Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Cardiology

Acute Coronary Syndrome in Women Under 45: The Overlooked Impact of Modifiable Risk Factors

Malak El Adraoui[1*], Abdelkrim Ait Yahya[1], Mustapha El Hattaoui[1]

[1]Department of Cardiology, Mohammed VI university Hospital, Cadi Ayyad University, Marrakech, Morocco

DOI: https://doi.org/10.36347/sjmcr.2025.v13i05.129 | **Received:** 23.04.2025 | **Accepted:** 26.05.2025 | **Published:** 29.05.2025

***Corresponding author:** Malak El Adraoui
Department of Cardiology, Mohammed VI university Hospital, Cadi Ayyad University, Marrakech, Morocco

Abstract **Original Research Article**

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality globally. Acute coronary syndrome (ACS) in young women remains under-researched despite increasing prevalence. This study aims to identify modifiable cardiovascular risk factors (CVRFs) in women under 45 years old presenting with ACS.A retrospective descriptive study was conducted from December 2022 to December 2024 at the Cardiology Department of CHU Med VI, Marrakech. Female patients aged ≤45 admitted for ACS were included. Data on demographics, medical history, and CVRFs were collected and analyze. Among the study population, 97% had at least one modifiable CVRF. Diabetes was the most prevalent (83%, OR = 6.66), followed by dyslipidemia (55%), hypertension (34%), and obesity (24%). Only 17% were postmenopausal. Elevated C-reactive protein (CRP), hypothyroidism, and psychosocial factors were also observed. No patients reported smoking or a family history of cardiovascular disease. Concomitant presence of multiple risk factors was found in 66% of patients. Diabetes emerged as the most significant risk factor for ACS in young women, followed by dyslipidemia and hypertension. The coexistence of multiple modifiable risk factors significantly increases the risk of ACS. Early identification and management of these factors, alongside consideration of hormonal, inflammatory, and psychosocial influences, are essential for effective prevention strategies in this population.

Keywords: Acute Coronary Syndrome (ACS), Young Women, Cardiovascular Risk Factors, Inflammation, Preventive Cardiology.

INTRODUCTION

Cardiovascular disease (CVD) remains one of the leading causes of morbidity and mortality worldwide, affecting both men and women. However, in recent years, a rising trend of acute coronary syndrome (ACS) in young women—typically defined as those under the age of 45—has become a growing concern. Despite this, the burden of cardiovascular risk in this demographic is under-recognized and under-studied.

The pathophysiology of ACS in young women is often multifactorial, involving a complex interplay of traditional modifiable risk factors such as diabetes mellitus, hypertension, dyslipidemia, obesity, and smoking. Additional factors—including hormonal influences, psychosocial stressors, autoimmune conditions, and inflammatory markers like C-reactive protein (CRP)—may further contribute to disease onset and progression in this group. Notably, diabetes has been shown to exert a disproportionately greater cardiovascular risk in women compared to men, increasing the likelihood of myocardial infarction and adverse cardiac outcomes.

While the majority of existing research has focused on older adults or male populations, the specific risk profiles and clinical characteristics of young women with ACS remain less well characterized. Understanding these profiles is critical for early identification, targeted prevention, and effective management strategies aimed at reducing long-term cardiovascular events. This study aims to evaluate the prevalence and distribution of modifiable cardiovascular risk factors in young women diagnosed with ACS at the Cardiology Department of CHU Med VI in Marrakech, Morocco. By examining these factors, the study seeks to contribute to a more nuanced understanding of gender-specific cardiovascular risks and support the development of age-appropriate preventive measures.

MATERIALS AND METHODS

We conducted a descriptive retrospective study over 2years, from December 2022 to December 2024, including all female patients under the age of 45 individuals admitted for acute coronary syndrome at the cardiology Department of CHU Med VI, Marrakech. A data collection form was used for each patient to gather and analyze demographic characteristics, medical history and presence of cardiovascular risk factors.

RESULTS

- This 3D bar chart shows the proportion of cases categorized under "FRCV modifiables" (modifiable cardiovascular risk factors) and "Ménopause" (menopause).
- 97% of cases fall under modifiable risk factors, indicating that most risk factors can be controlled or mitigated through lifestyle or medical intervention.
- Only 17% of cases are linked to menopause, suggesting a lower direct association.

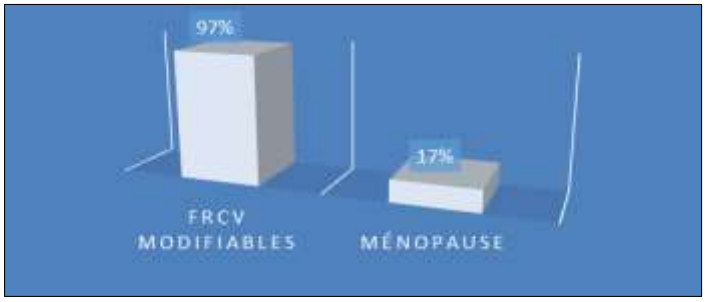

Fig. 1: Distribution of Cases by Modifiable CVRF

- This bar chart breaks down the modifiable risk factors (CVRF modifiables) into specific categories.
- Diabetes is the most significant modifiable risk factor (83%), highlighting its dominant role in cardiovascular risk.
- Dyslipidemia follows at 55%, showing the importance of cholesterol and lipid control.
- Hypertension (34%) and obesity (24%) are also notable but less prevalent.

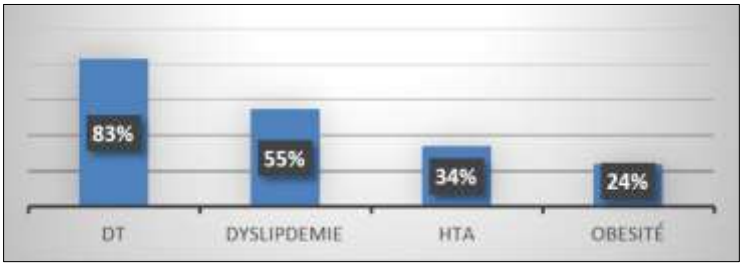

Fig. 2: Distribution of Cases by Number of Modifiable CVRF

- This pie chart categorizes cases based on how many modifiable risk factors they have:
  - 1 CVRF: 34%
  - 2 CVRF: 38%
  - More than 2 CVRF: 28%
- The majority of cases have multiple modifiable risk factors (66%), underlining the importance of addressing multiple lifestyle and health factors simultaneously.

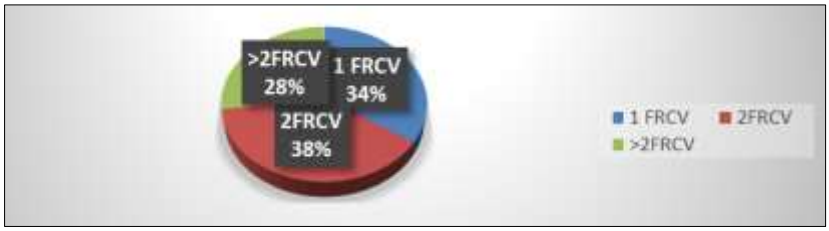

Fig. 3: Breakdown of Risk Factors per Number of CVRF

- This stacked bar chart provides a detailed distribution of different conditions (Diabetes, Obesity, Dyslipidemia, Hypertension) across cases with different numbers of risk factors.
- As the number of risk factors increases (from 1 CVRF to 4 CVRF), the prevalence of all conditions reaches 100%, demonstrating a cumulative effect. This suggests a strong correlation between multiple risk factors and an increased burden of cardiovascular disease.
- Diabetes (DT) remains a major contributor across all groups.

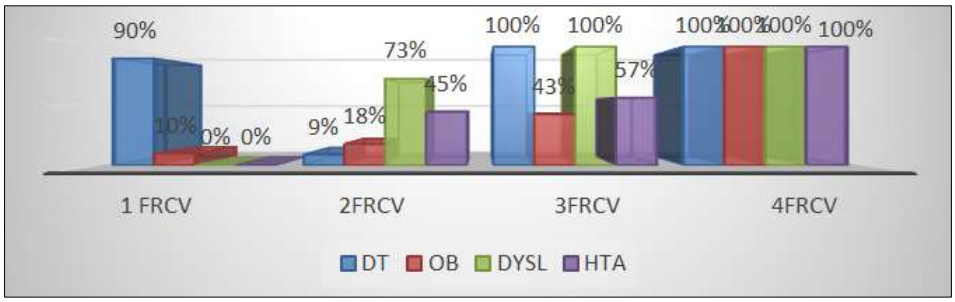

Fig. 4: distribution of of cases with number and name of risk factors

This horizontal bar chart presents the prevalence of different medical conditions in the population:

- Goiter and Cholecystectomy: 10% each.
- Anemia, Hypothyroidism, and Stroke (AVCI): 7% each.
- Other conditions like Hypercorticism, Anxiety/Depression, and NSTEMI Revascularization: 3%.
- Thyroid disorders (goiter, hypothyroidism) appear relatively common.
- Anemia and Stroke (AVCI) also have a moderate prevalence.
- The presence of psychiatric conditions (Anxiety/Depression) at 3% suggests a potential link between mental health and cardiovascular risk.
- Thyroid disorders, anemia, and previous cardiovascular events are notable comorbidities, suggesting a broader metabolic and systemic impact on cardiovascular health.

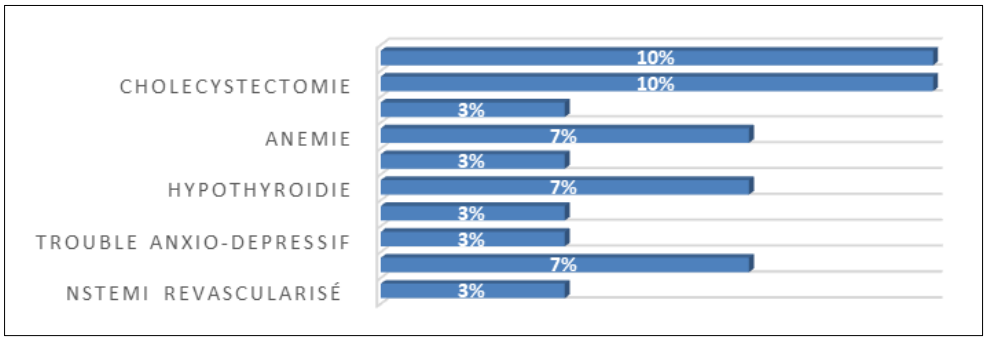

Fig. 5: Distribution of Cases by Medical History

DISCUSSION

Cardiovascular disease remains a major cause of morbidity and mortality worldwide. Among the known risk factors, hypertension, diabetes, dyslipidemia, obesity, and smoking are the most frequently associated with cardiovascular events. However, when it comes to young women, the impact of these risk factors remains relatively understudied, despite the worrying prevalence of acute coronary syndromes (ACS) in this population group.

Diabetes: A Major Risk Factor

Diabetes stands out as the most influential risk factor for the development of ACS in young women. In our study, 83% of patients had diabetes. This observation is consistent with the results of the INTERHEART study, which also demonstrated an increased risk of ACS in diabetic women with an odds ratio of 4.26 [1]. In the study by M. Bęćkowski, *et al*., diabetes was associated with an odds ratio of 6.66, indicating that it is one of the most important factors in the development of ACS in young women [2].

Hypertension and ACS

In the study by M. Beckowski *et al*., hypertension was present in nearly half of the patients (49.8%) and was associated with a more than fourfold increased risk of developing ACS [2]. This risk factor is well documented, and its major role in the development of coronary artery disease is widely recognized. Indeed, the INTERHEART study also showed that eliminating hypertension in women could reduce the risk of ACS by

36%, an effect that is twice as pronounced in women as in men [1]. Patwary MSR *et al*., has shown that 41.67% of young patients in their study were hypertensive [3]. In the present study, 34% of patients were hypertensive, which is a similar finding. Franklin *et al*., demonstrated a relationship between age, type of hypertension, and the risk of coronary artery disease. In subjects under 50 years of age, the most important risk factor was diastolic hypertension [4].

Dyslipidemia

Dyslipidemia, particularly high LDL and low HDL, was largely linked to an increased risk of ACS in our study, as also suggested by other research, including the study by Moebus *et al*., which analyzed the relationship between metabolic syndrome risk factors and cardiovascular events [5]. Patwary MSR *et al*., showed in a study that 53.33% of young patients were dyslipidemic [3]. This observed result is consistent with that obtained in our own study: 55% of patients were dyslipidemic which are similar findings.

Obesity

The impact of obesity on cardiovascular health remains controversial. While some studies have established an association between obesity and an increased risk of ACS, our study found no significant link; obesity accounted for only 24% of other modifiable risk factors. Our result is similar to that reported by M. BECKOWSKI *et al*., in their study, which found that obesity, defined by BMI (body mass index), was not significantly associated with the risk of ACS (OR 0.99) [2]. This could be due to a less strict definition of obesity, or to other risk factors occurring in young women. This is in contrast to the results of the Framingham Heart Study, which showed that the relative risk of coronary artery disease in women increased by 64% compared to men, where there was a 46% increase. The relationship between obesity and cardiovascular disease has become increasingly clear [6].

The Role of Menopause

Although premature menopause was observed in only 17% of patients in our study, it remains an important risk factor according to the literature [7]. The question of menopause is not completely defined. The Framingham Heart Study reported a higher risk of cardiovascular disease in postmenopausal women, even more pronounced in women aged 40 to 44 years [8], whereas the Nurses' Health Study found no significant association with time since natural menopause [9]. Decreased estrogen levels after menopause are associated with an increased risk of cardiovascular disease. The protective effects of estrogens on the cardiovascular system are well documented, [10], and their absence after menopause can lead to metabolic disturbances, elevated blood lipids and increased blood viscosity, thus promoting atherosclerosis [11].

Other Risk Factors

The results of the regression analysis showed that in young women, several factors constitute independent risks for acute coronary syndrome (ACS). These factors include hyperhomocysteinemia, elevated CRP, hypothyroidism, gynecological diseases, depression or anxiety, heart failure, oral contraceptive use, family history of premature coronary artery disease, and autoimmune diseases [12].

Various biomarkers, such as lipids, creatinine, and inflammatory reactions (LDL, TG, CRP), have been shown to be involved in the pathogenesis of SCA in young women [13]. The results we observed share similarities with those reported in our study. In our study, only one patient (3%) was being treated for anxiety and depression, while two patients (7%) were being treated for hypothyroidism. Additionally, six patients (20%) had elevated CRP. In our study, none of the patients had a family history of cardiovascular or cerebral infarction or sudden death. All patients had preserved renal function. This result is consistent with that reported in the study by Mbeckowski *et al*., which found no correlation between stroke and the risk of ACS [2].

In contrast, the RATIO study found that women with a familial history of MI had a 4-fold increased risk of ACS, with a significantly higher risk of stroke. As well as a history of multiple strokes, the risk of having an ACS has no effect on the incidence of stroke [14]. At admission, the patients had no history of autoimmune, immune, or gynecological diseases. Other risk factors reported in the literature but not found in our patients:

Smoking

In our study, no patients smoked. The WHO MONICA survey showed that 77% of women aged 35 to 39 years treated for acute coronary syndrome had a history of smoking [15]. Long-term follow-up of over one million British women showed a 4-fold reduction in the incidence of coronary artery disease and a 3-fold reduction in mortality in women who quit smoking [16].

Contraception and Number of Pregnancies

We did not collect data on contraceptive use and number of pregnancies. In addition to the risk factors discussed above, the use of oral contraceptive pills in women of reproductive age has been shown to double the risk of ACS, while pregnancy increases it another 3- to 4-fold [17, 18].

Combination of CVRFs:

Early onset of ACS appears to be associated with the presence of combined risk factors [19]. The concomitant presence of hypertriglyceridemia, low HDL cholesterol, hypertension, and diabetes was found to be largely responsible for the onset of ACS. This observation is in perfect agreement with our results. Women who smoke and take oral contraceptives have a

sevenfold increased risk of developing atherosclerotic cardiovascular disease. [20]. In our study, 34% of patients had only one modifiable risk factor, while 66% had more than one risk factor, or two risk factors.

NSE and Depression

Socioeconomic status and depression level may also play an important role in the prognosis of ACS in women [21].

Homocysteine and Uric Acid Levels

We did not have data on homcysteine levels. Homocysteine (Hcy) was not analyzed in our study. However, it is a known risk factor for coronary artery disease and may be involved in SCA in young women [22]. Various biomarkers, such as uric acid and homocysteine, have been shown to be involved in the pathogenesis of SCA in young women [13].

The Role of CRP in SCA

Previous studies have shown that elevated high-sensitivity CRP (hs-CRP) can predict future adverse cardiac events [22]. The relationship between CRP and SCA is complex, as CRP promotes the formation of unstable coronary atherosclerotic plaques, triggers their rupture, and causes thrombosis in the coronary arteries, leading to SCA and myocardial infarction (MI). Furthermore, CRP reduces the stability of nitric oxide (NO) synthesis mRNA in endothelial cells, which decreases the expression of NO synthetase protein. However, NO is essential for maintaining blood vessel elasticity and promoting vasodilation, countering vasoconstriction due to endothelin and angiotensin II, and promoting blood vessel formation. (CRP also increases the expression of endothelial adhesion molecules and binds to modified low-density lipoproteins (modified LDL), thereby facilitating monocyte aggregation in the atheromatous plaque and increasing its instability. MI causes the release of necrotizing substances that stimulate CRP production. CRP levels peak within two days of MI onset before to gradually decrease. This suggests a causal link between CRP and SCA, confirming that CRP is a major risk factor for SCA in young women.

Therapeutic Implications

Anti-inflammatory drugs, such as colchicine, methotrexate, and the IL-1β inhibitor canakinumab, can reduce the inflammatory response and significantly reduce the risk of cardiovascular events. These results confirm that inflammation plays a key role in the onset and progression of ACS [23].

CONCLUSION

This study highlights the importance of modifiable risk factors in the development of acute coronary syndromes in young women. Diabetes, hypertension, dyslipidemia, and obesity are major factors, but other factors, such as premature menopause, thyroid disorders, and psychosocial factors, also play a crucial role. To prevent cardiovascular disease in young women, it is crucial to adopt a comprehensive approach that includes risk management. Traditional methods, but also special attention to less obvious factors such as hormonal impact, stress and metabolic disorders. Increased surveillance and awareness are essential to reduce the future cardiovascular burden on this vulnerable population.

Conflicts of Interest: The authors declare no conflict of interest

Contributions of the Authors

All authors contributed to the conduct of this research work. All authors have read and approved the final version of the manuscript.

REFERENCES

1. S.S. Anand and al (2008) INTERHEART Investigators. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study, Eur. Heart J. 29 (7) 932–940.
2. M. Bęćkowski, and al. (2017) Risk factors predisposing to acute coronary syndromes in young women ≤45 years of age, Int JCardiol
3. Patwary MSR and al (2008) Risk factors and pattern of coronary artery disease in young myocardial infarction. Annual conventions and scientific sessions of the Association of Physicians of Bangladesh.
4. S.S. Franklin and al(2001)Does the relationship of blood pressure to coronary heart disease risk change with aging? The Framingham Heart Study, Circulation 103 (9) 1245–1249.
5. S. Moebus and al (2010) Age- and sex-specific prevalence and ten-year risk for cardiovascular disease of all 16 risk factor combinations of the metabolic syndrome - a cross-sectional study, Cardiovasc. Diabetol. 934
6. Adams B and al(2020) Higher BMI is linked to an increased risk of heart attacks in European adults: a Mendelian randomization study. BMCCardiovasc Disord. 2020;20:258
7. Greenwood BN and al(2018) Carnahan S, Huang L. Patient-physician gender concordance and increased mortality among female heart attack patients.Proc Natl Acad Sci U S A.;115(34):8569–74
8. Gordon T, Kannel WB, Hjortland MC, McNamara PM. Menopause and coronary heart disease: the Framingham Study. Ann Intern Med. 1978;89:157–161),
9. Colditz GA and al (1987)Menopause and the risk of coronary heart disease in women. N Engl J Med. 1987;316:1105–1110).
10. Zhao D and al(2018) Endogenous sex hormones and incident cardiovascular disease in postmenopausal women. J Am Coll Cardiol.;71(22):2555–66)

11. Shaw LJand al(2017)Quality and equitable health care gaps for women: attributions to sex differences in cardiovascular medicine. J Am Coll Cardiol. 2017;70(3):373–88.
12. Chandrasekhar J and al (2018)Acute myocardial infarction in young women: current perspectives. Int J Women's Health.;10:267–84
13. He C and al(2019) Prognostic value of hyperuricemia in patients with acute coronary syndrome: a meta-analysis. Eur J Clin Investig. 2019;49(4):e13074.
14. B. Siegerink and al (2012) Family history differs between young women with myocardial infarction and ischemic stroke: results from the RATIO case-control study, Atherosclerosis 223 (1) 235–238
15. M.S. Mähönen and al (2004) WHO MONICA Project. Current smoking and the risk of non-fatal myocardial infarction in the WHO MONICA Project populations. Tob. Control. 13 (3) 244–250.
16. R.R. Huxley and al (2013)Full hazards of smoking and benefits of stopping for women, Lancet 381 (9861) 96–98.
17. Tanis BC and al (2001) Oral contraceptives and the risk of myocardial infarction. N Engl J Med.;345:1787–1793.
18. James AH and al (2006) Acute myocardial infarction in pregnancy: a United States population-based study. ;113:1564–1571.
19. Pierpaolo Di Micco and al(2009). Association of thrombophilic gene variant with smoking as risk factors for early-onset of acute coronary syndrome. Open Atherosclerosis Thrombosis J.;2:42–44
20. Hackshaw Aand al (2018)Low cigarette consumption and risk of coronary heart disease and stroke: meta-analysis of 141 cohort studies in 55 study reports. BMJ.;363:k5035.
21. Shah AJ and al 2014.Sex and age differences in the association of depression with obstructive coronary artery disease and adverse cardiovascular events. J Am Heart Assoc.;3
22. Badimon L and al C-reactive protein in atherothrombosis and angiogenesis. Front Immunol.;9(2):430–7.
23. Liu et al. BMC Cardiovascular Disorders (2020) The characteristics of risk factors in Chinese young women with acute coronary syndrome.