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RESEARCH ARTICLE

SEX-RELATED DIFFERENCES IN GOUT: A COMPARATIVE STUDY IN A MOROCCAN COHORT

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Abstract

Background: The aim of this study was to characterize sex-related differences in the clinical, biological, and therapeutic features of gout in a Moroccan cohort.

Methods: We conducted a cross-sectional study including 147 patients with gout (92 men and 55 women). Epidemiological, clinical,biological radiological, and therapeutic characteristics were analyzed and compare d according to sex.

Results: Compared with men, women with gout were older (64.9 vs. 60.85 years) and had a higher prevalence of cardiometabolic comorbidi ties, particularly hypertension and diabetes ($p < 0.05$). Renal involveme nt was significantly more frequent and more severe in women ($p = 0.003$). In contrast, men exhibited a more inflammatory and severe disease profile, with higher pain scores and elevated C-reactive protein levels ($p = 0.003$), as well as a higher frequency of tophi and more frequent structural joint damage. No significant differences were observed regarding monoarticular versus polyarticular presentation. Treatment patterns were broadly similar between sexes, although colchicine use was significantly more frequent in men ($p = 0.001$).

Conclusion: Men and women with gout exhibit distinct clinical phenoty pes. Female gout is characterized by a predominantly metabolic and renal profile,whereas male gout is associated with a more inflammatory and structural disease pattern. These findings highlight the need for sex-specific management strategies.

Introduction

Gout is the most common inflammatory arthritis, with a prevalence estimated between 1% and 4% in Western countries, and has been steadily increasing over recent decades [1–3]. This trend is largely attributed to population aging, the rising prevalence of cardiometabolic comorbidities, and the increased use of medications promoting hyperuricemia, particularly diuretics [2,3]. Gout is associated with impaired quality of life, functionallimitations,and increased cardiovascular morbidity and mortality [1,23].

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Historically considered a predominantly male disease, gout in women has recently gained increasing attention. Its prevalence rises significantly after menopause, likely due to the loss of the uricosuric effect of estrogens [4,10–13]. Women with gout are generally older at diagnosis and present with a higher prevalence of comorbidities, particularly hypertension, diabetes, and chronic kidney disease, compared with men [5–8,14]. In contrast, men more frequently exhibit lifestyle-related risk factors, such as alcohol consumption and dietary habits, as well as a more inflammatory and structurally severe disease pattern [2,4,8,9].Despite these findings, gout in women remains under-recognized and insufficiently studied. Many studies include relatively small numbers of women or lack detailed sex-based analyses [5–7]. Moreover, treatment strategies are often not sex-specific, despite the existence of distinct clinical profiles suggesting the need for individualized management [15,16,24].In this context, and given the increasing burden of gout, it is essential to better characterize sex-related differences across diverse populations. Data from North African countries remain scarce.The aim of our study was to compare epidemiological, clinical, biological, radiological, and therapeutic characteristics of gout between the two sexes in a Moroccan cohort.

Materials and Methods

We conducted a cross-sectional study including 147 patients with gout (92 men and 55 women), followed in a rheumatology setting. The diagnosis of gout was based on clinical and biological findings and/or the identification of monosodium urate crystals in synovial fluid, in accordance with the 2015 ACR/EULAR classification criteria.
Data were collected retrospectively from medical records and completed during clinical visits. Variables included sociodemographic characteristics, comorbidities (hypertension, diabetes, dyslipidemia, renal impairment), and risk factors such as smoking, alcohol consumption, diuretic use, and family history of gout.

Clinical assessment included age at disease onset, pattern of joint involvement, number of flares, joint distribution, pain intensity assessed using a visual analog scale (VAS), presence of tophi, and chronicity of gout. Biological parameters included serum uric acid, C-reactive protein (CRP), and renal function assessed by creatinine clearance.
Radiological evaluation included standard radiographs assessing structural damage and ultrasonography identifying the double contour sign. Synovial fluid analysis was performed when available to detect monosodium urate crystals.
Treatments were analyzed by distinguishing symptomatic therapy (colchicine, nonsteroidal anti-inflammatory drugs, corticosteroids) and urate-lowering therapy (allopurinol, febuxostat).Quantitative variables were expressed as mean ± standard deviation and qualitative variables as frequencies and percentages. A bivariate analysis was performed to compare variables according to sex, with a significance threshold set at $p < 0.05$. No multivariate analysis was performeddue to the limited sample size.The study was conducted in accordance with the Declaration of Helsinki. Approval was obtained from the local ethics committee, and informed consent was obtained from all patients.

Results:-

Patient characteristics were compared between men and women. A total of 147 patients with gout were included, comprising 92 men (62.6%) and 55 women (37.4%), with a sex ratio of 1.67. The mean age was 60.85 ± 13 years in men and 64.9 ± 11 years in women, with no statistically significant difference ($p = 0.122$).Cardiometabolic comorbidities were significantly more frequent in women, particularly diabetes (38.18% vs. 18.47%; $p = 0.025$) and hypertension (58.18% vs. 34.7%; $p = 0.006$). In contrast, dyslipidemia did not differ significantly between the two groups ($p = 0.622$), nor did diuretic use ($p = 0.43$). Conversely, lifestyle-related risk factors were more prevalent in men, with higher rates of smoking (13.04% vs. 1.8%; $p = 0.032$) and alcohol consumption (9.2% vs. 0%; $p = 0.02$). A family history of gout was also more frequently reported in men (8.7% vs. 0%; $p = 0.025$). These sociodemographic characteristics, comorbidities, and risk factors are summarized in Table 1.

Clinically, the monoarticular form predominated in both groups, with no significant difference between sexes ($p = 0.35$). Similarly, the frequency of polyarticular forms did not differ significantly ($p = 0.36$). Pain intensity, assessed using the visual analog scale, was higher in men (49.89 ± 17 vs. 41.09 ± 18; $p = 0.05$). Women more frequently presented with renal involvement (31.6% vs. 23.9%; $p = 0.023$), whereas tophi were more common in men (10.8% vs. 3.6%; $p = 0.04$). Chronic gout affected 35.4% of men and 29.3% of women. These clinical and biological characteristics are presented in Table 2.Biologically, mean serum uric acid levels were comparable between sexes (81.23 ± 24 mg/L in men vs. 77.28 ± 24 mg/L in women; $p = 0.36$). However, men exhibited a more pronounced inflammatory profile, with significantly higher CRP levels (71.20 ± 19 mg/L vs. 46.77 ± 21 mg/L; $p = 0.003$). In contrast, renal function was significantly more impaired in women, with lower creatinine clearance (36.2 ± 21 mL/min vs. 51.4 ± 22 mL/min; $p = 0.003$). The presence of monosodium urate crystals in synovial fluid did not differ significantly between sexes.Radiological assessment showed more frequent erosive lesions in men (34.5% vs.

18.9%), although without statistical significance. On ultrasonography, the double contour sign was observed in both groupswith no statistically significant difference between sexes. These radiological and therapeutic data are summarized in Table 3.Regarding treatment, colchicine use was significantly more frequent in men than in women (88% vs. 62%; p = 0.001). No significant differences were observed for nonsteroidal anti-inflammatory drugs, corticosteroids, or urate-lowering therapies, including allopurinol and febuxostat.

Table 1. Sociodemographic characteristics, comorbidities, and risk factors according to sex

Variables	Men (n=92)	Women (n=55)	p-value
Mean age (years)	60.85 ± 13	64.9 ± 11	0.122
Diabetes	18.47%	38.18%	0.025
Hypertension	34.7%	58.18%	0.006
Dyslipidemia	18.4%	21.8%	0.622
Diuretic use	23.9%	18.9%	0.43
Smoking	13.04%	1.8%	0.032
Alcoholconsumption	9.2%	0%	0.02
Family history of gout	8.7%	0%	0.025

Table 2. Clinical and biological characteristics according to sex

Variables	Men	Women	p-value
Monoarticular	67.3%	74.5%	0.35
Polyarticular	32.6%	25.4%	0.36
VAS	49.89 ± 17	41.09 ± 18	0.05
Renalinvolvement	23.9%	31.6%	0.023
Tophi	10.8%	3.6%	0.04
Chronic gout	35.4%	29.3%	0.21
Serumuricacid	81.23 ± 24	77.28 ± 24	0.36
CRP	71.20 ± 19	46.77 ± 21	0.003
Creatinine clearance	51.4 ± 22	36.2 ± 21	0.003
MSU crystals	15.21%	10.9%	0.65

Table 3. Radiological and therapeutic data

Variables	Men (n=92)	Women (n=55)	p-value
Radiographicerosions	34.5%	18.9%	0.79
Double contour sign (ultrasound)	70.5%	88.8%	0.63
Colchicine	88%	62%	0.001
NSAIDs	16.3%	9.09%	0.22
Corticosteroids	16.3%	11%	0.37
Allopurinol	78.26%	69.09%	0.32
Febuxostat	9.8%	12.7%	0.71

Discussion

In our study, we compared men and women with gout and identified significant differences in clinical, biological, and therapeutic profiles. Women were older and had a higher prevalence of cardiometabolic and renal comorbidities, whereas men exhibited a more inflammatory and structurally severe disease pattern.Our findings are consistent with the literature, which reports a male predominance of gout but an increasing frequency in women, particularly after menopause [1–4]. Women in our cohort were older at diagnosis, in agreement with large observational studies reporting a delay of several years between sexes [5–9]. This difference is generally attributed to the protective effect of estrogens on urate excretion, the loss of which after menopause promotes hyperuricemia [10–13]. In addition to this mechanism, the timing of gout onset in women is closely related to menopausal status, which likely contributes to the observed age differences.Comorbidity profiles also differed by sex. Women more frequently had diabetes, hypertension, and chronic kidney disease, as described in several international cohorts [5–8, 14]. These findings are likely related to older age and a higher burden of cardiovascular risk factors. In line with studies from Western countries, our findings confirm similar patterns of age distribution and comorbidity burden, although regional variations may exist. In contrast, men exhibited more lifestyle-related risk factors, particularly smoking and alcohol consumption, confirming the role of behavioral factors in male gout [2, 4, 8, 9, 17, 18]. Although dietary factors

were not specifically assessed in our study, traditional dietary habits, including high intake of purine-rich foods and sweetened beverages, may contribute to hyperuricemia, and these habits may differ between sexes.Clinically, joint distribution did not differ significantly between sexes, consistent with previous studies [19, 20]. However, disease severity appeared greater in men, with higher pain intensity, a higher frequency of tophi, and more pronounced structural damage, in line with previous reports [2, 3, 8].

Biological findings reinforced this distinction. Serum uric acid levels were comparable between sexes, but men exhibited greater inflammatory activity, whereas women had more impaired renal function. These findings suggest different underlying mechanisms, with inflammation predominating in men and metabolic–renal factors playing a larger role in women [7, 21].Factors contributing to gout also differed by sex. In our study, renal involvement was more frequent in women, whereas men were more exposed to lifestyle-related risk factors. Although diuretic use did not differ significantly between sexes, its role in hyperuricemia, particularly in older hypertensive women, is well established [5, 7, 18, 22]. In addition, the loss of the uricosuric effect of estrogens after menopause represents a key factor explaining these differences [10–13].From a therapeutic perspective, management strategies were broadly similar between sexes. However, colchicine was more frequently used in men, which may reflect greater inflammatory activity. In contrast, in women—who were older and had more comorbidities—a more cautious approach is often adopted, in line with current recommendations [15, 16, 24]. The higher prevalence of renal impairment in women has important therapeutic implications, requiring dose adjustment of urate-lowering therapies and careful monitoring to avoid toxicity. In such cases, febuxostat may represent an alternative, although cardiovascular risk should be considered. Previous studies have also shown that women less frequently achieve target serum urate levels, likely due to lower treatment intensification and greater clinical complexity [4, 6, 8, 23–26].

These findings have important clinical implications. In women, management should focus on controlling metabolic comorbidities and renal function, as well as adapting therapeutic strategies. In men, identifying and correcting lifestyle-related risk factors remains essential to prevent gout flares (Table 4).In summary, our study highlights two distinct gout phenotypes: a metabolic–renal profile predominantly observed in women and an inflammatory–structural profile more common in men (Figure 1).Our study has several limitations, including its monocentric design, relatively small sample size, and retrospective data collection, which may limit statistical power and introduce information bias. In addition, certain factors, particularly dietary and hormonal variables, were not systematically assessed.Nevertheless, this study provides original data from a Moroccan population that remains underrepresented in the literature. It confirms the existence of clinically relevant sex-related differences in gout and highlights the importance of an individualized management approach.
These findings support the need to systematically integrate sex as a key determinant in the management of gout.

Table 4. Suggested sex-specific monitoring priorities for comorbidity management in gout, based on the findings of the present study and consistent with existing literature.

Domain	Women	Men
Cardiometabolic comorbidities	Priority monitoring	Standard monitoring
Renal function	Priority monitoring	Routine monitoring
Lifestyle-related risk factors	Routine monitoring	Priority monitoring

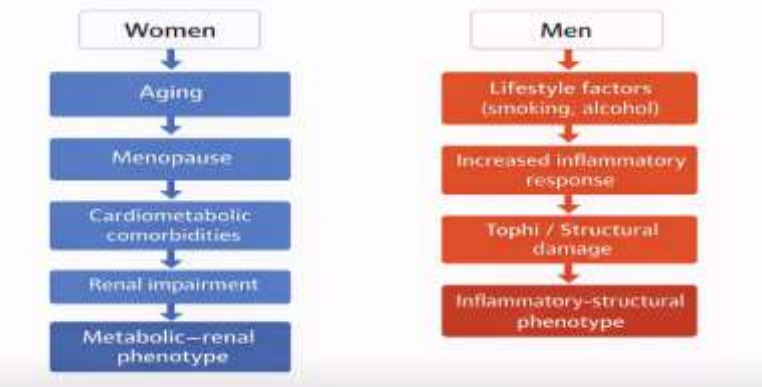

Figure 1. Distinct sex-related pathways in gout: a metabolic–renal profile in women and an inflammatory–structural profile in men.

Conclusion

Men and women with gout exhibit distinct clinical phenotypes. Female gout is characterized by a predominance of metabolic and renal comorbidities, whereas male gout is associated with a more inflammatory and structurally severe disease pattern.These findings highlight the importance of considering sex-specific differences in the clinical assessment and management of gout. Tailored therapeutic strategies that account for comorbidities, renal function, and lifestyle factors may improve patient outcomes.Further studies, particularly prospective and multicenter investigations, are needed to better understand these differences and optimize personalized management approaches.

Conflict of interest

The authors declare no conflicts of interest.

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