



# Cardiovascular disease and association with arthritis in primary care Enfermedades

cardiovasculares y asociación con artritis en la atención primaria

Authors

**Dr. Edwin Miranda Solis. Professor of Medicine at the Universidad Regional Autónoma de los Andes (UNIANDÉS Ambato).**

Email: [ua.edwinmiranda@uniandes.edu.ec](mailto:ua.edwinmiranda@uniandes.edu.ec)  
<https://orcid.org/0000-0003-1625-0138>

**Dr. Denisse Isabel Suaste Pazmiño. Professor of Medicine at the Universidad Regional Autónoma de los Andes (UNIANDÉS Ambato).**

Email: [ua.denissesuaste@uniandes.edu.ec](mailto:ua.denissesuaste@uniandes.edu.ec)  
<https://orcid.org/0000-0003-4429-5915>

**Dr. Valeria Monserrath Zúñiga Sánchez. Professor of Medicine at the Universidad Regional Autónoma de los Andes (UNIANDÉS Ambato).**

Email: [ua.valeriazuniga@uniandes.edu.ec](mailto:ua.valeriazuniga@uniandes.edu.ec)  
<https://orcid.org/0000-0002-6765-0660>

## Abstract

**Introduction:** People with most forms of arthritis are at increased risk for CVD. Shared inflammatory pathways are a possible link between any form of arthritis and CVD.

**Purpose:** To examine the relationship between arthritis and CVD risk factors in young, middle-aged, and older adults.

**Methods:** A cross-sectional study was conducted in 122 primary care practices involving 13 776 participants.

**Results:** Arthritis was reported by 4.0% of young adults, 28.8% of middle-aged adults, and 54.5% of older adults.

**Conclusions:** Ecuadorian adults of all ages with arthritis are more likely to have CVD risk factors.

**Keywords:** cardiovascular disease, arthritis, obesity, primary care. source: DeCS

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## Resumen

**Introducción:** Las personas con la mayoría de las formas de artritis tienen un mayor riesgo de ECV. Las vías inflamatorias compartidas son un posible vínculo para cualquier forma de artritis y ECV.

**Objetivo:** Examinar la relación entre la artritis y los factores de riesgo de ECV en adultos jóvenes, de mediana edad y mayores.

**Método:** Se realizó un estudio transversal, en 122 prácticas de atención primaria que incluyó a 13 776 participantes.

**Resultados:** La artritis fue reportada por el 4,0% de los adultos jóvenes, el 28,8% de los adultos de mediana edad y el 54,5% de los adultos mayores.

**Conclusiones:** Los adultos ecuatorianos de todas las edades con artritis tienen mayores probabilidades de tener factores de riesgo de ECV.

**Palabras clave:** enfermedades cardiovasculares, artritis, obesidad, atención primaria fuente: DeCS



## Introduction

Cardiovascular disease (CVD) remains the leading cause of disease burden worldwide. The burden of CVD has continued to increase for decades in almost all countries and alarmingly, the age-standardized CVD rate has risen. According to the Global Burden of Disease study, CVD was the underlying cause of 6.2 million deaths between the ages of 30 and 70 years and one-third of all deaths worldwide in 2019<sup>(1)</sup>. The underlying pathophysiology of CVD is accelerated by obesity, hypertension, dyslipidemia, and diabetes. These conditions develop over many years, remain silent, and are usually advanced when CVD symptoms occur<sup>(2)</sup>. Although traditional risk score screening is recommended in guidelines to identify people at risk of CVD, it remains underutilized. Furthermore, addressing these risk factors in all affected individuals is challenging, as many individuals with these CVD risk factors are largely asymptomatic and may not actively seek medical care to address their CVD risk specifically. Therefore, using other risk-increasing factors to identify subsets of individuals most likely to receive a clinical benefit for CVD prevention offers an alternative approach<sup>(3)</sup>.

On the other hand, musculoskeletal conditions such as arthritis cause pain and immobility and are one of the most common reasons for presentation to primary health care. Therefore, presentations for arthritis symptoms can be used as a "teachable moment" or an opportunity for healthcare professionals to manage arthritis and assess CVD risk factors in parallel to reduce the burden of both conditions. Therefore, we aimed to examine the relationship between arthritis and CVD risk factors (obesity, hypertension, dyslipidemia, and diabetes) in young, middle-aged, and older adults and to estimate the proportion of people with CVD risk factors in the population that could be reduced by targeting arthritis<sup>(5,6)</sup>.

## Method

A cross-sectional study was conducted in the central highlands of Ecuador in 122 primary care practices. Participants were excluded if

they were under 18 years of age, as both OA and CVD are less common in this age category. This study was approved by the Universidad Regional Autónoma de Los Andes (UNIANDES).

Interviews were conducted between July 2, 2020 and June 30, 2021. Voluntary height and weight measurements were collected from respondents. If respondents chose not to be measured, they were asked to self-report their height and weight. In total, 80% of respondents agreed to be measured and the remainder chose to self-report these data. Body mass index (BMI) was calculated by the formula weight (kg) divided by the square of height (m), and obesity was defined by BMI > 30 kg/m<sup>2</sup>. Voluntary blood pressure measurements were also taken. The second of two readings was counted unless there was a difference of > 10 mmHg between the two readings, in which case a third reading was taken. Hypertension was defined by a systolic blood pressure > 140 mmHg or a diastolic blood pressure > 90 mmHg.

Respondents were asked whether they had arthritis, including osteoarthritis, rheumatoid arthritis, rheumatism, gout, or other types of arthritis. The presence of arthritis was defined as whether a physician or nurse had diagnosed the condition or whether it was a current or long-term condition. Respondents were also asked whether a doctor or nurse had diagnosed them with any diabetes or high blood sugar and was included as diabetic if they answered yes, except if they had gestational diabetes. Similarly, respondents were asked if a doctor or nurse had ever told them that they had high cholesterol.

Study participants were classified into three age groups: young adults (18 to 39 years), middle-aged (40 to 64 years), and older adults (65 years and older). Descriptive statistics were used to describe population characteristics and arthritis and CVD risk factors distribution. Logistic regression models were used to estimate the odds ratio (OR) with 95% confidence intervals (CI) for CVD risk factors concerning the presence of arthritis. The attributable population fraction (PAF) was calculated to determine the



proportion of CVD risk factors in the population that could be attributed to arthritis. Database and statistical processing of the data were performed and analyzed in SPSS 26 statistical software (SPSS Inc., Chicago, IL, USA).

**Results**

The study included 13,776 participants. Arthritis was reported by 4.0% of young adults, 28.8% of middle-aged adults, and 54.5% of older adults. People with arthritis had higher odds of obesity (2.07 times in young, 1.75 times in middle-aged and 1.89 times in older adults), higher odds of diabetes (5.70 times in young, 1.64 times in middle-aged and 1.37 times in older) adults), higher odds of hypertension (2.72 times in young, 1.78 times in middle-aged and 1.48 times in older adults) and higher odds of dyslipidemia (4.64 times in young, 2.14 times in middle-aged and 1.22 times in older adults) compared to those without arthritis. These elevated odds remained significant even after adjusting for obesity, except for diabetes in the older population.

The prevalence, associations, and PAF of CVD and arthritis risk factors in young adults are presented in Table 1. Of this population, 29.1 % of those with arthritis were obese, compared with 16.5 % of those without arthritis, indicating a 2.07-fold (95 % CI: 1.36-3.16) higher prevalence of obesity in young adults with arthritis. The FAP, or the proportion of the young adult population with obesity that could be attributed to arthritis, was 15.0% (95 % CI: 4.1-24.7 %). The prevalence of diabetes was 2.5% in young adults with arthritis, a 5.70-fold higher prevalence (95% CI 1.74-15.37) compared to those without arthritis, which remained significant after adjusting for obesity. The prevalence of hypertension and dyslipidemia

in young adults with arthritis was 8.9 % for each, a 2.72 (95 % CI 1.53-4.84) and 4.64-fold (95 % CI 2.56-8.39) higher prevalence compared to those without arthritis, respectively.

These results remained significant after adjusting for obesity. The PEFs for hypertension and dyslipidemia in relation to arthritis were 5.6 % (95 % CI 0.9-10.2 %) and 7.0 % (95 % CI 2.3-11.5 %), respectively. In young adults with arthritis, 13.4 % had at least one of hypertension, dyslipidemia or diabetes compared to 5.2 % of those without arthritis, a 2.82-fold higher prevalence (95 % CI 1.74-4.56) and a PAF of 8.6 % (95 % CI 2.7-14.1 %). If obesity were included, 36.4% of this population with arthritis had at least one CVD risk factor (hypertension, dyslipidemia, diabetes or obesity), compared to 20.6% of those without arthritis, 2.28 times (95% CI 1.53-3.40) higher prevalence and a PAF of 20.4% (95% CI 8.2-31.0%). Dyslipidemia or diabetes compared to 5.2 % of those without arthritis, 2.82 times (95 % CI 1.74-4.56) higher prevalence and a PAF of 8.6 % (95 % CI 2.7-14.1 %). If obesity were included, 36.4% of this population with arthritis had at least one CVD risk factor (hypertension, dyslipidemia, diabetes or obesity), compared to 20.6% of those without arthritis, 2.28 times (95% CI 1.53-3,40) higher prevalence and a PAF of 20.4% (95% CI 8.2-31.0%),dyslipidemia or diabetes compared to 5.2% of those without arthritis, 2.82 times (95% CI 1.74-4.56) higher prevalence and a PAF of 8.6% (95% CI 2.7-14.1%). If obesity were included, 36.4% of this population with arthritis had at least one CVD risk factor (hypertension, dyslipidemia, diabetes or obesity), compared to 20.6% of those without arthritis, 2.28 times (95% CI 1.53-3.40) higher prevalence and a PAF of 20.4% (95% CI 8.2-31.0%).

**Table 1.** Cardiovascular risk factors in adults with/without arthritis aged 18-39 years.

Variable	Total Number		OR (95% CI)		Fraction attributable to population, % (95% CI)
	Non-arthritis (n= 3773)	Arthritis (n = 157)	OR (95% CI)	Obesity - adjusted OR (95% CI)	



Obesity	473 (16,5%)	32 (29,1%)	2,07 (1,36-3,16)	-	15,0 (4,1-24,7)
Diabetes	19 (0,5%)	4 (2,5%)	5,70 (1,74-15,37)	4,87 (1,34-17,69)	2,1 (0,00-4,50)
Hypertension	131 (3,5%)	14 (8,9%)	2,72 (1,53-4,84)	2,35 (1,17-4,70)	5,6 (0,9-10,2)
Dyslipidemia	78 (2,1%)	14 (8,9%)	4,64 (2,56-8,39)	4,62 (2,34-9,14)	7,0 (2,3-11,5)
1 or more of hypertension/dyslipidemia/diabetes	196 (5,2%)	21 (13,4%)	2,82 (1,74-4,56)	2,78 (1,59-4,88)	8,6 (2,7-14,1)
1 or more of hypertension/dyslipidemia/diabetes/obesity * 1 or more of hypertension/dyslipidemia/diabetes/ obesity	613 (20,6%)	40 (36,4%)	2,28 (1,53-3,40)	-	20,4 (8,2-31,0)

Source: Own elaboration based on statistical analysis, \* Obesity data n = 2791, OR: Odds ratio, CI: confidence interval, p ≤ 0.05.

The prevalence of obesity was 38.3% in those with arthritis compared to 26.2% in those without, a 1.75-fold higher prevalence (95% CI 1.54-2.01). The PAF of arthritis due to obesity was 16.5 % (95 % CI: 12.5-20.3 %). The prevalence of diabetes was 9.2 % in middle-aged adults with arthritis, which represents a 1.64-fold higher prevalence (95 % CI: 1.33-2.03) compared to those without arthritis, and remains significant after adjusting for obesity. The PAF of arthritis due to diabetes was 3.6 % (95 % CI: 1.9-5.3 %). The prevalence of hypertension and dyslipidemia in this population with arthritis was 28.6 % and 21.9 %, respectively, with a 1.78-fold (95 % CI 1.60-2.04) and 2.14-fold (95 % CI 1.84-2.49) higher prevalence compared to those without arthritis, remains significant after adjusting for obesity. The PAF for arthritis was 5.6 % (95 % CI 0.8-10.2 %) for hypertension and 11.6 % (95 % CI 9.1-14.0 %) for dyslipidemia. Among middle-aged adults, 41.5 % of those with arthritis had at least one hypertension, dyslipidemia, or diabetes, a 1.90-fold prevalence (95 % CI 1.69-2.15) and a PAF of 19.7 % (95 % CI

16.0-23.2 %). If obesity were included, 60.4% of this population with arthritis had at least one of hypertension, diabetes, dyslipidemia or obesity, a 2.03-fold (95 % CI 1.79-2.31) higher prevalence and a PAF of 30.7% (95 % CI 25.5-35.5%).

The prevalence of obesity was 32.9% among people with arthritis, a prevalence 1.89 times higher (95 % CI: 1.62-2.21) compared to people without arthritis. PAF was 15.5% (95% CI 12.0-18.9%). The prevalence of diabetes in people with arthritis was 17.6 %, representing a 1.37-fold increase in prevalence (95 % CI: 1.15-1.62) compared with people without arthritis. The PAF of arthritis due to diabetes was 4.7 % (95 % CI: 2.2-7.2 %). The prevalence of hypertension and dyslipidemia in this population with arthritis was 48.2% and 28.7%, respectively, with an increased prevalence of 1.48-fold (95% CI 1.31-1.68) and 1.22-fold (95% CI 1.07-1.41) respectively compared to those without arthritis, which remained significant when adjusted for obesity. The PAF was 15.7% (95% CI 11.0-20.1%) for hypertension and 5.2% (95% CI 1.7-8.7%) for dyslipidemia. 61.7% of older



adults with arthritis had at least one of hypertension, dyslipidemia or diabetes, representing a 1.49-fold higher prevalence (95 % CI 1.31-1.68) compared to those without arthritis and a PAF of 20.2% (95 % CI 14.4-25.6.) %. Of the older adults with arthritis, 70.4 % had at least one of hypertension, dyslipidemia, diabetes, or obesity, equivalent to a 1.58-fold higher prevalence (95 % CI 1.38-1.83) compared to those without arthritis and a PAF of 26.0 % (95 % CI 1.38-1.83). % IC 18.8-32.5%).

### Discussion

This study showed high prevalences of treatable CVD risk factors in people with arthritis. The proportion of one or more CVD risk factors (hypertension, dyslipidemia, or diabetes) in the population that could be identified by targeting people with arthritis was 8.6% in young adults, 19.7% in middle-aged adults, and 20.2% in older adults. These proportions were significantly higher if obesity was included, 20.4%, 30.7% and 26.0%, respectively.

The prevalence of arthritis in each age group is similar to that reported in other literature and Western countries<sup>(7)</sup>. Although the type of arthritis was not specified in our study, it is likely to vary in each age group. However, there is evidence that all common forms of arthritis, osteoarthritis, inflammatory arthritis, and crystalline arthritis, such as gout, are associated with an increased risk of CVD, which is significantly attributed to traditional risk factors such as hypertension and dyslipidemia<sup>(8,9)</sup>.

Arthritis, in contrast to CVD risk factors, causes pain and immobility and is a very common reason for seeking medical attention. CVD risk factors are common in people with all forms of arthritis and people with arthritis are more likely to come into contact with health professionals; this point of contact can be used as a teaching moment to signal CVD risk assessment. This may also be a strategy to help target higher-risk individuals who are less likely to seek medical attention for preventive

(asymptomatic) care<sup>(10,11)</sup>. The potential to address the hidden burden of CVD risk would benefit people with arthritis. Furthermore, the high prevalence of arthritis can affect the overall burden of CVD. We estimate that targeting people with arthritis has the potential to identify 5.6% of hypertension in young and middle-aged adults and 15.7% in older adults in these populations. Similarly, by targeting people with arthritis, there is the potential to identify 7.0 % of dyslipidemia in young adults, 11.6 % in middle-aged adults, and 5.2 % in older adults in these populations<sup>(12,13)</sup>.

The prevalence of arthritis is high in the community, and arthritis symptoms are a common reason for seeking medical care<sup>(14)</sup>. Finding people with arthritis and screening them for CVD presents an opportunity to improve community-based CVD prevention, as cardiovascular risk factors are asymptomatic until CVD develops. The current study shows an opportunity to target individuals for CVD prevention at their first point of contact for joint pain. This can potentially increase cardiovascular prevention awareness by targeting a population with a high prevalence of CVD risk factors. This approach, in turn, also can reduce joint pain, as CVD and OA, the most common cause of joint pain in adults, share common risk factors and we have shown that addressing these through a low-intensity lifestyle intervention improves joint pain<sup>(15,16)</sup>.

The results of this study should be considered in the context of its limitations. Although measurements mainly defined hypertension and obesity, the prevalence of dyslipidemia and diabetes was self-reported, which may have been subject to bias and resulted in underestimation. Our results may be limited by using dichotomous variables (i.e., presence or absence) of conditions. There were no supporting clinical, biochemical, or radiographic data that confirmed the diagnoses and could also be used to



classify severity. There may be a stronger association between more severe CVD risk factors and arthritis, which our study would not elucidate<sup>(17,18)</sup>. Third, the type of arthritis was not specified in our data. While it is possible to infer that inflammatory arthritis may predominate in the younger population, as with OA in the older population, the types of arthritis are separate entities and may cause increased CVD risk through different pathophysiological processes<sup>(19)</sup>. As the association between inflammatory arthritis (e.g., rheumatoid arthritis, gout) and cardiovascular disease is increasingly recognized, individuals with these conditions may have been more likely to be screened for CVD risk factors, so that bias may have been introduced<sup>(20)</sup>. However, the association between OA and CVD risk factors is not well recognized among health professionals and specific CVD screening in this population is not recommended in either CVD screening guidelines or guidelines for managing OA. As the prevalence of inflammatory arthritis is much less common than osteoarthritis in middle-aged and older populations, it is unlikely that bias due to CVD risk factor screening is the only explanation for our findings, as arthritis was associated with an elevated risk of CVD, regardless of age category. Another limitation is that we did not have access to data related to physical activity levels, which could act as a potential confounder in some of the relationships drawn. Finally, this was a cross-sectional study, so a temporal relationship between arthritis and CVD risk factors could not be established. Nevertheless, this study may confirm that both arthritis and CVD coexist and if one of these health risks is present, individuals should be referred for testing for the other condition.

### Conclusions

The study demonstrates that Ecuadorian adults of all ages with arthritis are more likely to have CVD risk factors independent of obesity. Presentation to health

professionals with symptoms due to arthritis could provide an opportunity to detect individuals with asymptomatic CVD risk factors. By adopting an approach to managing arthritis and CVD risk factors in parallel rather than in silos, there is the potential to improve outcomes in both conditions.

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