

at least one component of metabolic syndrome, including abdominal obesity, hypertriglyceridemia, low HDL cholesterol, elevated blood pressure, or hyperglycemia. Random oversampling addressed class imbalance, creating a dataset of 6,146 analyses with equal case and control distribution. Machine learning models—Random Forest, XGBoost, and LightGBM—were trained on an 80% training subset and evaluated on a 20% testing subset using Accuracy, F1-Score, Recall, Precision, and AUC.

Results: Random Forest achieved the best performance, with an AUC of 0.870, Recall of 76.4%, and Precision of 77.7%. It effectively identified at-risk women with a low false positive rate. XGBoost had moderate performance (AUC: 0.791), while LightGBM showed the lowest performance (AUC: 0.765). Key predictors identified by Random Forest included weight gain, dry skin, neck or head pain, fatigue, poor memory, and urinary incontinence during laughter or coughing. After excluding weight gain, the random forest resulted in an AUC of 0.853, recall of 78.2%, and precision of 75.3%.

Conclusion: This study demonstrates the potential of machine learning, particularly Random Forest, in predicting metabolically unhealthy status among women undergoing menopausal transition. Incorporating menopausal symptom-based metabolic risk stratification into clinical practice has the potential to enhance early identification of high-risk individuals and mitigate the burden of metabolic disorders across diverse populations. Future studies should validate these findings and explore their applicability in broader demographic settings.

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The longitudinal association between menopausal transition and hearing decline in middle-aged Korean women

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Background: The prevalence of hearing loss is rising globally due to population growth and increased life expectancy. Women generally experience hearing loss later than men, with onset typically after age 50, coinciding with menopause and declining estrogen levels. While cross-sectional studies potentially link menopause to hearing loss, longitudinal patterns during the menopausal transition (MT) remain unexplored. This study examined the longitudinal association between menopausal stage transitions and pure-tone audiometry-based hearing in women undergoing natural menopause.

Methods: This cohort study included 4,556 Korean middle-aged women who underwent annual or biennial comprehensive health examinations at the Kangbuk Samsung Hospital Total Healthcare Centers over 10 years. Menopausal stage transitions, the main exposure variable, were categorized according to the revised Stages of Reproductive Aging Workshop +10 criteria. Hearing was defined as the pure-tone average (dB) at 0.5, 1.0, and 2.0 kHz in either or both ears. Longitudinal associations between MT and hearing were estimated

using a linear mixed-effects model with random intercepts for individual identifiers.

Results: Compared to pre-menopause, the coefficients (95% CI) for the pure-tone average hearing in both ears was as follows: 0.24 (0.14-0.34) in early transition, 0.78 (0.67-0.89) in late transition, and 1.56 (1.43-1.68) in post-menopause. For the right ear, the coefficients were 0.22 (0.11-0.34), 0.64 (0.51-0.77) and 1.21 (1.07-1.35) during early transition, late transition, and post-menopause, respectively. For the left ear, the corresponding coefficients were 0.25 (0.13-0.37), 0.92 (0.78-1.05), and 1.90 (1.75-2.05). While time-varying age was also significantly associated with hearing, with smaller coefficients observed (right 0.02, left -0.03), the estimates for MT were slightly attenuated but remained significant after adjustment for age and other confounders, including smoking status, alcohol consumption, physical activity, body mass index, age at menarche, parity, marital status, and education.

Conclusion: This cohort study of middle-aged Korean women undergoing menopausal transition demonstrated a progressive decline in hearing across menopausal stages, beginning as early as the early transition and independent of chronological age. This study highlights the importance of timely management and intervention during MT to facilitate early detection and screening of hearing decline.

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Exploring the effects of a green exercise program on body composition and connection with nature in postmenopausal women

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The study aimed to evaluate the effects of a 16-week green exercise program on body composition and nature connection in postmenopausal women. A total of 76 women, aged 44 to 71 years, were assigned to either a control group (CG, n = 20) or an exercise group (EG, n = 55). Participants in the EG engaged in a 16-week green multimodal exercise program, consisting of three 60-minute sessions per week. The program included cardiorespiratory exercise performed in a natural environment (three sessions per week, 30 minutes per session, at 40–75% of heart rate reserve), strength and muscle power training (two sessions per week, 2–3 sets of 8–12 repetitions), flexibility training (one session per week, 2–3 sets of 10–30 seconds), and neuromotor exercises (one session per week). Body composition was assessed using the InBody 120 bioimpedance device, which measured fat mass (FM), visceral fat level

(VFL), and trunk and appendicular skeletal muscle mass. Connection to nature was evaluated using the Nature Relatedness Scale, which assesses the domains of self (NR-Self), perspective, and experience. Independent samples *t*-tests and two-way mixed-design ANOVAs were used, with statistical significance set at $p \leq 0.05$.

Most participants reported natural menopause (90.8%), no use of hormone therapy (51.3%), and estrogen depletion for over six years (80.3%). The baseline values were similar between the two groups. Compared to the CG, the EG demonstrated greater changes ($p \leq 0.01$) in %FM (-1.87% vs. -7.16%) and VFL (-3.80% vs. -13.46%). No differences in muscle condition were observed between the two groups. A significant change in NR-Self was observed over the intervention period, regardless of the participants' group assignment ($F = 4.246$, $p = 0.043$, partial $\eta^2 = 0.055$). The data revealed a significant interaction ($p < 0.01$) between time and group in the variation of %FM (partial $\eta^2 = 0.135$) and VFL (partial $\eta^2 = 0.136$).

The data suggest that the exercise program was effective in improving total and central adiposity levels. Regardless of the group, the women revealed that they had incorporated nature as a fundamental part of their personal identity.

Keywords: Menopause, adiposity, muscle condition, Nature Relatedness Scale, physical activity.

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Immunization for midlife women: addressing the adult immunization gap

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Background: Midlife health is often defined as age 50 and above, a period marked by increased risk for chronic diseases. While healthcare professionals routinely screen for these conditions, immunization recommendations are often overlooked. Vaccine-preventable diseases like influenza contribute globally to significant morbidity and mortality. Immunosenescence, the age-related decline in immune function, exacerbates susceptibility to infectious diseases, highlighting the need for enhanced immunization strategies in midlife women.

Methods: A review of current immunization practices, gaps, and clinical evidence supporting vaccination in midlife women was conducted. Key sources include data from the Public Health Agency of Canada, the Centers for Disease Control and Prevention (CDC), and recent peer-reviewed studies on vaccine efficacy and safety. The focus areas include influenza, respiratory syncytial virus (RSV), pneumococcal disease, and herpes zoster, with particular attention to comorbidities increasing susceptibility to severe outcomes.

Results: Findings reveal a significant adult immunization gap, particularly in awareness and uptake among midlife women. RSV, a major but underrecognized pathogen, has been associated with increased hospitalizations and exacerbations of chronic conditions such as chronic obstructive pulmonary disease (COPD) and congestive heart failure (CHF). Recent clinical trials demonstrate that RSV vaccines (RSVpreF3, Arexvy, and Abrysvo) offer robust protection, with efficacy rates exceeding 80% in adults over 60. Pneumococcal and herpes zoster vaccines also show substantial benefits in reducing disease burden. However, challenges remain, including limited healthcare provider awareness, access barriers, and patient hesitancy.

Conclusion: Enhancing vaccine uptake among midlife women requires a multifaceted approach, including increased healthcare provider education, patient engagement, and policy support for vaccination

programs. Immunization plays a crucial role in reducing the burden of infectious diseases in aging populations, ultimately improving health outcomes and quality of life. Future research should explore targeted strategies to bridge the adult immunization gap and optimize preventive care.

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The relationship of a weight-efficacy lifestyle with anthropometric indices among middle-aged Iranian women

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Background: Overweight or obese middle-aged women are at a greater risk of chronic diseases. This study aimed to evaluate the relationship between a weight-efficacy lifestyle and anthropometric indices in middle-aged women.

Methods: In this study, 500 middle-aged women were recruited randomly from ten public health centres in Ahvaz. A sociodemographic questionnaire and weight-efficacy lifestyle (WEL) questionnaire were used to collect the data. Anthropometric indices including weight, height, waist and hip circumference, waist-hip ratio, body fat percentage, and mid-upper arm circumference were measured. The Pearson correlation coefficient and logistic regression were used to analyse the data.

Results: Women with higher negative emotions and those with a higher availability of food were 0.93 (OR 0.93, 95% CI 0.86–0.99, $p = 0.03$) and 0.89 (OR 0.89, 95% CI 0.82–0.96, $p = 0.003$) times more likely to have a higher BMI, respectively. Women with increased negative emotion (OR 0.92, 95% CI 0.85–0.99, $p = 0.04$), and lower positive activities (OR 1.15, CI 1.05–1.27, $p = 0.003$) were more likely to have a wider waist circumference.

Conclusion: A weight-efficacy lifestyle was found to have a significant relationship with body mass index, waist circumference, hip circumference, waist-hip ratio, body fat percentage, and upper mid-arm circumference. Middle-aged women should be specifically educated regarding a weight-efficacy lifestyle.

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Diet for extending beauty and youth in premenopausal women

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Introduction: Obesity in premenopausal women is linked to hormonal imbalances, disrupted metabolic processes, and skin deterioration. Weight loss in women aged 45–50 often results in muscle mass loss and decreased skin turgor, negatively affecting both appearance and health. This study investigates the effect of a low-carbohydrate diet on hormone levels, metabolic markers, and skin quality in women with obesity.

Materials and Methods: The study involved 10 women aged 45–50 years with class 1 obesity (average body mass index of 33). They followed a low-carbohydrate diet for 3 months, which focused on plant