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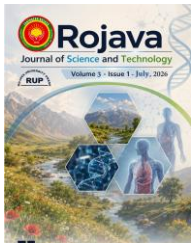

Prevalence and Risk Factors for Cardiovascular Disease in Post-Menopausal Syrian Women Living in North and East Syria: A Cross-Sectional Study

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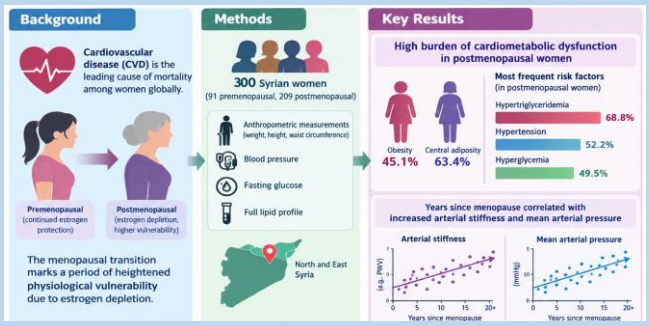
ABSTRACT

Background: Cardiovascular disease (CVD) is the leading cause of mortality among women globally. The menopausal transition marks a period of heightened physiological vulnerability due to estrogen depletion. Methods: This cross-sectional study investigated CVD prevalence and risk factors among 300 Syrian women (91 premenopausal, 209 postmenopausal) in North and East Syria. Data collection included anthropometric measurements, blood pressure, fasting glucose, and full lipid profiles. Results: Postmenopausal women showed a high burden of cardiometabolic dysfunction. Obesity and central adiposity affected 45.1% and 63.4% of postmenopausal participants, respectively. The most frequent risk factors were hypertriglyceridemia (68.8%), hypertension (52.2%), and hyperglycemia (49.5%). Years since menopause positively correlated with increased arterial stiffness and mean arterial pressure. Conclusion: These findings underscore an urgent need for gender-sensitive public health interventions and targeted screening for hypertension and dyslipidemia in this population.



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1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death among women globally, accounting for approximately one-third of female mortality. While CVD is often perceived as a male-centric pathology, women experience a sharp escalation in risk during middle age. Following the cessation of ovarian function and the resulting estrogen deficiency, women undergo a "catch-up" phenomenon where CVD prevalence matches or exceeds that of men. (Whelton et al. 2018; Vogel et al. 2021). Menopause is an independent CVD risk factor, marking a transition from a protected hormonal state to one of high vulnerability. The withdrawal of 17β-estradiol, a key vasodilator and anti-inflammatory agent, impairs endothelial function, induces pro-atherogenic lipid shifts, and reduces glucose tolerance. These changes often manifest as "metabolic syndrome of menopause," characterized by central adiposity and increased arterial stiffness. (El Khoudary et al. 2020; Maas and Rosano 2022). In North and East Syria, women face a "double burden" of risk. Biological menopausal vulnerability is compounded by over a decade of conflict, mass displacement, and fragmented healthcare infrastructure. These stressors contribute to chronic psychosocial strain and food insecurity, which exacerbate metabolic dysfunction. In conflict zones, chronic diseases are often overlooked in favor of acute trauma, leaving this demographic without adequate screening. (Akik et al. 2019; Maziak et al. 2024). This study aims to estimate CVD prevalence and identify modifiable and non-modifiable risk factors among postmenopausal women in this region. By analyzing lifestyle, clinical history, and dietary patterns, this research seeks to provide empirical evidence for targeted, gender-sensitive public health interventions in an underserved population.

2. Subjects and Methods

- **Study Design:** A descriptive and analytical cross-sectional study.
- **Study Population:** 300 Syrian women (91 premenopausal for comparative baseline, 209 postmenopausal) residing in North and East Syria.
- **Settings:** Data collection was conducted at outpatient clinics in Afrin Hospital (Aleppo), Tal Rifaat Hospital (Aleppo), Kobani Hospital (East of Euphrates), Mashta Al-Nur laboratory (East of Euphrates), Al-Rafiqa laboratory (Raqqa area), and Central laboratory (Raqqa area)
- **Ethical Considerations:** Protocol approved by the Ethics Committee of Rojava University; informed written consent was obtained from all participants.
- **Data Collection Tools:**
  - **Questionnaires:** Collected demographics, lifestyle habits (smoking, activity), and medical history.
  - **Clinical Assessments:** Standardized measurements of weight, height, BMI, resting blood pressure, and waist circumference.
  - **Laboratory Analysis:** Venous blood samples analyzed for fasting plasma glucose and complete lipid profiles (TC, HDL, LDL, TG).

Statistical Analysis: Data analyzed using SPSS version 27. Tests included chi-square for categorical variables and independent sample t-tests or ANOVA for numerical variables ($p < 0.05$).

3. Results

3.1. Anthropometric and Metabolic Characteristics

Postmenopausal women showed a significant divergence in metabolic status compared to the premenopausal group (Table 1). While mean weight was comparable, postmenopausal women exhibited a significant shift toward central obesity, with 63.4% exceeding the clinical threshold for waist circumference (>88 cm). Biochemical investigations (Table 2) showed postmenopausal women had markedly elevated LDL (110.8 mg/dL vs. 94.2 mg/dL)

and significantly reduced HDL (44.9 mg/dL vs. 51.6 mg/dL).

Table 1: Anthropometric measurements of the study population in North and East Syria (May – November 2025).

Parameter	Premenopausal (Mean ± SD) (n=91)	Postmenopausal (Mean ± SD) (n=209)	p-value
Weight (kg)	74.4 ± 16.20	76.3 ± 16.48	0.354
Height (m)	1.58 ± 0.08	1.58 ± 0.08	0.980
Waist Circumference (cm)	94.9 ± 13.70	94.5 ± 16.85	0.841
Body Mass Index (kg/m2)	27.9 ± 5.3	30.5 ± 6.1	< 0.01**

****p < 0.01 (Correlation is Highly Significant)**

Table 2: Blood pressure measurements and laboratory biochemical investigations of the study population.

Clinical Parameter	Premenopausal (Mean ± SD) (n=91)	Postmenopausal (Mean ± SD) (n=209)	p-value
Systolic BP (mmHg)	132.1 ± 21.5	135.3 ± 21.9	0.244
Diastolic BP (mmHg)	85.3 ± 14.7	84.6 ± 14.2	0.697
Mean Arterial Pressure (mmHg)	100.9 ± 15.7	101.4 ± 15.2	0.796
Fasting Blood Glucose (mg/dL)	107.8 ± 45.2	126.1 ± 52.0	< 0.01**
Total Cholesterol (mg/dL)	165.5 ± 34.5	176.4 ± 45.0	< 0.05*
Triglycerides (mg/dL)	195.8 ± 98.0	203.7 ± 98.0	< 0.05*

***p < 0.05 (Correlation is Significant); **p < 0.01 (Correlation is Highly Significant)**

3.2. Prevalence and Ranking of Risk Factors

The ranking of cardiovascular risk factors (Figure 1) revealed that hypertriglyceridemia was the most prevalent metabolic derangement (68.8%), followed by hypertension (52.2%) and hyperglycemia (49.5%). Correlation analysis (Figure 2) demonstrated a significant positive relationship between the duration of menopause and the severity of systolic hypertension and arterial stiffness.

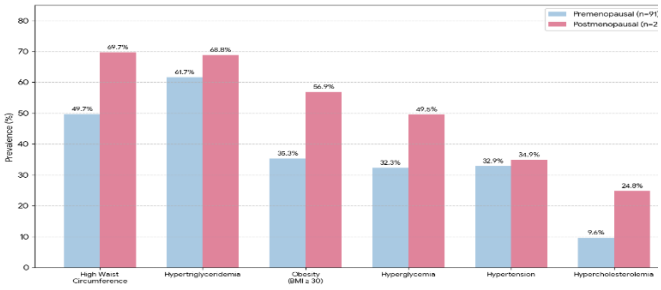

Figure 1: Prevalence and ranking of cardiovascular risk factors by menopausal status

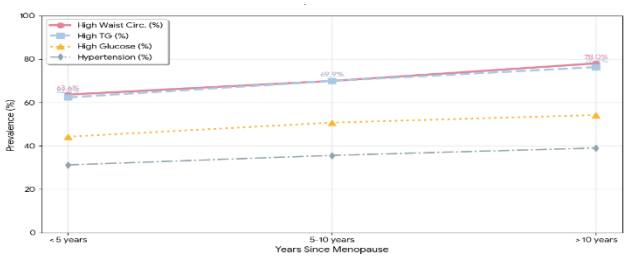

Figure 2: Time-dependent progression of cardiovascular risk factors in postmenopausal women

3.3. Lifestyle and Clinical Determinants

Lifestyle factors such as high physical activity (Figure 3) and adherence to a healthy diet (Figure 4) were associated with a statistically significant reduction in the prevalence of metabolic syndrome markers. Furthermore, women reporting difficult access to healthcare (Table 3) exhibited significantly higher mean BMI (31.8 vs. 29.7 kg/m²) and a higher prevalence of hypertension (42.5%) compared to those with easy access.

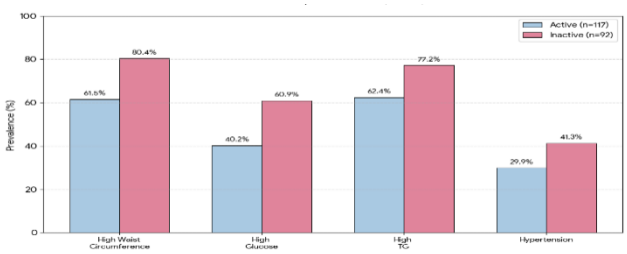

Figure 3: Influence of physical activity on cardiovascular risk factors in postmenopausal women.

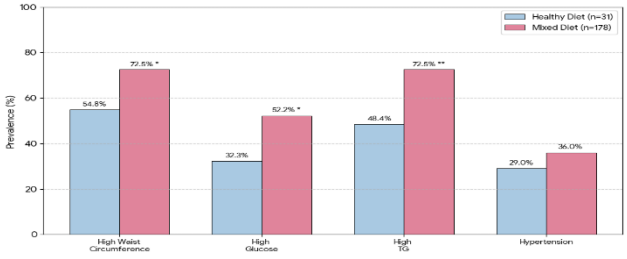

Figure 4: Impact of dietary patterns on cardiovascular risk factors in postmenopausal women

Table 3: Correlation between healthcare accessibility and cardiovascular risk factors in postmenopausal women.

Healthcare Access	n (%)	Mean BMI (kg/m²)	High Waist Circ. n (%)	High Glucose n (%)	High TG n (%)	Hypertension n (%)
Easy Access	129 (61.7%)	29.7 ± 5.6	87 (67.4%)	57 (44.2%)	84 (65.1%)	39 (30.2%)
Difficult Access	80 (38.3%)	31.8 ± 6.9	59 (73.8%)	46 (57.5%)	60 (75.0%)	34 (42.5%)
Total	209 (100%)	30.5 ± 6.1	146 (69.7%)	103 (49.5%)	144 (68.8%)	73 (34.9%)
p-value	—	*< 0.05**	*0.334*	*< 0.05**	*0.128*	*< 0.05**

p < 0.05 (Correlation is Significant)

4. Discussion

The findings of this study confirm a high prevalence of cardiovascular risk factors among postmenopausal women in North and East Syria, illustrating a significant shift in cardiometabolic health during the menopausal transition. This period is characterized by a rapid decline in endogenous hormones, which appears to act as a catalyst for metabolic syndrome components. The high prevalence rates observed here suggest that the menopausal transition is not merely a reproductive milestone but a critical window of vulnerability for long-term cardiovascular health. These results align with global trends indicating that postmenopausal status significantly alters the baseline risk profile for ischemic heart disease and stroke (Lobo et al. 2022). The transition to menopause represents a critical "physiological crossroad." The withdrawal of $17\beta\text{-estradiol}$, which normally promotes nitric oxide production and maintains vascular elasticity through the activation of estrogen receptors in the vessel walls, triggers systemic endothelial dysfunction. This loss of hormonal protection leads to increased systemic vascular resistance and arterial stiffness, explaining the high rates of hypertension (52.2%) observed in our participants. Furthermore, the absence of estradiol's antioxidant properties may further accelerate oxidative stress within the vascular endothelium, promoting the early stages of atherosclerosis (El Khoudary et al. 2020). Furthermore, estrogen deficiency fundamentally alters adipocyte metabolism, causing a distinct shift from "gynoid" fat distribution (subcutaneous) to "android" (visceral) fat distribution, as evidenced by the high central obesity data in this cohort. Visceral fat acts as an active endocrine organ, secreting pro-inflammatory cytokines such as $TNF\text{-}\alpha$ and $IL\text{-}6$ that contribute to systemic insulin resistance. This biological

mechanism aligns with the high rates of hyperglycemia and elevated fasting glucose found in the postmenopausal group. This shift is often accompanied by a decrease in basal metabolic rate, which, if not compensated for by physical activity or caloric restriction, creates a self-reinforcing cycle of obesity and metabolic derangement (Ko et al. 2020). In the Syrian context, these biological vulnerabilities are significantly amplified by local environmental factors. A decade of conflict has severely impacted food security and dietary diversity across the region. The heavy reliance on energy-dense, nutrient-poor subsidized foods—such as bread, processed vegetable oils, and refined sugar—has likely exacerbated the prevalence of hypertriglyceridemia (68.8%), which emerged as the top-ranked risk factor in this study. Additionally, chronic psychosocial stress stemming from displacement and economic instability is a known driver of hypothalamic-pituitary-adrenal (HPA) axis dysregulation. This chronic elevation of cortisol further promotes visceral adiposity and sympathetic nervous system overactivity, driving hypertension (Akik et al. 2020). The data from the present study reveal that 38.3% of postmenopausal women face significant barriers to healthcare, including transportation costs, lack of female providers, and fragmented primary care services. This lack of access correlates strongly with higher BMI and unmanaged hypertension, suggesting that cardiovascular risk in Syria is a "biosocial" issue where political and economic conditions dictate physiological outcomes. Furthermore, the low utilization of Hormone Replacement Therapy (HRT) (27.8%), despite the metabolic benefits observed in HRT users in this study, highlights a significant gap in clinical management. This underutilization may stem from a lack of provider training or patient misconceptions regarding the safety of HRT, missing an opportunity to mitigate the metabolic shifts that occur during this transition (Nappi et al. 2021).

5. Conclusion and Recommendations

Menopause is a critical window of cardiovascular vulnerability for Syrian women. The high prevalence of central obesity, hypertension, and dyslipidemia suggests a looming increase in cardiovascular events unless targeted interventions are implemented. To address the cardiovascular health challenges identified, it is recommended that healthcare facilities implement routine screenings for waist circumference and lipid profiles within women's health clinics to ensure early detection of metabolic risks. From a public health perspective, priority should be given to gender-sensitive interventions that focus specifically on the management of hypertension and dyslipidemia. Furthermore, nutritional initiatives must emphasize accessible dietary modifications to effectively combat the high prevalence of hypertriglyceridemia among the population. Finally, at the policy level, integrating cardiovascular monitoring into existing reproductive health services in North and East Syria is essential to ensure these vital screenings reach vulnerable and underserved populations.

Reference

1. Akik, Chaza, et al. 2019. "Hostage to Crisis: The Perilous State of Non-Communicable Disease Services in Humanitarian Settings in the Middle East." Journal of Global Health 9 (2): 020401.
2. Akik, Chaza, Hala Ghattas, Sawsan Abdulrahim, and Annie S. Anderson. "The Impact of Conflict on Dietary Intake and Nutrition Health Outcomes in Women of Reproductive Age in the Middle East and North Africa: A Systematic Review."

Progress in Cardiovascular Diseases 63, no. 2 (2020): 138–46.

3. El Khoudary, Samar R., Brooke Aggarwal, Theresa M. Beckie, Paul N. Hopkins, Matthew A. Allison, Kristine Ensrud, Carol E. Kasten, et al. "Menopause Transition and Cardiovascular Disease Risk: Implications for Modern Clinical Practice: A Scientific Statement From the American Heart Association." Circulation 142, no. 25 (2020): e506–32.
4. El Khoudary, Samar R., et al. 2020. "Menopause Transition and Cardiovascular Disease Risk: A Scientific Statement From the American Heart Association." Circulation 142 (25): e506–e532.
5. Ko, Seung-Hyun, and Youn-Jee Kim. "Menopause and Cardiovascular Disease: Women's Health is an Essential Part of Public Health." International Journal of Environmental Research and Public Health 17, no. 23 (2020): 8697.
6. Lobo, Rogerio A., Faith G. Davis, Anne G. Rosenfeld, Sarah M. Samaan, Martha Gulati, Mercedes R. Carnethon, and Kevin C. Maki. "Evaluation of Cardiovascular Risk in Women for the Practitioner." Journal of the American College of Cardiology 79, no. 13 (2022): 1301–13.
7. Maas, Angela H. E. M., and Giuseppe M. C. Rosano. 2022. "The Transition from Low to High Cardiovascular Risk in Women." European Heart Journal 43 (31): 2921–2923.
8. Maziak, Wasim, et al. 2024. "The Burden of Non-Communicable Diseases in Conflict-Affected Syria." The Lancet Global Health 12 (1): e15–e16.
9. Nappi, Rossella E., Simonetta Piloni, and Valentina De Pascalis. "The Management of Menopause in Women at High Risk for Cardiovascular Disease." Maturitas 146 (2021): 44–50.
10. Vogel, Birgit, et al. 2021. "The Lancet Women and Cardiovascular Disease Commission: Reducing the Global Burden by 2030." The Lancet 397 (10292): 2385–2438.
11. Whelton, Paul K., et al. 2018. "2017 ACC/AHA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults." Journal of the American College of Cardiology 71 (19): e127–e248.