Research Article

Autoimmune Idiopathic Inflammatory Myopathies: Pharmacological Differences and Similarities by Type of Myositis and by Sociodemographic Variables

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Objective. Autoimmune idiopathic inflammatory myopathies (IIMs) are a group of pathologies that are generally characterized by muscle weakness. Their treatment involves glucocorticoids and immunosuppressants. The aim was to identify differences and similarities in the pharmacological management of a group of patients with autoimmune IIMs according to the type of disease, sex, age group, and city of residence in Colombia from 2020 to 2021.

Methods. This cross-sectional study identified medication prescription patterns for outpatient use in patients with autoimmune IIMs between 2020 and 2021 based on a population database of 8.5 million Colombians affiliated with the Colombian health system. Sociodemographic and pharmacological variables were considered.

Results. A total of 671 patients with autoimmune IIMs were identified, with a median age of 57 years, and 70.9% were women. Overlap myositis was the most frequent disease (31.4%). A total of 91.5% of the patients received pharmacological treatment, mainly systemic glucocorticoids (78.5%), conventional disease-modifying antirheumatic drugs (DMARDs) (74.1%), immunosuppressants (9.1%), and biological DMARDs (3.7%). Pharmacological management predominated among patients with overlap myositis, those who lived in cities, and those affiliated with the contributory regime of the Colombian health system. Conventional DMARDs were prescribed mainly to women and to those older than 65 years.

Conclusions. Patients with autoimmune IIMs are not treated homogeneously. The pattern of drug use varies according to the type of IIM, sex, age group, city, and health system regime affiliation.

1. Introduction

Autoimmune idiopathic inflammatory myopathies (IIMs) are a group of rare immune-mediated, multisystemic, heterogeneous diseases that mainly affect skeletal muscle and the skin but can also affect many other organs, such as the lungs, heart, joints, and gastrointestinal tract [1–3]. They are mainly characterized by progressive, symmetrical muscle weakness, and sometimes myalgias, but in addition, heliotrope erythema, Gottron papules, and cutaneous ulcers may appear on the skin. Extramuscular manifestations may also emerge, such as fever, arthralgia, Raynaud’s phenomenon, arrhythmias, and dysfunction. Ventricular and pulmonary complications are mainly due to interstitial lung disease [4–6]. The prevalence
varies between 2.4 and 33.8 per 100,000 inhabitants, and the incidence ranges from 1.16 to 19 per million people per year [7]. In Colombia, the estimated global prevalence is 25.7 cases per 100,000 inhabitants [8].

IIMs traditionally include polymyositis, dermatomyositis, juvenile dermatomyositis, inclusion body myositis, immune-mediated necrotizing myopathy, and antisynthetase syndrome [1, 3, 9]. In addition, inflammation of the skeletal tissue can occur in the context of other connective tissue diseases, such as systemic lupus erythematosus, rheumatoid arthritis, Sjögren’s syndrome, and systemic sclerosis, a condition called overlap myositis [3, 5]. Its management seeks to control the inflammatory process and prevent damage to skeletal muscle or extramuscular organs [2]. Depending on the type of autoimmune IIM and its severity and complications, systemic glucocorticoids, conventional disease-modifying antirheumatic drugs (DMARDs) (especially azathioprine or methotrexate), or immunosuppressants (primarily cyclophosphamide, cyclosporine, human mycophenolate mofetil, or gamma-globulin) are prescribed. Biological DMARDs (mainly rituximab) [2–4, 6, 10] are given, but the response to treatment varies [3].

The Colombian health system offers universal coverage to the entire population through two regimes, including one contributory (paid by the worker and employer) and another subsidized by the state, and has a benefit plan that includes a heterogeneous group of medications used for the treatment of autoimmune IIMs. Sociodemographic factors such as age, sex, location of residence, and type of health system coverage can influence the use of medications [11–13], as well as the type of autoimmune IIM diagnosed [14]. Therefore, we aimed to identify differences and similarities in the pharmacological management of a group of Colombian patients with autoimmune IIMs according to the type of disease, sex, age group, place of residence (capital city vs. smaller city), and system regime affiliation in 2020–2021.

2. Materials and Methods

An observational cross-sectional study was conducted on the prescription patterns of drugs used in patients diagnosed with autoimmune IIMs based on a population database that collects information from approximately 8.5 million people affiliated with the Colombian health system through six health insurance companies, corresponding to approximately 30.0% of the active affiliated population of the contributory or payment regime and 6.0% of the state-subsidized regime, accounting for 17.3% of the Colombian population.

Patients were identified and classified using International Classification of Diseases (ICD-10) codes, including those for juvenile dermatomyositis (M330), dermatomyositis (M331), polymyositis (M332), and dermatopolymyositis (M339) in the period between January 1, 2020, and December 31, 2021. Patients with a concomitant diagnosis of rheumatoid arthritis (M053, M058-M060, M068, M069, and M080), systemic sclerosis (M340, M348, and M349), systemic lupus erythematosus (M321, M328, and M329), and Sjögren’s syndrome (M350) were considered to have overlap myositis. Patients of any age and sex who attended outpatient medical consultations were selected. Those with two or more different diagnoses of autoimmune IIMs and those who appeared only once with a considered diagnosis in the study period were excluded.

Based on information on drug consumption for the affiliated population systematically obtained from the dispensing company (Audifarma S.A.), a database was designed in which we gathered the following groups of patient variables:

(1) Sociodemographic: sex, age (<40 years, 40–64 years, and ≥65 years), regime affiliation (contributory or subsidized), and dispensation city. The place of residence was categorized into a region according to the classification of the National Administrative Department of Statistics (DANE) of Colombia (the entity responsible for the planning, processing, analysis, and dissemination of official statistics in Colombia) as follows: Bogotá-Cundinamarca region, Caribbean region, Central region, Eastern region, Pacific region, and Amazonia-Oriente region. The city of residence was classified as a capital city or an intermediate municipality.

(2) Comorbidities were identified from the diagnoses reported by the ICD-10 in the selected patients.

(3) Medications:

(i) Systemic glucocorticoids: prednisolone, prednisone, deflazacort, methylprednisolone, dexamethasone, hydrocortisone, and betamethasone

(ii) Conventional DMARDs: methotrexate and azathioprine. Others: chloroquine, hydroxychloroquine, leflunomide, and sulfasalazine

(iii) Immunosuppressants: mycophenolate mofetil, cyclosporine, tacrolimus, and human gamma globulin

(iv) Biological DMARDs: rituximab. Others: infliximab, etanercept, adalimumab, and certolizumab

(4) Comedications were grouped into the following categories: (a) antidiabetics (oral and subcutaneous), (b) antihypertensives and diuretics, (c) lipid-lowering drugs, (d) antilucer drugs, (e) antidepressants, (f) anxiolytics and hypnotics (benzodiazepines and Z drugs), (g) thyroid hormone, (h) antipsychotics (typical and atypical), (i) antiepileptics, (j) antiarrhythmics, (k) antihistamines, (l) antidementia drugs, (m) analgesics (acetaminophen and opioids), (n) nonsteroidal anti-inflammatory drugs, and (o) inhaled bronchodilators and corticosteroids and others.

The protocol was approved by the Bioethics Committee of the Universidad Tecnológica de Pereira in the category of research without risk. The ethical principles established by the Declaration of Helsinki were respected.

The data were analyzed with the statistical package SPSS Statistics, version 26.0 for Windows (IBM, USA). A descriptive analysis was performed with frequencies and proportions for...
the qualitative variables and measures of central tendency and dispersion for the quantitative variables depending on their parametric behavior established by the Kolmogorov–Smirnov test. Quantitative variables were compared by Student’s t-test or the Mann–Whitney U test, and categorical variables were compared by the χ² test or Fisher’s exact test. Statistical significance was accepted at p < 0.05.

3. Results

A total of 671 patients diagnosed with some autoimmune IIMs were identified, who were distributed in 71 different cities or municipalities. The percentage of women was 70.9% (n = 476). The median age was 57.0 years (inter-quartile range: 43.0–66.0 years; range: 19.0–93.0 years), and the patients were distributed in the following age groups: <40 years (n = 135; 20.1%), 40-64 years (n = 346; 51.6%), and ≥65 years (n = 190; 28.3%). Most of them lived in the Bogotá-Cundinamarca region (n = 240; 35.8%), followed by the Caribbean region (n = 141; 21.0%), the central region (n = 130; 19.4%), the Pacific region (n = 130; 19.4%), and the eastern Amazon region (n = 30; 4.5%). Three-fourths (n = 508; 75.7%) of them took their medications in capital cities. A total of 87.9% (n = 590) were affiliated with the contributory regime, and 12.1% (n = 81) were affiliated with the country’s subsidized health system.

Most patients had a diagnosis of overlap myositis (n = 221; 31.4%), followed by polymyositis (n = 198; 29.5%), other dermatomyositis (n = 145; 21.6%), dermatopolymyositis (n = 113; 16.8%), and juvenile dermatomyositis (n = 4; 0.6%). Among the most frequent comorbidities in this group of patients were arterial hypertension (n = 249; 37.1%), diabetes mellitus (n = 139; 20.7%), and hypothyroidism (n = 124; 18.5%). According to groups, rheumatological pathologies (n = 274; 40.8%) were the most prevalent, followed by endocrine (n = 261; 38.9%) and cardiovascular pathologies (n = 252; 37.6%). Among the patients with overlap myositis, the most frequently noted concomitant rheumatological diseases were rheumatoid arthritis (n = 119; 21.1%; 56.4%), systemic lupus erythematosus (n = 64; 30.3%), Sjögren’s syndrome (n = 55; 26.1%), and systemic sclerosis (n = 13; 6.2%). A total of 23.4% (n = 157) had some infection and predominantly urinary tract infections (n = 61; 9.1%), followed by upper respiratory tract infections (n = 43; 6.4%), skin infections (n = 26; 3.9%), intestinal infections (n = 22; 3.3%), and lower respiratory tract infections (n = 20; 3.0%).

A total of 91.5% (n = 614) of patients received pharmacological treatment for autoimmune IIMs, especially systemic glucocorticoids (n = 527; 78.5%), particularly prednisolone (n = 414; 61.7%) and prednisone (n = 149; 22.2%), followed by conventional DMARDs (n = 497; 74.1%), with prescriptions for azathioprine (n = 327; 48.7%) and methotrexate (n = 242; 36.1%) predominating, while the use of immunosuppressants was found in 9.1% (n = 61) of patients, and biological DMARDs were used by 3.7% (n = 25). The main comedications identified in this group of patients were analgesics (n = 449; 66.9%), antiulcer agents (n = 413; 61.5%), antihypertensives/diuretics (n = 288; 42.9%), nonsteroidal anti-inflammatories (n = 283; 42.2%), and antihistamines (n = 242; 36.1%).

3.1. Associations between the Type of Autoimmune Idiopathic Inflammatory Myositis and Some Sociodemographic Variables. Systemic glucocorticoids, immunosuppressants, and conventional and biological DMARDs predominated in a statistically significant manner in overlap myositis (Table 1 and Supplementary Table 1). Prednisolone, prednisone, and conventional DMARDs were prescribed significantly more frequently to women (Table 2). With respect to age, conventional DMARDs were used more often in adults older than 65 years, but chloroquine predominated among those younger than 65 years (Table 3). Significant differences were found between the place of origin and the type of health system regime affiliation, where pharmacological treatment and the use of conventional DMARDs predominated among patients from capital cities and among those affiliated with the contributory regime (Tables 4 and 5, respectively).

4. Discussion

This study allowed us to identify the pattern of prescription medications taken by patients with autoimmune IIMs as evidence of the use of medications in the real world in a group of people affiliated with the Colombian health system. To the best of our knowledge, this is the largest study of patients with these pathologies in Colombia or Latin America. The median age of the patients was higher than that found in other studies (34.3–52.5 years) [9, 14–18], although a predominance of women was found in all such studies (63.3–69.0-82.7%) [9, 14–20]. On the other hand, the characterization of the main comorbidities was also consistent with that found in other publications [12, 14, 17, 18, 21].

In this analysis, most patients were diagnosed with overlap myositis, which is consistent with observations reported by Chinniah and Mody in a cohort from South Africa (39.4%) [19] but is not consistent with observations found in the European registry of inflammatory myopathies (Euro-Myositis Registry), where dermatomyositis predominated (31.0%) [9], as in Asia (42.0-63.3%) [15, 16, 22] and South America (43.9-62.9%) [17, 21], while in Spain, cases of polymyositis prevailed (29.0–40.1%) [14, 18]. These differences may be methodological in nature, deriving from the type of study, the inclusion and exclusion criteria, the method of identifying the patients, the source of information, the diagnostic criteria used, and the period during which the cases were identified, as well as the different geographical regions where the research was conducted [8, 9, 14–19, 21, 22]. In this study, the patients were identified by their ICD-10 codes, but the ICD-10 does not have an exact diagnosis for some autoimmune IIMs, such as antisynthetase syndrome, immune-mediated necrotizing myopathy, and inclusion body myositis [23], which leads to the available codes being used to cover different types of myositis [3].

Most patients received some medication for their autoimmune IIMs in contrast to data found in the EuroMyositis Registry, where only one-third of patients were receiving treatment at the time of publication [9]. The proportion of...
patients with glucocorticoid prescriptions was very similar to that found by Salazar et al. in two high-complexity institutions in Colombia (81.3%) [17] and by Smoyer et al. in the USA (72.7%) [12] but was higher than that found in the EuroMyositis Registry (31.6%) [9] and in the last consultation of the Myopathies Registry of the Community of Madrid (REMICAM Cohort) (56.6%) [14]. Among the conventional DMARDs, azathioprine and methotrexate were

| Variables                      | Nonoverlap myositis | Overlap myositis | P       |
|--------------------------------|---------------------|------------------|---------|
| Age, median (IQR)              | 55.0 (41.0-65.0)    | 59.0 (47.0-68.0) | 0.016*  |
| Women                          | 303                 | 173              | <0.001  |
| Comorbidities                  | 324                 | 211              | <0.001  |
| Arterial hypertension          | 154                 | 95               | 0.004   |
| Diabetes mellitus              | 87                  | 52               | 0.089   |
| Hypothyroidism                 | 76                  | 48               | 0.054   |
| Rheumatoid arthritis           | 0                   | 119              | <0.001**|
| Chronic pain                   | 43                  | 34               | 0.011   |
| Infections                     | 91                  | 66               | 0.001   |
| Pharmacotherapy                | 408                 | 206              | <0.001  |
| Systemic glucocorticoids       | 349                 | 178              | 0.013   |
| Prednisolone                   | 264                 | 150              | 0.001   |
| Prednisone                     | 100                 | 49               | 0.668   |
| Dexamethasone                  | 85                  | 34               | 0.457   |
| Methylprednisolone             | 27                  | 25               | 0.007   |
| Pulses                         | 5                   | 5                | 0.301** |
| Deflazacort                    | 29                  | 18               | 0.294   |
| Betamethasone                  | 21                  | 9                | 0.861   |
| Hydrocortisone                 | 8                   | 2                | 0.733** |
| Conventional DMARDs            | 303                 | 194              | <0.001  |
| Azathioprine                   | 205                 | 122              | 0.001   |
| Methotrexate                   | 141                 | 101              | <0.001  |
| Chloroquine                    | 56                  | 49               | <0.001  |
| Hydroxychloroquine             | 5                   | 27               | <0.001  |
| Sulfasalazine                  | 3                   | 3                | 0.385** |
| Leflunomide                    | 2                   | 3                | 0.182** |
| Immunosuppressants             | 32                  | 29               | 0.005   |
| Mycophenolate                  | 12                  | 12               | 0.046   |
| Cyclosporine                   | 11                  | 10               | 0.105   |
| Cyclophosphamide               | 11                  | 10               | 0.105   |
| Human immunoglobulin           | 2                   | 3                | 0.652** |
| Biological DMARDs              | 9                   | 16               | <0.001  |
| Rituximab                      | 7                   | 14               | <0.001  |
| Others (n = 4)^                | 2                   | 2                | 0.594** |
| Comedications                  | —                   | —                | —       |
| Analgesics                     | 291                 | 158              | 0.003   |
| Antileuk                     | 260                 | 153              | <0.001  |
| Antihypertensives and diuretics| 188                 | 100              | 0.113   |
| Nonsteroidal anti-inflammatory drugs | 186         | 97               | 0.178   |
| Antihistamines                 | 154                 | 88               | 0.039   |

IQR: interquartile range; DMARD: disease-modifying antirheumatic drugs. *Mann–Whitney U test. **Fisher’s exact test. ^Others: adalimumab, abatacept, belimumab, and certolizumab.
the most commonly used, which is consistent with other reports [9, 14–18, 22]. Among the biological DMARDs, rituximab was the most commonly used, which is also consistent with the literature [9, 12, 14, 17, 18, 22]. On the other hand, among the immunosuppressants, a predominance of mycophenolate mofetil was found, which is consistent with

Table 2: Comparison of some sociodemographic and pharmacological variables between women and men diagnosed with autoimmune idiopathic inflammatory myopathies in Colombia.

| Variables                              | Women       | %     | Men         | %     | P     |
|----------------------------------------|-------------|-------|-------------|-------|-------|
| Age, median (IQR)                      | 53.0 (41.0-64.0) |      | 53.0 (41.0-64.0) |      | 0.054*|
| Type of inflammatory myopathy         | —           | —     | —           | —     | —     |
| Overlap myositis                       | 173         | 36.3  | 38          | 19.5  | <0.001|
| Polymyositis                           | 118         | 24.8  | 80          | 41.0  | <0.001|
| Other dermatomyositis                  | 96          | 20.2  | 49          | 25.1  | 0.156 |
| Dermatopolymyositis                    | 86          | 18.1  | 27          | 13.8  | 0.185 |
| Juvenile dermatomyositis               | 3           | 0.6   | 1           | 0.5   | 1.000**|
| Comorbidities                          | 397         | 83.4  | 138         | 70.8  | <0.001|
| Arterial hypertension                  | 187         | 39.3  | 62          | 31.8  | 0.068 |
| Diabetes mellitus                      | 104         | 21.8  | 35          | 17.9  | 0.258 |
| Hypothyroidism                         | 96          | 20.2  | 28          | 14.4  | 0.078 |
| Rheumatoid arthritis                   | 97          | 20.4  | 22          | 11.3  | 0.005 |
| Chronic pain                           | 61          | 12.8  | 16          | 8.2   | 0.089 |
| Infections                             | 119         | 25.0  | 38          | 19.5  | 0.126 |
| Pharmacotherapy                        | 441         | 92.6  | 173         | 88.7  | 0.097 |
| Systemic glucocorticoids               | 380         | 79.8  | 147         | 75.4  | 0.203 |
| Prednisolone                           | 305         | 64.1  | 109         | 55.9  | 0.048 |
| Prednisone                             | 117         | 24.6  | 32          | 16.4  | 0.021 |
| Dexamethasone                          | 90          | 18.9  | 29          | 14.9  | 0.214 |
| Methylprednisolone                     | 43          | 9.0   | 9           | 4.6   | 0.052 |
| Pulses                                 | 9           | 1.9   | 1           | 0.5   | 0.295**|
| Deflazacort                            | 35          | 7.4   | 12          | 6.2   | 0.581 |
| Betamethasone                          | 22          | 4.6   | 8           | 4.1   | 0.768 |
| Hydrocortisone                         | 9           | 1.9   | 1           | 0.5   | 0.295**|
| Conventional DMARDs                   | 366         | 76.9  | 131         | 67.2  | 0.099 |
| Azathioprine                           | 238         | 50.0  | 89          | 45.6  | 0.305 |
| Methotrexate                           | 181         | 38.0  | 61          | 31.3  | 0.099 |
| Chloroquine                            | 82          | 17.2  | 23          | 11.8  | 0.079 |
| Hydroxychloroquine                     | 27          | 5.7   | 5           | 2.6   | 0.086 |
| Sulfasalazine                          | 5           | 1.1   | 1           | 0.5   | 0.678**|
| Leflunomide                            | 3           | 0.6   | 2           | 1.0   | 0.631**|
| Immunosuppressants                     | 43          | 9.0   | 18          | 9.2   | 0.936 |
| Mycophenolate                          | 17          | 3.6   | 7           | 3.6   | 0.991 |
| Cyclosporine                           | 16          | 3.4   | 5           | 2.6   | 0.590 |
| Cyclophosphamide                       | 15          | 3.2   | 6           | 3.1   | 0.960 |
| Human immunoglobulin                   | 4           | 0.8   | 1           | 0.5   | 1.000**|
| Biological DMARDs                      | 19          | 4.0   | 6           | 3.1   | 0.570 |
| Rituximab                              | 17          | 3.6   | 4           | 2.1   | 0.464**|
| Others (n = 4)^                         | 2           | 0.4   | 2           | 1.0   | 0.584**|
| Comedications                          | —           | —     | —           | —     | —     |
| Analgesics                             | 328         | 68.9  | 121         | 62.1  | 0.087 |
| Antiulcer                              | 312         | 65.5  | 101         | 51.8  | 0.001 |
| Antihypertensives and diuretics        | 216         | 45.4  | 72          | 36.9  | 0.045 |
| Nonsteroidal anti-inflammatory drugs   | 204         | 42.9  | 79          | 40.5  | 0.577 |
| Antihistamines                         | 189         | 39.7  | 53          | 27.2  | 0.002 |

IQR: interquartile range; DMARD: disease-modifying antirheumatic drugs. *Mann–Whitney U test. **Fisher’s exact test. ^Others: adalimumab, abatacept, belimumab, and certolizumab.
| Variables                              | <65 years | %   | ≥65 years | %   | p   |
|---------------------------------------|----------|-----|----------|-----|-----|
| Woman                                 | 334      | 69.4| 142      | 74.7| 0.173|
| Type of inflammatory myopathy         | —        | —   | —        | —   | —   |
| Overlap myositis                      | 141      | 29.3| 70       | 36.8| 0.058|
| Polymyositis                          | 136      | 28.3| 62       | 32.6| 0.265|
| Other dermatomyositis                 | 112      | 23.3| 33       | 17.4| 0.093|
| Dermatopolymyositis                   | 88       | 18.3| 25       | 13.2| 0.109|
| Juvenile dermatomyositis              | 4        | 0.8 | 0        | 0.0 | 0.582*|
| Comorbidities                         | 358      | 74.4| 177      | 93.2| <0.001|
| Arterial hypertension                 | 134      | 27.9| 115      | 60.5| <0.001|
| Diabetes mellitus                     | 67       | 13.9| 72       | 37.9| <0.001|
| Hypothyroidism                        | 65       | 13.5| 59       | 31.1| <0.001|
| Rheumatoid arthritis                  | 74       | 15.4| 45       | 23.7| 0.011|
| Chronic pain                          | 49       | 10.2| 28       | 14.7| 0.096|
| Infections                            | 107      | 22.2| 50       | 26.3| 0.262|
| Pharmacotherapy                       | 440      | 91.5| 174      | 91.6| 0.966|
| Systemic glucocorticoids              | 381      | 79.2| 146      | 76.8| 0.501|
| Prednisolone                          | 292      | 60.7| 122      | 64.2| 0.400|
| Prednisone                            | 112      | 23.3| 37       | 19.5| 0.285|
| Dexamethasone                         | 92       | 19.1| 27       | 14.2| 0.133|
| Methylprednisolone                    | 40       | 8.3 | 12       | 6.3 | 0.383|
| Pulses                                | 7        | 1.5 | 3        | 1.6 | 1.000*|
| Delfazacort                           | 34       | 7.1 | 13       | 6.8 | 0.918|
| Betamethasone                         | 22       | 4.6 | 8        | 4.2 | 0.837|
| Hydrocortisone                        | 7        | 1.5 | 3        | 1.6 | 1.000*|
| Conventional DMARDs                   | 346      | 71.9| 151      | 79.5| 0.045|
| Azathioprine                          | 233      | 48.4| 94       | 49.5| 0.809|
| Methotrexate                          | 166      | 34.5| 76       | 40.0| 0.182|
| Chloroquine                           | 86       | 17.9| 19       | 10.0| 0.011|
| Hydroxychloroquine                    | 25       | 5.2 | 7        | 3.7 | 0.407|
| Sulfasalazine                         | 3        | 0.6 | 3        | 1.6 | 0.359*|
| Leflunomide                           | 4        | 0.8 | 1        | 0.5 | 1.000*|
| Immunosuppressants                    | 50       | 10.4| 11       | 5.8 | 0.062|
| Mycophenolate                         | 21       | 4.4 | 3        | 1.6 | 0.105*|
| Cyclosporine                          | 16       | 3.3 | 5        | 2.6 | 0.641|
| Cyclophosphamide                      | 18       | 3.7 | 3        | 1.6 | 0.217*|
| Human immunoglobulin                  | 5        | 1.0 | 0        | 0.0 | 0.329*|
| Biological DMARDs                     | 21       | 4.4 | 4        | 2.1 | 0.256*|
| Rituximab                             | 17       | 3.5 | 4        | 2.1 | 0.462*|
| Others (n = 4)^                       | 4        | 0.8 | 0        | 0.0 | 0.582|
| Comedication                          | —        | —   | —        | —   | —   |
| Analgesics                            | 313      | 65.1| 136      | 71.6| 0.107|
| Antiulcer                             | 287      | 59.7| 126      | 66.3| 0.111|
| Antihypertensives and diuretics       | 164      | 34.1| 124      | 65.3| <0.001|
| Nonsteroidal anti-inflammatory drugs  | 215      | 44.7| 68       | 35.8| 0.035|
| Antihistamines                        | 185      | 38.5| 57       | 30.0| 0.040|

*Fisher’s exact test. DMARD: disease-modifying antirheumatic drugs. ^Others: adalimumab, abatacept, belimumab, and certolizumab.
Table 4: Comparison of some sociodemographic and pharmacological variables between cities and municipalities of patients diagnosed with autoimmune idiopathic inflammatory myopathies in Colombia.

| Variables                              | Capital city | Intermediate municipality | P    |
|----------------------------------------|--------------|---------------------------|------|
| Age, median (IQR)                      | 56.0 (43.0-67.0) | 57.0 (41.0-65.0)          | 0.550*|
| Women                                  | 367 (72.2%)     | 109 (66.9%)               | 0.189|
| Type of inflammatory myopathy          |              |                           |      |
| Overlap myositis                        | 163 (32.1%)     | 48 (29.4%)                | 0.528|
| Polymyositis                            | 150 (29.5%)     | 48 (29.4%)                | 0.985|
| Other dermatomyositis                   | 96 (18.9%)      | 49 (30.1%)                | 0.003|
| Dermatopolymyositis                     | 95 (18.7%)      | 18 (11.0%)                | 0.023|
| Juvenile dermatomyositis                | 4 (0.8%)        | 0 (0.0%)                  | 0.577**|
| Comorbidities                           |              |                           |      |
| Arterial hypertension                   | 189 (37.2%)     | 60 (36.8%)                | 0.928|
| Diabetes mellitus                       | 102 (20.1%)     | 37 (22.7%)                | 0.473|
| Hypothyroidism                          | 100 (19.7%)     | 24 (14.7%)                | 0.156|
| Rheumatoid arthritis                    | 93 (18.3%)      | 26 (16.0%)                | 0.493|
| Chronic pain                            | 68 (13.4%)      | 9 (5.5%)                  | 0.006|
| Infections                              | 123 (24.2%)     | 34 (20.9%)                | 0.379|
| Pharmacotherapy                         | 474 (93.3%)     | 140 (85.9%)               | 0.003|
| Systemic glucocorticoids                | 397 (78.1%)     | 130 (79.8%)               | 0.664|
| Prednisolone                            | 312 (61.4%)     | 102 (62.6%)               | 0.791|
| Prednisone                              | 119 (23.4%)     | 30 (18.4%)                | 0.180|
| Dexamethasone                           | 81 (15.9%)      | 38 (23.3%)                | 0.032|
| Methylprednisolone                      | 41 (8.1%)       | 11 (6.7%)                 | 0.583|
| Pulses                                 | 7 (1.4%)        | 3 (1.8%)                  | 0.712**|
| Deflazacort                             | 38 (7.5%)       | 9 (5.5%)                  | 0.394|
| Betamethasone                           | 17 (3.3%)       | 13 (8.0%)                 | 0.013|
| Hydrocortisone                          | 7 (1.4%)        | 3 (1.8%)                  | 0.712**|
| Conventional DMARDs                     | 397 (78.1%)     | 100 (61.3%)               | <0.001|
| Azathioprine                            | 260 (51.2%)     | 67 (41.1%)                | 0.025|
| Methotrexate                            | 195 (38.4%)     | 47 (28.8%)                | 0.027|
| Chloroquine                             | 83 (16.3%)      | 22 (13.5%)                | 0.385|
| Hydroxychloroquine                      | 28 (5.5%)       | 4 (2.5%)                  | 0.139**|
| Sulphasalazine                          | 4 (0.8%)        | 2 (1.2%)                  | 0.637**|
| Leflunomide                             | 1 (0.2%)        | 4 (2.5%)                  | 0.014**|
| Immunosuppressants                      | 46 (9.1%)       | 15 (9.2%)                 | 0.955|
| Mycophenolate                           | 19 (3.7%)       | 5 (3.1%)                  | 0.687|
| Cyclosporine                            | 13 (2.6%)       | 8 (4.9%)                  | 0.134|
| Cyclophosphamide                        | 18 (3.5%)       | 3 (1.8%)                  | 0.437**|
| Human immunoglobulin                    | 4 (0.8%)        | 1 (0.6%)                  | 1.000**|
| Biological DMARDs                       | 20 (3.9%)       | 5 (3.1%)                  | 0.610|
| Rituximab                               | 16 (3.1%)       | 5 (3.1%)                  | 0.958|
| Others (n = 4)                          | 4 (0.8%)        | 0 (0.0%)                  | 0.577*|
| Comedications                           |              |                           |      |
| Analgesics                              | 335 (65.9%)     | 114 (69.9%)               | 0.346|
| Antiulcer                               | 312 (61.4%)     | 101 (62.0%)               | 0.901|
| Antihypertensives and diuretics         | 218 (42.9%)     | 70 (42.9%)                | 0.994|
| Nonsteroidal anti-inflammatory drugs    | 208 (40.9%)     | 75 (46.0%)                | 0.254|
| Antihistamines                          | 183 (36.0%)     | 59 (36.2%)                | 0.968|

IQR: interquartile range; DMARD: disease-modifying antirheumatic drugs. * Mann–Whitney U test. ** Fisher’s exact test. ^ Others: adalimumab, abatacept, belimumab, and certolizumab.
Table 5: Comparison of some sociodemographic and pharmacological variables between the types of affiliation regimen to the health system of patients diagnosed with autoimmune idiopathic inflammatory myopathies in Colombia.

| Variables                              | Contributory Subsidized |  |  |  |  |
|----------------------------------------|-------------------------|------------------------|------------------------|------------------------|------------------------|
| **Variables**                          | **n = 590**             | **%**                  | **n = 81**             | **%**                  | **p**                  |
| Age, median (IQR)                      | 58.0 (44.0-67.0)        | 48.0 (32.5-59.5)       | <0.001**               |
| Women                                  | 415 (70.3)              | 61 (75.3)              | 0.356                  |
| Type of inflammatory myopathy          | —                       | —                      | —                      | —                      | —                      |
| Overlap myositis                       | 188 (31.9)              | 23 (28.4)              | 0.528                  |
| Polymyositis                           | 174 (29.5)              | 24 (29.6)              | 0.980                  |
| Other dermatomyositis                  | 124 (21.0)              | 21 (25.9)              | 0.314                  |
| Dermatopolymyositis                    | 100 (16.9)              | 13 (16.0)              | 0.839                  |
| Juvenile dermatomyositis               | 4 (0.7)                 | 0 (0.0)                | 1.000**                |
| Comorbidities                          | 473 (80.2)              | 62 (76.5)              | 0.446                  |
| Arterial hypertension                  | 230 (39.0)              | 19 (23.5)              | 0.007                  |
| Diabetes mellitus                      | 127 (21.5)              | 12 (14.8)              | 0.162                  |
| Hypothyroidism                         | 116 (19.7)              | 8 (9.9)                | 0.033                  |
| Rheumatoid arthritis                   | 105 (17.8)              | 14 (17.3)              | 0.910                  |
| Chronic pain                           | 74 (12.5)               | 3 (3.7)                | 0.015**                |
| Infections                             | 141 (23.9)              | 16 (19.8)              | 0.409                  |
| Pharmacotherapy                        | 547 (92.7)              | 67 (82.7)              | 0.002                  |
| Systemic glucocorticoids               | 468 (79.3)              | 59 (72.8)              | 0.183                  |
| Prednisolone                           | 375 (63.6)              | 39 (48.1)              | 0.007                  |
| Prednisone                             | 135 (22.9)              | 14 (17.3)              | 0.256                  |
| Dexamethasone                          | 103 (17.5)              | 16 (19.8)              | 0.612                  |
| Methylprednisolone                     | 45 (7.6)                | 7 (8.6)                | 0.749                  |
| Pulses                                 | 10 (1.7)                | 0 (0.0)                | 0.618*                 |
| Deflazacort                            | 40 (6.8)                | 7 (8.6)                | 0.538                  |
| Betamethasone                          | 28 (4.7)                | 2 (2.5)                | 0.565**                |
| Hydrocortisone                         | 9 (1.5)                 | 1 (1.2)                | 1.000**                |
| Conventional DMARDs                    | 448 (75.9)              | 49 (60.5)              | 0.003                  |
| Azathioprine                           | 288 (48.8)              | 39 (48.1)              | 0.911                  |
| Methotrexate                           | 219 (37.1)              | 23 (28.4)              | 0.125                  |
| Chloroquine                            | 92 (15.6)               | 13 (16.0)              | 0.916                  |
| Hydroxychloroquine                     | 28 (4.7)                | 4 (4.9)                | 1.000**                |
| Sulfasalazine                          | 6 (1.0)                 | 0 (0.0)                | 1.000**                |
| Leflunomide                            | 5 (0.8)                 | 0 (0.0)                | 1.000**                |
| Immunosuppressants                     | 57 (9.7)                | 4 (4.9)                | 0.166**                |
| Mycophenolate                          | 22 (3.7)                | 2 (2.5)                | 0.757**                |
| Cyclosporine                           | 20 (3.4)                | 1 (1.2)                | 0.497**                |
| Cyclophosphamide                      | 19 (3.2)                | 2 (2.5)                | 1.000**                |
| Human immunoglobulin                   | 5 (0.8)                 | 0 (0.0)                | 1.000**                |
| Biological DMARDs                      | 22 (3.7)                | 3 (3.7)                | 1.000**                |
| Rituximab                              | 18 (3.1)                | 3 (3.7)                | 0.732**                |
| Others (n = 4)                         | 4 (0.7)                 | 0 (0.0)                | 1.000**                |
| Comedications                          | —                       | —                      | —                      | —                      |
| Analgesics                             | 393 (66.6)              | 56 (69.1)              | 0.651                  |
| Antiucler                              | 363 (61.5)              | 50 (61.7)              | 0.972                  |
| Antihypertensives and diuretics        | 262 (44.4)              | 26 (32.1)              | 0.036                  |
| Nonsteroidal anti-inflammatory drugs   | 237 (40.2)              | 46 (56.8)              | 0.005                  |
| Antihistamines                         | 211 (35.8)              | 31 (38.3)              | 0.659                  |

IQR: interquartile range; DMARD: disease-modifying antirheumatic drugs. *Mann–Whitney U test. **Fisher’s exact test. ^Others: adalimumab, abatacept, belimumab, and certolizumab.
findings in India [22] and the USA [12] but not with findings in other countries, where cyclophosphamide prevailed [14, 15, 17, 18]. The differences in drug use patterns may be due to the characteristics of health systems, the accessibility and availability of drugs in each country, the management guidelines followed, the preferences of the prescriber, the marketing strategies of the pharmaceutical industry, the disease severity and complications, the type of myopathy, the disease course, and the patient tolerability to these drugs [6, 11, 24].

In general, most patients with autoimmune IIMs were treated with the medications indicated by guidelines [3–6, 10], but notably, the management of IIMs is challenging due to the heterogeneous behavior of the different entities and the absence of multidisciplinary and comprehensive management guidelines [3, 6] and evidence-based recommendations for the management of patients with extramuscular conditions, comorbidities, and severe manifestations [6]. In this study, differences were found in the pattern of drug use according to the type of autoimmune IIM, which is consistent with other reports [9, 17, 22]. The predominance of different therapeutic groups among patients with overlap myositis is notable, as described in Spain, where Nuño-Nuño et al. found that these patients had more prescriptions for glucocorticoids, methotrexate, mycophenolate, and cyclophosphamide than those who diagnosed with dermatomyositis or polymyositis [14]. In China, Xiao et al. found sociodemographic, clinical, and paraclinical differences between these patients, but their pharmacological treatments were not evaluated [25]. The greater use of medications in this group of patients is due to the concomitant presence of other connective tissue diseases [14, 15, 21, 26, 27]. On the other hand, patients with inclusion body myositis do not usually respond to the therapies recommended for other autoimmune IIMs [3–5, 10]. However, these cases could not be identified due to the methodological limitations of our study.

Drug prescriptions were not homogeneous with respect to certain sociodemographic variables. Prednisolone/prednisone and conventional DMARDs prevailed among women. Such differences between sexes have also been documented in studies involving other rheumatological diseases [11, 28, 29]. Thus, among patients with systemic lupus erythematosus, glucocorticoids, immunosuppressants, chloroquine, and azathioprine predominate for men [11]. In patients with axial spondyloarthropathies, prednisone and conventional DMARDs prevail for women [28], and among patients with ankylosing spondylitis, glucocorticoids and methotrexate predominate for women, while biological DMARDs predominate for men [29]. These differences in treatment, rather than being due to health inequalities due to sex, are better explained by genetic and hormonal differences between men and women, the greater burden of autoimmune morbidity in women—which affects the degree of activity, the progression, the severity, and the prognosis of rheumatological diseases—and the effectiveness of pharmacological therapy [11, 28–30].

In general, treatment with conventional DMARDs strongly predominated among older adults, which differs from observations in patients with systemic lupus erythematosus, where pharmacological therapy with conventional DMARDs, glucocorticoids, and immunosuppressants has decreased with increasing age [11], while in patients with rheumatoid arthritis, treatment with glucocorticoids was similar between all age groups, and biological DMARDs were more likely to be used by younger patients [31]. Differences were also found in pharmacological management according to whether the patients lived in a capital city or municipality. In the USA, Deodhar et al. found that variations among patients with ankylosing spondylitis depend on the geographic region of care [32]. Similarly, in Colombia, other pharmacoepidemiological studies involving anti-rheumatic drugs and other therapeutic groups have shown differences in the pattern of prescription to patients [11, 13], which might be due to differences in access to the health system, resource availability, and quality of care [33].

Most patients were affiliated with the contributory regimen, which is consistent with an earlier study in Colombia [8]. In this report, some differences were found in the management received according to the type of health system regime affiliation, which is in line with a USA study, where the databases of three health insurance policies were compared (commercial and Medicare patients vs. Medicaid patients), revealing that in general, commercial and Medicare patients received more medications, especially systemic glucocorticoids and methotrexate, than Medicaid patients [12]. In addition, among patients with psoriatic arthritis and ankylosing spondylitis under the same health policy, greater use of conventional and biological DMARDs was found for Medicare patients [34]. Similarly, in Argentina, in patients with systemic lupus erythematosus, the authors found that cyclophosphamide was significantly more commonly used in the public sector than in the private sector [35].

Some limitations might complicate interpretation of our results since access to the clinical histories was not available to verify the patients' ethnicities, their clinical characteristics, the characterization of the type of inflammatory myopathy, its complications, its severity, disease activity, and paraclinical variables (creatine phosphokinase, antibodies, electromyography, nerve conduction velocity, images, and muscle biopsy, among others). Similarly, the medications prescribed outside the health system or not delivered by the dispensing company that the patients may have received are unknown. One strength is that this study enrolled many cases, which were distributed throughout most of the national territory, involving both the contributory and subsidized health systems of Colombia.

With these findings, we can conclude that patients with autoimmune IIMs are not treated homogeneously: the pattern of drug use varies by the type of inflammatory myopathy, by sex, by age group, by regional city versus municipality, and by system regime affiliation. Importantly, current management guidelines that include pharmacological treatment and optimal physical rehabilitation should be standardized to improve the prognosis and quality of life of IIM patients. The absence of standardized management guidelines for autoimmune myopathies impedes homogeneous management of a pharmacological type, resulting in a lack of therapeutic adherence due to the implementation of management that can be applied for only a short time or empirically, drug
changes without a comprehensive evaluation to identify an adequate clinical response, and a greater possibility of adverse drug reactions.

**Data Availability**

Data are available at https://doi.org/10.17504/protocols.io.b4xtqxnn.

**Additional Points**

**Author Responsibility.** The corresponding author had full access to all data in the study and final responsibility. **Significance and Innovations.** Patients with autoimmune idiopathic inflammatory myopathies are not treated homogeneously. The pattern of drug use varies by the type of inflammatory myopathy, by sex, by age group, by capital city versus municipality, and by system regime affiliation. Current management guidelines that include pharmacological treatment and optimal physical rehabilitation should be standardized to improve patient prognosis and quality of life.

**Conflicts of Interest**

The authors declare no conflicts of interest.

**Authors’ Contributions**

LFVR participated in drafting the manuscript, data collection, data analysis, description of the results, and the discussion. ACDA was responsible for the formal analysis, investigation, and data curation. BSAC was responsible for the formal analysis, investigation, and data curation. LMSR was responsible for the methodology, formal analysis, investigation, and data curation. JEMA participated in drafting the manuscript, data analysis, description of the results, the discussion, critical revision of the article, and evaluation of the final version of the manuscript.

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**Supplementary Materials**

Comparison of some sociodemographic and pharmacological variables between the types of autoimmune idiopathic inflammatory myopathy in Colombia. *(Supplementary Materials)*

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