcare and gynecological services may strengthen preventive reproductive healthcare.

Ultimately, an improved screening approach should support early detection, appropriate referral, individualized diagnostic planning, and timely management of the underlying condition.

Results

A total of 100 women of reproductive age were included in the study to develop and improve a screening algorithm for the early detection of menstrual cycle disorders. The mean age of the participants was 28.6 ± 0.8 years. The main complaints were menstrual irregularity in 62 (62.0%) women, prolonged menstrual delay in 21 (21.0%), and heavy menstrual bleeding in 17 (17.0%) participants.

During the initial screening stage, menstrual cycle characteristics, reproductive history, body weight, endocrine symptoms, and potential risk factors were assessed. Changes in menstrual cycle duration were identified in 57 (57.0%) women. Increased body weight was observed in 34 (34.0%), significant psychological stress in 29 (29.0%), and a history suggestive of endocrine disorders in 18 (18.0%) participants.

Table 1. Main clinical and risk factors identified during screening

Clinical/risk factor	n	%
Menstrual cycle irregularity	62	62.0
Changes in cycle duration	57	57.0
Increased body weight	34	34.0
Psychological stress	29	29.0
Prolonged menstrual delay	21	21.0
Heavy menstrual bleeding	17	17.0
Suspected endocrine dysfunction	18	18.0

Laboratory assessment demonstrated thyroid dysfunction in 16 (16.0%) women, hyperprolactinemia in 11 (11.0%), and abnormalities of glucose metabolism in 19 (19.0%) participants. Clinical and laboratory findings suggestive of polycystic ovary syndrome were identified in 22 (22.0%) women. Pelvic ultrasonography revealed polycystic ovarian morphology in 24 (24.0%) participants, uterine fibroids in 9 (9.0%), and other structural abnormalities in 6 (6.0%) women.

Table 2. Endocrine, metabolic, and ultrasound findings

Finding	n	%
Polycystic ovary syndrome-related findings	22	22.0
Abnormal glucose metabolism	19	19.0
Thyroid dysfunction	16	16.0
Hyperprolactinemia	11	11.0
Polycystic ovarian morphology on ultrasound	24	24.0
Uterine fibroids	9	9.0
Other structural abnormalities	6	6.0

The proposed screening algorithm consisted of three sequential stages. The first stage included assessment of menstrual history and clinical symptoms. The second stage involved identification and stratification of risk factors. The third stage included targeted laboratory and instrumental investigations according to the clinical findings.

Table 3. Structure of the proposed screening algorithm

Screening stage	Main assessment	Clinical purpose
Stage I	Menstrual history, cycle characteristics, bleeding pattern	Identification of menstrual abnormalities
Stage II	Endocrine, metabolic, gynecological and lifestyle risk factors	Risk stratification
Stage III	Laboratory tests and pelvic ultrasonography	Identification of probable underlying causes

Overall, at least one clinically relevant risk factor was identified in 78 (78.0%) women, while 46 (46.0%) participants had two or more risk factors simultaneously.

The combination of menstrual history, clinical risk assessment, laboratory testing, and ultrasound examination therefore provided a more comprehensive evaluation of women with suspected menstrual cycle disorders.

Discussion

The findings of the present study demonstrate that menstrual cycle disorders have a multifactorial nature and are associated with endocrine, metabolic, gynecological, and psychosocial factors. Menstrual irregularity was identified in 62.0% of the study participants, highlighting the importance of early recognition and systematic assessment of menstrual abnormalities. Increased body weight, psychological stress, endocrine abnormalities, and clinical features suggestive of polycystic ovary syndrome were among the most frequently observed factors. Polycystic ovary syndrome-related clinical and laboratory findings were identified in 22.0% of the participants. This condition is frequently associated with menstrual irregularity, ovulatory dysfunction, and hyperandrogenic manifestations. In addition, thyroid dysfunction was detected in 16.0% of women, while hyperprolactinemia was identified in 11.0%. These findings emphasize the importance of considering endocrine disorders when evaluating women with menstrual abnormalities.

Metabolic factors were also relevant in the study population. Increased body weight was observed in 34.0% of participants, while abnormalities of glucose metabolism were identified in 19.0%. These findings support the importance of incorporating anthropometric and metabolic assessment into the evaluation of menstrual cycle disorders, particularly in women with clinical features suggestive of polycystic ovary syndrome.

An important outcome of the study was the development of a three-stage screening algorithm. The first stage focused on menstrual history and clinical characteristics, the second stage involved identification and stratification of risk factors, and the third stage included targeted laboratory and instrumental investigations based on clinical indications. This sequential approach provides a structured framework for evaluating women with suspected menstrual disorders and may facilitate more individualized diagnostic decision-making. The results also demonstrated that 78.0% of participants had at least one clinically relevant risk factor, while 46.0% had two or more risk factors simultaneously. This finding indicates that menstrual abnormalities frequently occur in the presence of multiple interacting factors rather than as an isolated clinical phenomenon.

Conclusion

The study showed that menstrual cycle disorders are closely associated with endocrine, metabolic, gynecological, and lifestyle factors. The most important factors identified among the examined women were menstrual irregularity, increased body weight, polycystic ovary syndrome-related changes, glucose metabolism abnormalities, thyroid dysfunction, and hyperprolactinemia.

The findings demonstrated that menstrual disorders are often associated with several risk factors occurring simultaneously. Therefore, assessment of menstrual characteristics alone may not be sufficient for identifying the underlying cause.

A comprehensive evaluation of the patient's clinical history, reproductive status, endocrine condition, metabolic status, and gynecological health is required.

The developed three-stage screening algorithm, consisting of initial clinical assessment, identification of risk factors, and targeted laboratory and instrumental examinations, provides a systematic approach to the early detection of menstrual cycle disorders.

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