CLINICAL SCIENCE

ASSOCIATION BETWEEN METABOLIC SYNDROME AND MENOPAUSAL SYMPTOMS IN PERIMENOPAUSE

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Abstract

The perimenopausal transition is characterized by hormonal fluctuations that trigger physical and psychological symptoms while simultaneously increasing the risk of metabolic syndrome. Understanding the link between these physiological shifts is crucial for preventing long-term cardiovascular and endocrine complications. Aim of the study was to determine the prevalence of metabolic syndrome (MS) in perimenopausal women and evaluate the association between the severity of menopausal symptoms and MS components. Materials and methods: This prospective cohort study was conducted over a one- year period (2021-2022) at the University Clinic for Gynaecology and Obstetrics. The study included 100 perimenopausal patients (aged 45–50) with abnormal uterine bleeding, categorized by BMI: group I (BMI > 30), group II (BMI up to 30), and a control group (n=40) of asymptomatic women. Data were collected via the Menopause Quick 6 assessment tool and laboratory biochemical analyses (lipid status, glycemia, blood pressure, and anthropometric measurements). Results: The prevalence of metabolic syndrome was significantly higher in patients of group I (80.3%) and group II (41.2%) compared to the control group (17.5%). While MS prevalence was similar between premenopausal (52.9%) and perimenopausal (52.8%) patients, specific symptoms showed strong statistical correlations. In group I ($p < 0.05$), metabolic syndrome and hot flashes, insomnia, and bone pain were significantly associated. In group II, insomnia remained significantly associated with MS ($p = 0.0326$). Hot flashes were the most prevalent symptom in group I (93.9%), while insomnia predominated in group II (73.5%). Conclusion: The study demonstrates a significant link between the intensity of menopausal symptoms - particularly vasomotor symptoms and sleep disturbances - and the prevalence of metabolic syndrome. These findings suggest that severe menopausal symptoms may serve as early clinical indicators of metabolic risk. An integrated clinical approach addressing both hormonal shifts and metabolic health is essential for reducing long-term cardiovascular and diabetic risks in perimenopausal women.

КЛИНИЧКИ ИСТРАЖУВАЊА

АСОЦИРАНОСТ ПОМЕЃУ МЕТАБОЛИЧКИОТ СИНДРОМ И СИМПТОМИТЕ НА ПЕРИМЕНОПАУЗА

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Клучни зборови: перименопауза, метаболички синдром, симптоми на менопауза.

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Печатарски права: ©2026 Анета Сима, Ана Данева-Маркова, Слаѓана Симеонова-Крстевска, Весна Ливринова, Драге Дабески. Оваа статија е со отворен пристап дистрибуирана под условите на нелокализирана лиценца, која овозможува неограничена употреба, дистрибуција и репродукција на било кој медиум, доколку се цитираа торигиналниот(ите) автор(и) и изворот.

Конкурентски интереси: Авторот изјавува дека нема конкурентски интереси.

Извадок

Менопаузалната транзиција - перименопауза се карактеризира со хормонални флуктуации кои предизвикуваат физички и психолошки симптоми, а истовремено го зголемуваат ризикот од метаболички синдром. Разбирањето на врската помеѓу овие физиолошки промени е клучно за превенција на долгорочни кардиоваскуларни и ендокрини компликации. Цел на трудот е да се утврди преваленцијата на метаболичкиот синдром (МС) кај жени во перименопауза и да се процени поврзаноста помеѓу интензитетот на менопаузалните симптоми и компонентите на МС. Материјали и методи: Оваа проспективна кохортна студија беше спроведена во текот на една година (2021-2022) на Универзитетската клиника за гинекологија и акушерство. Студијата вклучуваше 100 пациентки во перименопауза (на возраст од 45–50 години) со абнормално крварење од матката, категоризирани според BMI: група I (BMI > 30), група II (BMI до 30) и контролна група (n=40) од асимптоматски жени. Податоците беа собрани преку алатката за проценка – модифициран прашалник Menopause Quick 6 и лабораториски биохемиски анализи (липиден статус, гликемија, крвен притисок и антропометриски мерења). Резултати: Преваленцијата на метаболички синдром беше значително поголема кај пациентките од групата I (80,3%) и групата II (41,2%) во споредба со контролната група (17,5%). Преваленцијата на МС, пак, беше слична кај пациентките во пременопауза (52,9%) и перименопауза (52,8%). Специфичните симптоми на перименопауза покажаа силни статистички корелации. Во групата I беа пронајдени значајни асоцијации ($p < 0,05$) помеѓу метаболичкиот синдром и брановите на топлина, несоницата и болката во коските. Во групата II, несоницата покажа значајна поврзаност со МС ($p = 0,0326$). Брановите на топлина беа доминантен симптом кај пациентките од групата I (93,9%), додека несоницата преовладуваше во групата II (73,5%). Заклучок: Студијата покажа значајна корелација помеѓу интензитетот на менопаузалните симптоми - особено вазомоторните симптоми и нарушувањата на спиењето - и преваленцијата на метаболичкиот синдром. Овие наоди сугерираат дека тешките менопаузални симптоми можат да послужат како рани клинички индикатори за метаболички ризик. Интегриран клинички пристап кој се однесува и на хормоналните промени и на метаболичкото здравје е од суштинско значење за намалување на долгорочните кардиоваскуларни и дијабетогени ризици кај жените во перименопауза.

Introduction

The perimenopausal transition is a critical phase in a woman's life, marked by significant hormonal fluctuations that often result in a variety of physical and psychological symptoms. Common menopausal symptoms, including hot flashes, night sweats, sleep disturbances, and mood changes, can severely impact quality of life [1,2]. At the same time, this period is also associated with an increased risk of metabolic disorders and metabolic syndrome, which includes factors like abdominal obesity, insulin resistance, hypertension, and dyslipidemia [3,4,5].

Several studies have indicated a possible link between the physiological changes occurring during perimenopause and the onset of metabolic syndrome [6, 7, 8]. However, the precise mechanisms behind this association remain poorly understood. Hormonal shifts, particularly declines in estrogen, are believed to play a crucial role in the development of both menopausal symptoms and metabolic syndrome. Still, other factors, including lifestyle, genetics, and pre-existing conditions, may also contribute [9, 11, 12].

Given the growing population of women experiencing perimenopause and the known risks associated with metabolic syndrome - such as cardiovascular disease and type 2 diabetes - understanding the relationship between these two conditions is of paramount importance [3,8,10].

This study aimed to explore the association between menopausal symptoms and metabolic syndrome in perimenopausal women, highlighting potential pathways and implications for clinical management and preventive care.

The primary aim of this study was to determine the prevalence of metabolic syndrome in women undergoing perimenopause and to find an association between metabolic syndrome and the severity of menopausal symptoms, including vasomotor symptoms (hot flashes, night sweats), sleep disturbances, mood disorders, sexual dysfunction, etc.

Materials and methods

This was a prospective cohort study, conducted at the University Clinic for Gynecology and Obstetrics in a 1-year period (2021-2022). A total of 100 patients with abnormal uterine bleeding in the perimenopausal period were included, aged 45-50 years, who were divided into two groups according to BMI. The control group consisted of 40 patients.

a) First group - patients with BMI> 30 (obese patients),

b) Second group - patients with BMI up to 30 (increased body weight),

c) Control group (40) - asymptomatic patients, with regular gynecological findings (without pathological findings and normal BMI).

A complete gynecological and ultrasound examination was performed (with transvaginal ultrasound, vaginal probe DE10-3E, device type Mindray DC-70). Further interventions had been done where indicated, which were not included in this study.

Here, we only included laboratory analyses and data from the Menopause Quick 6 assessment tool questionnaire - ultrasound examination - with transvaginal ultrasound (vaginal probe DE10-3E, device type Mindray DC-70). Laboratory analyses were

performed at the University Clinic for Biochemistry (blood pressure, glycemia, lipid status, waist circumference, waist/hip ratio, BMI).

Blood pressure (on 3 occasions with an interval of 1 hour between measurements, in a sitting position) was measured using the device OMRON M3 Comfort.

Measurement of body weight and height was done with a digital body scale (type GIMA Pegaso electronic body scale), barefoot, without clothes, only in underwear), electronic online calculator for BMI. Waist and hip circumferences were measured using a tape measure; waist circumference was measured at the level of the navel, before the end of expiration, and hip circumference was measured at the level of the trochanters of the femur. Glycemia and lipid status were measured by spectrophotometric method (Albott Architect C 80).

Results

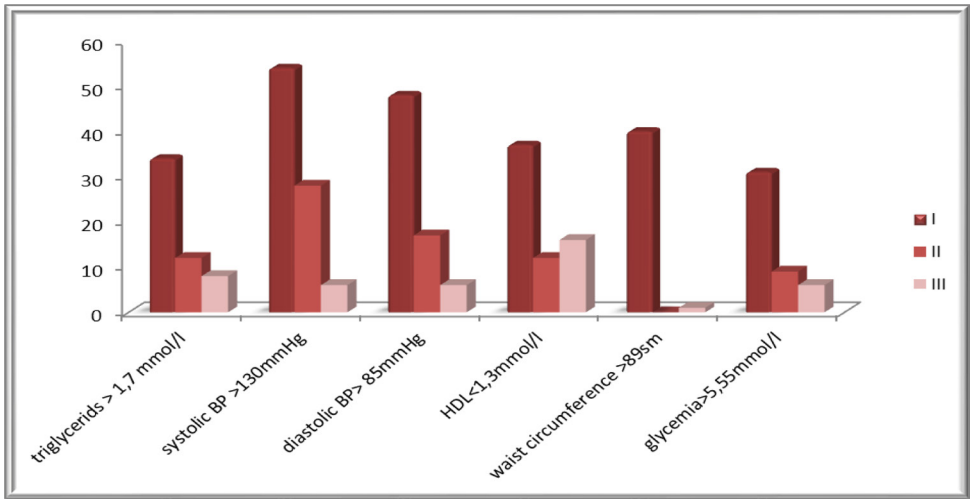


Figure 1: Patients who met the AHA criteria of metabolic syndrome.

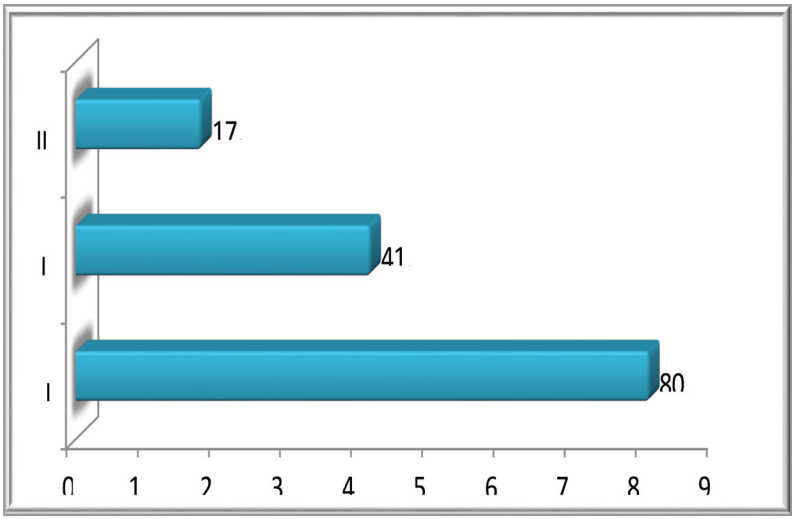


Figure 2: Prevalence of metabolic syndrome in pre/perimenopausis

The prevalence of MS in the three studied groups showed the highest value in the first studied group - high 80.3%: in the second group it was 41.2%, and in the control group it was the lowest, 17.5% (Figure 1).

The prevalence of metabolic syndrome (MS) in patients showed a similar value. It was 52.9% in premenopausal, and 52.8% in perimenopausal women (Figure 2).

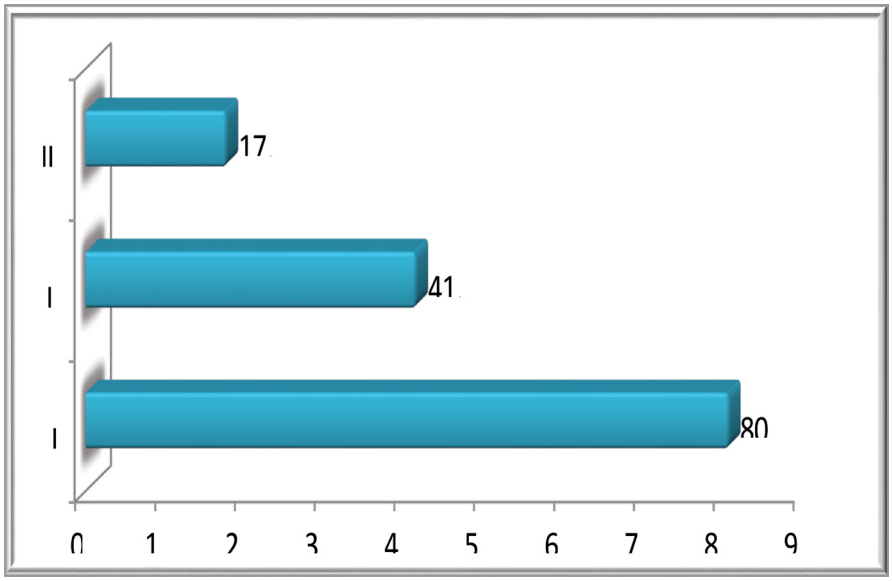


Figure 3: Menopausal symptoms in all groups

In the first examined group, the highest percentage of menopausal symptoms were hot flashes - 93.9%, followed by emotional instability - 75.8%, elevated TT - 71.2%, insomnia (disturbed sleep) - 65.2%, sexual dysfunction - 63.6%, therapy - 56.1%, bone pain - 36.4%, and the lowest percentage was dysuric complaints - 31.8%.

In the second examined group, the highest percentage of menopausal symptoms was insomnia - 73.5%, followed by hot flashes - 58.5%, emotional instability, therapy - 52.9%, sexual dysfunction - 47.1%, bone pain - 20.6%, elevated TT - 17.6%, and the lowest percentage was dysuric complaints - 14.7%.

In the third control group, the highest percentage of menopausal symptoms was elevated TT - 65.0%, followed by hot flashes - 60.0%, emotional instability - 50.0%, insomnia - 45.0%, sexual dysfunction - 37.5%, therapy and dysuric complaints with 22.5%, and the lowest percentage was bone pain - 17.5% (Figure 3).

Table 1. Baseline characteristics by fixation type

Group	Variable	Pearson Chi-square ($\chi 2$)	p-value	Significance ($p<0.05$)
First Group	Hot flashes	4.2809	0.0385	Yes
	Insomnia	8.4289	0.0037	Yes
	Therapy	7.1499	0.0075	Yes
	Bone pain	5.7509	0.0165	Yes
Second Group	Insomnia	4.5679	0.0326	Yes

An association was observed between metabolic syndrome and the presence of hot flashes in the first group ($p<0.05$) (Pearson Chi-square: 4.28091, p=.038543).

An association was found between metabolic syndrome and the presence of insomnia in the first group ($p<0.05$) (Pearson Chi-square: 8.42893, p=.003693), and the use of therapy in the first group ($p<0.05$) (Pearson Chi-square: 7.14987, p=.007497).

An association was registered between metabolic syndrome and the presence of bone pain in the first group ($p<0.05$) (Pearson Chi-square: 5.75088, p=.016480).

An association was observed between metabolic syndrome and the presence of insomnia in the second group ($p<0.05$) (Pearson Chi-square: 4.56787, p=.032577) (Table 3).

Discussion

The findings of this study suggested a significant association between menopausal symptoms and the development of metabolic syndrome during perimenopause. The hormonal changes that characterize this transition, particularly the decline in estrogen, appear to play a pivotal role in the co-occurrence of these conditions. Our results align with previous studies that have demonstrated a link between estrogen deficiency and increased risk factors for metabolic syndrome, such as insulin resistance, central obesity, and dyslipidemia [13, 14, 16].

The data indicate that the severity of vasomotor symptoms, including hot flashes and night sweats, is strongly correlated with the presence of metabolic syndrome markers. This relationship suggests that women experiencing more intense menopausal symptoms may be

at greater risk of developing metabolic syndrome. This supports the hypothesis that vasomotor symptoms may be a clinical indicator of underlying metabolic disturbances, potentially driven by common hormonal mechanisms [10, 11].

Furthermore, sleep disturbances and mood changes, which are also prevalent in perimenopause, were found to be associated with key components of metabolic syndrome.

Sleep disruption, often linked to vasomotor symptoms, may exacerbate metabolic dysfunction by altering cortisol levels and insulin sensitivity, thus contributing to weight gain and hypertension. Mood disturbances, such as anxiety and depression, may similarly influence metabolic health by affecting lifestyle choices, including physical activity and diet.

The findings underscore the importance of considering the metabolic health of women experiencing menopausal symptoms during perimenopause. Early identification and management of these symptoms may provide an opportunity to mitigate the risk of developing metabolic syndrome. Clinicians should be aware of the potential for co-occurring metabolic and menopausal symptoms, and a comprehensive approach to management - addressing both hormonal and lifestyle factors - may be key to improving outcomes [15, 16, 17].

Limitations and Future Research

While this study adds valuable insight

into the relationship between menopausal symptoms and metabolic syndrome, several limitations should be acknowledged. The cross-sectional nature of the study limits the ability to infer causality between these conditions. Future research would benefit from longitudinal studies that track the progression of menopausal symptoms and metabolic changes over time. Additionally, the study population may not fully represent the diversity of perimenopausal women, as factors such as ethnicity, socioeconomic status, and pre-existing health conditions were not extensively controlled for. Future studies should aim to explore how these variables may influence the association between menopausal symptoms and metabolic syndrome.

Conclusion

Women experiencing more severe vasomotor symptoms, such as hot flashes and night sweats, were found to be at a heightened risk for developing metabolic syndrome. Additionally, other symptoms like sleep disturbances and mood changes also demonstrated strong associations with key components of metabolic syndrome, including abdominal obesity, insulin resistance, and hypertension. Recognizing that severe menopausal symptoms may signal a higher risk of metabolic syndrome can lead to early intervention strategies. Addressing both hormonal imbalances and metabolic risk factors could help reduce the long-term health risks associated with cardiovascular disease and type 2 diabetes in this population.

Further research, particularly longitudinal studies, is needed to clarify the causal relationships between symptom severity and metabolic changes. However, monitoring and managing metabolic health in women with severe menopausal symptoms is a critical step toward improving their overall well-being during the perimenopausal transition.

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