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Original Article

## Health Care Resource Utilization in Patients With Atopic Dermatitis According to Treatment Response: Evidence From the BIOBADATOP Registry



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### ABSTRACT

**Introduction:** Atopic dermatitis (AD) represents a significant burden for both patients and the health care system. The objective of this study was to describe resource utilization in patients with AD according to the level of disease control.

**Material and methods:** Multicenter, observational, prospective cohort study (BIOBADATOP). Sociodemographic characteristics and disease severity variables were included. According to disease control after 12 months of follow-up, patients were classified as optimally controlled, moderately controlled, or uncontrolled. In addition, information on health care resource utilization was collected.

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**Results:** A total of 211 patients were included. At the 12-month follow-up, a total of 35.5% achieved optimal control, 46.0% moderate control, and 18.5% continued to have uncontrolled disease. Shorter AD duration, lower baseline POEM, and baseline initiation with a biologic or JAK inhibitor (JAKi) were associated with better disease control. A total of 42.7% of patients required some type of additional health care assistance during follow-up. Uncontrolled patients showed a higher tendency for health care visits vs moderately controlled and optimally controlled patients (2.13 vs 1.71 vs 0.80,  $P = .084$ ).

**Conclusion:** Health care resource utilization in patients with AD varies according to the level of disease control. Factors associated with better control included shorter disease duration, initial treatment with biologics or JAK inhibitors from baseline, and lower baseline POEM.

## Introduction

Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by recurrent flares and the appearance of eczematous lesions and intense pruritus.<sup>1</sup> The etiopathogenesis of AD involves immune system dysregulation, epidermal barrier dysfunction, and cutaneous dysbiosis.<sup>2,3</sup> It is one of the most common dermatological diseases, affecting more than 20% of children and more than 10% of adults.<sup>4</sup> AD has a significant impact on both patients' quality of life and the health care system.<sup>5,6</sup>

Furthermore, patients with more severe AD experience a greater disease burden, reflected by greater impairment in quality of life, increased life dissatisfaction, more intense pruritus, and worsening sleep and mental health outcomes.<sup>7,8</sup> Since 2020, there has been a therapeutic revolution in AD management with the introduction of new biologic agents (dupilumab, tralokinumab, lebrizumab) and JAK pathway inhibitors (JAKi) (upadacitinib, baricitinib, abrocitinib).<sup>9</sup> These drugs have contributed to improvements in disease severity and patient quality of life and have helped reduce the overall disease burden.<sup>10,11</sup> However, the use of these therapies has also resulted in significant costs for the health care system.<sup>12</sup>

In addition, with the emergence of new drugs, expectations regarding safety and efficacy have increased among both clinicians and patients.<sup>13</sup> In fact, it has been reported that patients with AD who achieve optimal disease control experience greater improvement in symptoms, daily activities, emotional well-being, and work productivity vs those who achieve only moderate but not optimal control.<sup>14,15</sup> However, it remains unknown whether achieving optimal disease control results in health care resource savings that would justify higher therapeutic expectations.

Therefore, the objective of this study was to analyze health care resource utilization in patients with AD according to the level of disease control.

## Material and methods

### Study design and participants

We conducted a multicenter, observational, prospective cohort study including patients of any age with AD who initiated systemic treatment. BIOBADATOP is the Spanish Atopic Dermatitis Registry, which includes patients of any age on systemic treatment for AD, including both conventional and modern therapies.<sup>16,17</sup> The registry involves 14 dermatology departments distributed across Spain. In this study, all adult patients ( $\geq 18$  years) with a 12-month follow-up in the BIOBADATOP registry from March 2020 (registry start date) through June 2024 were included.

### Variables

The registry systematically records baseline and demographic characteristics, diagnosis, and changes in AD severity, as well as atopic and non-atopic comorbidities, previous treatments, and current treatment. For each new treatment, the start and discontinuation dates are

recorded, along with the reason for treatment withdrawal. Drug effectiveness was evaluated using the objective Eczema Area and Severity Index (EASI) score and through patient-reported outcomes using the Patient-Oriented Eczema Measure (POEM) questionnaire and the Visual Analog Scale (VAS) for pruritus. According to disease control after 12 months of follow-up, patients were classified as optimally controlled: EASI clean or almost clean ( $EASI \leq 1$ ); moderately controlled: mild EASI ( $1 < EASI \leq 7$ ); and uncontrolled: moderate or severe EASI ( $EASI > 7$ ).

In addition, during follow-up visits (6 and 12 months), information on health care resource utilization related to AD was collected: emergency department visits, hospitalizations, specialist care visits, primary care visits, healthcare visits, and loss of days of usual activities. A healthcare visit was defined as the need for any of the following: hospitalization, emergency department visit, specialist visit, or primary care visit.

### Statistical analysis

Continuous variables were expressed as mean (SD), and qualitative variables as absolute frequencies (percentages). Comparisons between the different groups were analyzed according to each variable using the Kruskal–Wallis test for continuous variables and Pearson's chi-square test for qualitative variables. Statistical analysis was performed using Stata v.17 (StataCorp. 2021. Stata Statistical Software: Release 17). Statistical significance was defined as  $P < .05$ .

The BIOBADATOP registry was approved by the *Comité Ético de Investigación Clínica de Aragón* (PA18/051), in full compliance with the principles outlined in the Declaration of Helsinki and current legislation. In addition, it has received the EnCePP (European Network of Centres for Pharmacoepidemiology and Pharmacovigilance) seal, a mark of quality, independence, and transparency of the network coordinated by the European Medicines Agency.

## Results

A total of 211 adult patients who reached 12 months of follow-up in the BIOBADATOP registry were included, with a mean age of 37.1 years (SD, 14.1), of whom 106/211 (50.2%) were women (see [Table 1](#)). Allergic rhinoconjunctivitis was present in 58.7% of patients and asthma in 50%. At the time of study inclusion, patients presented with severe disease reflected by an EASI of 22.8 (SD, 11.9), a pruritus VAS of 7.6 (SD, 2.2), a DLQI of 15.5 (SD, 7.3), and a POEM of 20 (SD, 6.3). Only 10.9% were moderately controlled, whereas the remaining 89.1% were uncontrolled. A total of 68.7% initiated a biologic treatment or a JAK inhibitor (JAKi) at study entry, and 66/211 (31.3%) started conventional systemic therapy.

At the 12-month follow-up, patients improved the severity of their disease, reflected by a mean overall decrease of 17.6 points (SD, 13.9) in EASI. After 12 months of follow-up, 75/211 (35.5%) achieved optimal disease control, 97/211 (46.0%) achieved moderate control, and 39 remained uncontrolled (18.5%). Patients with optimal disease control had a shorter disease duration (18.9 vs 26.0 vs 21.7;  $P = .010$ ) and a lower baseline POEM (18.4 vs 19.9 vs 23.1;  $P = .008$ ). In addition, patients with optimal control more frequently had allergic contact der-

**Table 1**  
Characteristics of the study population.

|   | Severity at 12 months              |            |  |            |                                 |            |                             |      | P |
|---|------------------------------------|------------|--|------------|---------------------------------|------------|-----------------------------|------|---|
|   | Optimal control<br>(n = 75; 35.5%) |            | Moderate but not<br>optimal control<br>(n = 97; 46.0%) |            | Uncontrolled<br>(n = 39; 18.5%) |            | Total<br>(n = 211;<br>100%) | N    |   |
|   | N                                  | Percentage | N  | Percentage | N                               | Percentage |                             |      |   |
| Age (years), mean (SD)  | 38.8                               | 14.3       | 37.3   | 14.6       | 33.0                            | 11.8       | 37.1                        | 14.1 |   |
| Sex (female, %)   | 43                                 | 57.3       | 42   | 43.3       | 21                              | 53.8       | 106                         | 50.2 |   |
| Disease duration (years), mean (SD)                             | 18.9                               | 15.4       | 26.0   | 16.3       | 21.7                            | 12.0       | 22.7                        | 15.5 |   |
| Number of previous systemic treatments                          | 1.8                                | 1.4        | 1.8  | 1.6        | 1.5                             | 1.7        | 1.7                         | 1.6  |   |
| Baseline pruritus VAS (0–10), mean (SD)                         | 7.5                                | 2.4        | 7.6  | 2.2        | 8.0                             | 2.2        | 7.6                         | 2.2  |   |
| Baseline EASI (0–72), mean (SD)                                 | 22.8                               | 12.2       | 22.8   | 11.1       | 22.8                            | 13.6       | 22.8                        | 11.9 |   |
| Baseline POEM (0–28), mean (SD)                                 | 18.4                               | 6.5        | 19.9   | 6.3        | 23.1                            | 5.0        | 20.0                        | 6.3  |   |
| Baseline quality of life (DLQI, CDLQI, IDLQI) (0–30), mean (SD) | 14.5                               | 7.9        | 15.4   | 6.9        | 17.5                            | 7.4        | 15.5                        | 7.3  |   |
| Duration of first treatment (years), mean (SD)                  | 0.9                                | 0.3        | 0.8  | 0.3        | 0.8                             | 0.3        | 0.9                         | 0.3  |   |
| Follow-up time (12 months), mean (SD)                           | 12.4                               | 1.4        | 12.6   | 1.5        | 12.5                            | 1.5        | 12.5                        | 1.5  |   |
| Nodular prurigo (yes)   | 6                                  | 8.2        | 7  | 7.2        | 5                               | 12.8       | 18                          | 8.6  |   |
| Palmoplantar eczema (yes)                                       | 10                                 | 13.9       | 14   | 14.4       | 8                               | 20.5       | 32                          | 15.4 |   |
| Specific locations (yes)  | 59                                 | 80.8       | 76   | 80.0       | 27                              | 69.2       | 162                         | 78.3 |   |
| Previous systemic treatment (yes)                               | 64                                 | 85.3       | 80   | 82.5       | 29                              | 74.4       | 173                         | 82.0 |   |
| Previous phototherapy treatment (yes)                           | 32                                 | 43.2       | 40   | 41.7       | 14                              | 35.9       | 86                          | 41.1 |   |
| <b>Severity according to EASI</b>                               |                                    |            |  |            |                                 |            |                             |      |   |
| Mild (EASI ≤ 7)   | 12                                 | 16.0       | 5  | 5.2        | 6                               | 15.4       | 23                          | 10.9 |   |
| Moderate (7.01–20.99)   | 20                                 | 26.7       | 37   | 38.1       | 9                               | 23.1       | 66                          | 31.3 |   |
| Severe ≥21  | 43                                 | 57.3       | 55   | 56.7       | 24                              | 61.5       | 122                         | 57.8 |   |
| <b>Atopic comorbidities (yes)</b>                               |                                    |            |  |            |                                 |            |                             |      |   |
| Asthma (yes)  | 50                                 | 69.4       | 71   | 73.2       | 28                              | 75.7       | 149                         | 72.3 |   |
| Allergic rhinoconjunctivitis (yes)                              | 34                                 | 46.6       | 49   | 50.5       | 21                              | 55.3       | 104                         | 50.0 |   |
| Allergic rhinoconjunctivitis (yes)                              | 42                                 | 58.3       | 56   | 58.3       | 20                              | 60.6       | 118                         | 58.7 |   |
| Atopic ocular disease (yes)                                     | 10                                 | 13.7       | 18   | 18.9       | 3                               | 9.1        | 31                          | 15.4 |   |
| Allergic contact dermatitis (yes)                               | 27                                 | 44.3       | 17   | 22.1       | 9                               | 26.5       | 53                          | 30.8 |   |
| Anxiety (yes)   | 16                                 | 23.5       | 19   | 20.4       | 5                               | 13.9       | 40                          | 20.3 |   |
| Depression (yes)  | 11                                 | 15.9       | 12   | 13.3       | 0                               | 0.0        | 23                          | 11.8 |   |
| <b>Systemic treatment (baseline)</b>                            |                                    |            |  |            |                                 |            |                             |      |   |
| Biologic (yes)  | 11                                 | 14.7       | 32   | 33.0       | 23                              | 59.0       | 66                          | 31.3 |   |
| JAK inhibitor (yes)   | 64                                 | 85.3       | 65   | 67.0       | 16                              | 41.0       | 145                         | 68.7 |   |

Quantitative variables are expressed as mean (SD), and qualitative variables as absolute frequency (percentage). Comparisons between groups were analyzed according to each variable using the Kruskal–Wallis test for continuous variables and Pearson’s chi-square test for qualitative variables. Statistical analysis was performed using Stata v.17 (StataCorp. 2021. Stata Statistical Software: Release 17). Statistical significance was defined as  $P < .05$ .

matitis compared with those with moderate control or those who were uncontrolled (44.3% vs 22.1% vs 26.5%;  $P = .016$ ). Uncontrolled patients had depression less frequently than moderately controlled and optimally controlled patients (15.9% vs 13.3% vs 0%;  $P = .046$ ). Similarly, at the baseline visit, uncontrolled patients received a biologic treatment or JAKi less frequently than moderately controlled or optimally controlled patients (85.3% vs 67% vs 41%;  $P < .001$ ). Specifically, uncontrolled patients more frequently initiated cyclosporine. No other sociodemographic or clinical characteristic was associated with differences between groups according to disease control at 12 months.

Regarding resource utilization (Table 2), 42.7% of patients required some type of additional health care related to AD during follow-up, with a mean of 2.0 health care visits per year. A total of 38.9% required additional specialist care, 7.1% additional primary care, 5.2% emergency department care, and 0.9% hospitalization. Uncontrolled patients had a greater number of health care visits than moderately controlled and optimally controlled patients, although the differences were not statistically significant (0.80 vs 1.71 vs 2.13;  $P = .084$ ). Regarding individual visits, optimally controlled patients had fewer primary care visits than moderately controlled and uncontrolled patients (0% vs 9.3% vs 15.4%;  $P = .005$ ). No statistically significant differences were observed in emergency department visits, hospitalizations, or specialist visits, although a trend was observed (optimal control < moderate control < uncontrolled). Uncontrolled patients more frequently lost days of

usual activities compared with those with moderate and optimal control (10.3% vs 1% vs 4%;  $P = .0387$ ).

Similarly, patients with AD who used any type of health care resource showed worse indicators during follow-up (pruritus, EASI, POEM, DLQI) (Figs. 1 and 2).

**Discussion**

This study of adult patients with AD, with a 1-year follow-up, allowed the identification of relevant trends in health care resource utilization, clinical evolution, and disease control. Overall, patients experienced a significant improvement in disease severity, although only one third achieved optimal disease control.

The adult patient population with AD included in this study had a mean age of approximately 35–40 years, with an equitable gender distribution and a high prevalence of allergic comorbidities (one third allergic rhinoconjunctivitis, one half asthma), findings consistent with recent studies.<sup>18–20</sup> Patients included at baseline showed a significant disease burden, with high values in severity, pruritus, and quality-of-life indicators. This profile is representative of patients with severe AD and is consistent with findings reported in international cohorts.<sup>21</sup> A significant proportion of patients (two thirds) initiated biologic treatments or JAK inhibitors at the beginning of the study, reinforcing the internatio-

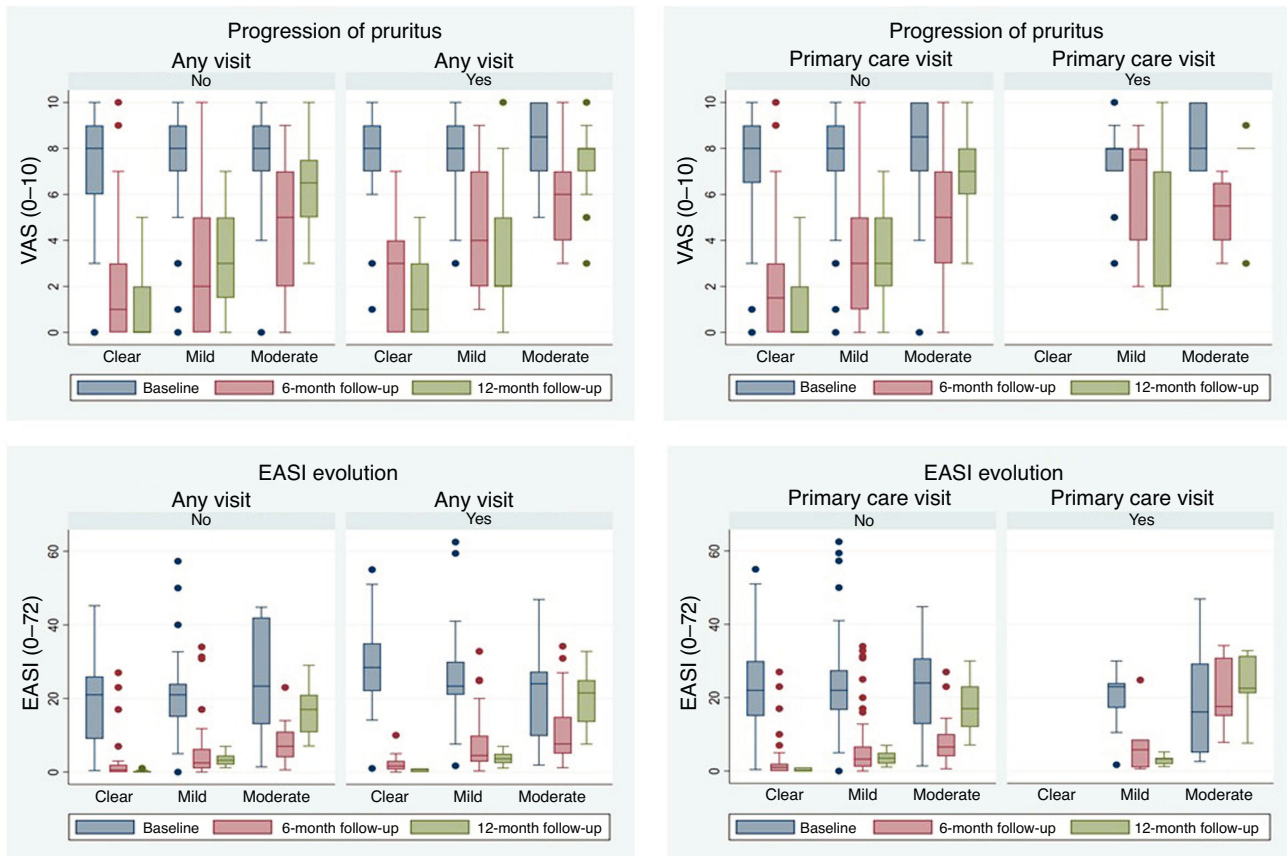


Fig. 1. Progression of atopic dermatitis severity (pruritus, EASI) according to health care resource utilization.

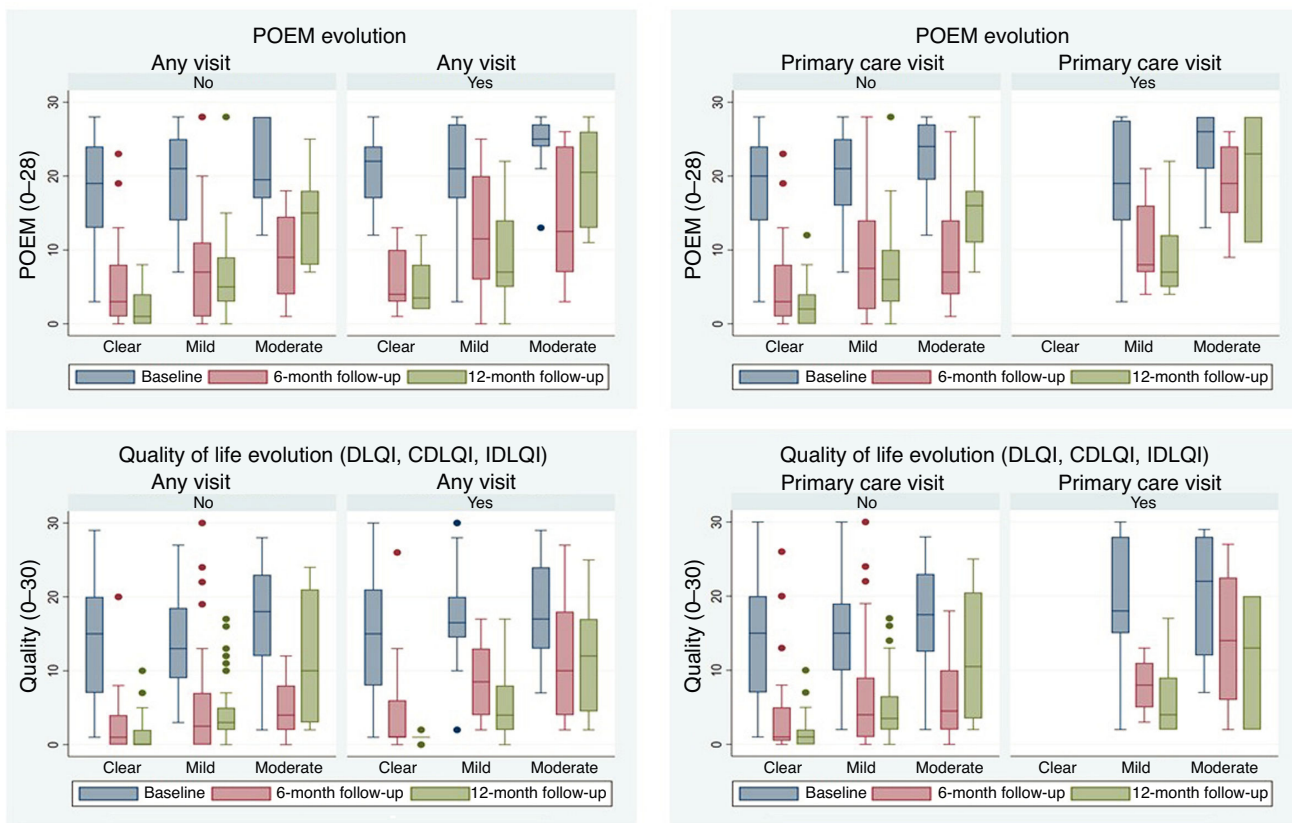


Fig. 2. Evolution of quality of life in atopic dermatitis (POEM, DLQI) according to health care resource utilization.

**Table 2**  
Health care resource utilization of patients after 12 months of follow-up.

|  | Optimal control |            | Moderate but not optimal control |            | Uncontrolled |            | Total<br>N | P    |
|--|-----------------|------------|----------------------------------|------------|--------------|------------|------------|------|
|  | N               | Percentage | N                                | Percentage | N            | Percentage |            |      |
| Emergency department visits (yes)      | 3               | 4.0        | 4                                | 4.1        | 4            | 10.3       | 11         | 5.2  |
| Hospitalizations (yes)                 | 0               | 0.0        | 1                                | 1.0        | 1            | 2.6        | 2          | 0.9  |
| Specialist care visits (yes)           | 24              | 32.0       | 40                               | 41.2       | 18           | 46.2       | 82         | 38.9 |
| Primary care visits (yes)              | 0               | 0.0        | 9                                | 9.3        | 6            | 15.4       | 15         | 7.1  |
| Healthcare visits (yes)                | 25              | 33.3       | 44                               | 45.4       | 21           | 53.8       | 90         | 42.7 |
| Loss of days of usual activities (yes) | 3               | 4.0        | 1                                | 1.0        | 4            | 10.3       | 8          | 3.8  |

Quantitative variables are expressed as mean (SD), and qualitative variables as absolute frequency (percentage). Comparisons between groups were analyzed according to each variable using the Kruskal–Wallis test for continuous variables and Pearson’s chi-square test for qualitative variables. Statistical analysis was performed using Stata v.17 (StataCorp. 2021. Stata Statistical Software: Release 17). Statistical significance was defined as  $P < .05$ .

nal trend toward the adoption of advanced therapies as the standard of care for severe cases.<sup>22</sup>

After a 1-year follow-up, approximately 35% of patients achieved optimal disease control, while about 45% achieved moderate control, and around 20% remained uncontrolled. These results reflect the positive impact of treatment in a large proportion of patients, but they also highlight the existence of a significant group that does not achieve adequate control, underscoring the need for more effective therapeutic approaches for these cases. Patients with optimal control more frequently presented allergic contact dermatitis vs those with moderate control and those who were uncontrolled. This finding suggests that avoidance of known triggers, as well as improved patient education regarding potential triggers of AD flares, could contribute to better disease control.<sup>23</sup> On the other hand, patients with optimal control showed a higher prevalence of depression in this study. Patients with AD have a higher prevalence of psychological disorders<sup>24</sup>; however, its relationship with AD control remains unknown. It is likely that this association is an incidental finding and that depression is not directly related to AD control, or that the relationships between clinical control and mental health may vary depending on the population and health care context.

Other factors associated with better AD control were shorter disease duration and lower baseline POEM. The association between shorter disease duration and better control could be due to a less active disease state or may reflect that earlier intervention could prevent the chronification of cutaneous inflammation and the progression of epidermal barrier damage.<sup>25,26</sup> The relationship between lower baseline POEM and better disease control may also highlight the influence of patients’ subjective perception of symptoms on clinical outcomes. POEM evaluates the frequency of the main AD symptoms during the previous week, unlike other scales such as SCORAD or the pruritus VAS, which mainly focus on intensity. This distinction is relevant because symptom frequency – such as persistent pruritus or sleep disturbance – may have a more significant cumulative impact on overall disease burden than occasional episodes of high intensity.<sup>27</sup> Similarly, the analysis of this study shows that uncontrolled patients initiated biologic or JAKi therapy less frequently, whereas the use of cyclosporine was more prevalent in this group. This is consistent with other studies that have shown that targeted therapies offer better disease control (greater efficacy and a more favorable safety profile) vs traditional immunosuppressants such as cyclosporine.<sup>20,26,28,29</sup>

During follow-up, approximately 50% of patients required some type of additional health care assistance related to their AD, with an average of 2 visits per patient, slightly lower than that reported in other studies.<sup>30</sup> Patients with optimal disease control showed fewer health care visits vs moderately controlled and uncontrolled patients. Specifically, optimally controlled patients had fewer primary care visits, and a decreasing trend was observed in emergency visits, hospitalizations, and specialist visits (optimal control < moderate control < uncontrolled). The analysis of health care resource utilization in BIOBADATOP suggests

that patients with uncontrolled disease have a greater impact on the health care system. This pattern is consistent with findings from other studies, which report that patients with moderate-to-severe AD experience greater clinical, psychosocial, and economic burden<sup>7</sup> and that the use of systemic therapies may reduce this burden.<sup>10</sup> The lower frequency of visits among optimally controlled patients in BIOBADATOP highlights the benefits of effective disease management, not only in terms of quality of life but also in reducing health care burden. Furthermore, patients who consumed health care resources during follow-up showed worse clinical indicators, including higher values of EASI, pruritus, POEM, and DLQI. This finding reinforces the bidirectional relationship between insufficient disease control and increased health care system burden.

The results from BIOBADATOP provide valuable information on AD; however, several limitations should be considered. The representativeness of the sample is limited by its geographical coverage, since although it includes data from multiple centers in Spain, not all hospitals and regions are equally represented. This may influence the representativeness of the results, as factors such as health care resource availability, access to advanced therapies, and sociodemographic characteristics may vary across autonomous communities. In addition, this registry focuses on patients with moderate-to-severe AD who initiate systemic treatment; therefore, the findings may not be generalizable and may limit understanding of the full spectrum of AD in the general population. Potential selection bias may exist, since patient inclusion depends on the availability and willingness of participating centers to register cases, which may lead to overrepresentation of certain patient profiles, such as those treated in specialized units. Furthermore, some clinical data, such as treatment adherence or medical visits, may not have been reported with complete accuracy, especially among patients who are not closely supervised.

In conclusion, this study demonstrates that health care resource utilization in patients with AD varies according to the level of disease control. Factors associated with better control included shorter disease duration, initial treatment with biologics or JAKi from baseline, and lower baseline POEM. Patients with optimal AD control required fewer health care visits vs those with moderate or uncontrolled disease, highlighting the importance of appropriate disease management in reducing the burden on the health care system.

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## Conflicts of interest

T. Montero-Vilchez has participated as an advisor, speaker, and in research projects for AbbVie, Almirall, Incyte, Leo-Pharma, Lilly, Novartis, Sanofi, Pfizer-Wyeth, UCB Pharma, and *Instituto de Salud Carlos III*.

S. Arias-Santiago has participated as a consultant and in clinical trials for AbbVie, Almirall, Leo-Pharma, Lilly, Sanofi, and Pfizer-Wyeth.

R. Sanabria-de la Torre has no conflicts of interest to declare regarding this article.

A. González Quesada has participated in consulting services, presentations, and related activities for AbbVie, Leo-Pharma, Sanofi, UCB, Lilly, and Almirall. She has participated as principal investigator or subinvestigator in clinical trials sponsored by Lilly, Leo-Pharma, Novartis, Janssen, Sanofi, Pfizer, AbbVie, Almirall, UCB, and Galderma.

Martina Espasandín Arias has conducted and/or participated in educational activities and attendance at courses and congresses sponsored by AbbVie, Sanofi, Almirall, Viatrix, Pfizer, and Leo-Pharma. She has served as subinvestigator in clinical trials promoted by AbbVie, Pfizer, Novartis, Sanofi, and Incyte.

M.A. Lasheras-Pérez has no conflicts of interest to declare regarding this article.

P. de la Cueva has participated as advisor and/or investigator and/or speaker with the following pharmaceutical companies: AbbVie, Almirall, BMS, Boehringer, Celgene, Janssen, Leo-Pharma, Lilly, MSD, Novartis, Novo Nordisk, Pfizer, Roche, Sanofi, and UCB.

R. Ruiz-Villaverde has no conflicts of interest to declare regarding this article.

M. Munera-Campos has received honoraria for scientific advisory services, presentations, or other related activities from AbbVie, Leo-Pharma, Janssen, Sanofi, and Galderma, and has participated as principal investigator and subinvestigator in clinical trials for Lilly, Leo-Pharma, Novartis, Janssen, Sanofi, Pfizer, AbbVie, Almirall, UCB, and Galderma.

P. Chicharro has participated in consulting activities, lectures, and clinical trials organized by the following companies: Janssen Pharmaceuticals, Almirall, Sanofi Genzyme, Lilly, AbbVie, Novartis, Leo-Pharma, and Pfizer-Wyeth.

Y. Gilaberte has participated as an advisor for Isdin, Roche Posay, and Galderma; has delivered lectures for Almirall, Sanofi, Avene, Rilastil, Lilly, Uriage, Novartis, and Cantabria Labs; and has participated in research projects for Almirall, Sanofi, Pfizer, AbbVie, and Leo-Pharma.

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