



# Prevalence of multiple myeloma in patients on hemodialysis programs: A multicenter cross-sectional study.

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19. Hospital Militar de Guayaquil, Ecuador.
20. Hospital General II DE "Libertad", Ecuador.

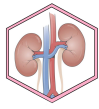
## Abstract

**Introduction:** Multiple myeloma (MM) is a hematological malignancy that often causes kidney failure and affects more than 50% of MM patients. Kidney damage in MM is primarily due to cast nephropathy, light chain deposition disease, and amyloidosis. However, there are no data on MM patients undergoing hemodialysis in Ecuador. This study aimed to report the prevalence of MM in the country's hemodialysis units.

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**Methods:** This observational, descriptive, cross-sectional, multicenter study evaluated the prevalence of MM in hemodialysis patients in Ecuador. A survey was distributed to 23 nephrologists, who collected data on the total number of hemodialysis patients and those diagnosed with MM. Prevalence was calculated via the following formula:  $\text{Prevalence} = (\text{MM patients} / \text{total hemodialysis patients}) \times 1000$ . The data were analyzed via nonparametric methods in R v4.3.2, with 99% confidence intervals.

**Results:** Patients were diagnosed with MM, yielding a prevalence of 1.1% (95% CI: 0.7% to 1.6%), or 11.3 cases per 1000 hemodialysis patients. The number of MM cases varied by city, with the highest number reported in Portoviejo (10 cases) and none reported in Riobamba.

**Conclusion:** The prevalence of MM in Ecuador is consistent with international reports, with similar findings in the United States (1.0%), Nigeria (0.81%), and other Latin American countries. These findings highlight the need for a national registry to better understand the needs of MM patients on hemodialysis.

## Keywords:

Multiple myeloma, prevalence, and hemodialysis.

Multiple myeloma (MM) is a hematological neoplasm that frequently causes acute deterioration of renal function in up to 30.8% of patients with this disease [1]. Reports indicate that the vast majority of patients with MM and dialysis-dependent acute renal failure secondary to myeloma cast nephropathy who have recovered independent renal function do not require additional dialysis [2]. Survival after recovery of renal function is good, and early variables are independently associated with survival and future renal function. However, 13.1% of MM patients develop advanced chronic kidney disease [3].

The incidence of MM has increased in the last 20 years. Approximately 25% of cases go directly to renal services [4], including new cases of multiple myeloma in patients who already have advanced chronic kidney disease [5]. This increased incidence of MM in hemodialysis units is also due to the greater survival of patients undergoing treatment with new biological therapies [6]. However, it is not possible to recover renal function; patients stabilize in hemodialysis programs, compensating for anemia with erythropoietin, hypercalcemia with hemodialysis, and protein loss with the use of high-flow filters [7].

Chronic kidney damage in MM is caused mainly by cast nephropathy, light chain deposition disease, and amyloidosis. However, there are no data on MM patients receiving hemodialysis in Ecuador. The objective of this study was to report the prevalence of MM in the country's hemodialysis units.

## Materials and methods

### Study design

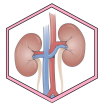
This study is cross-sectional. The source is prospective.

### Stage

The study was carried out in 23 hemodialysis clinics in 10 cities in Ecuador. The participating units were as follows:

1. Servicio de Nefrología, Hospital de la Fuerzas Armadas N1, Quito, Ecuador.
2. Unidad de Hemodiálisis, Cuidado renal de Baxter, Quito, Ecuador.
3. Unidad de diálisis Menydia, Quito, Ecuador.
4. Unidad de Hemodiálisis, Fresenius Medical Care, Ecuador.
5. Servicio de Nefrología, Hospital IESS Ambato, Ecuador.
6. Unidad de hemodiálisis CEHDIALEM, Ecuador.
7. Clínica de los Riñones Menydia Ibarra, Ecuador.
8. Contigo SA Dialicon, Ecuador.
9. Unidad médica vida, Ecuador.
10. Hospital General Provincial Docente Ambato, Ecuador.
11. Pafram, unidad de Hemodiafiltración, Sucúa, Ecuador.
12. Atención médica Fresenius, Ecuador.
13. Clínica de los Riñones Menydia
14. RenalPRO Daule, Ecuador.
15. San Vicente de Paúl Hospital, Ecuador.
16. Menydia Dialysis Unit, Riobamba, Ecuador.
17. Kidney Clinic with you, Ecuador.
18. Rodríguez Zambrano Hospital, Ecuador.
19. Military Hospital of Guayaquil, Ecuador.
20. General Hospital II DE "Libertad", Ecuador.

The study period was from November 1, 2024, to January 15, 2025.



### Participants

Patients who underwent conventional hemodialysis were included in the study. There were no exclusion criteria. Cases with an established diagnosis of multiple myeloma as the primary etiology of kidney failure or as an associated pathology were recorded.

### Variables

The variables were the presence or absence of multiple myeloma.

### Data sources/measurements

The source was indirect. The data were collected through e-mail invitations to the cooperating centers addressed to the medical directors of the hemodialysis units. The data collected are presented as absolute frequencies.

### Biases

Observation and selection bias were avoided by applying the participant selection criteria. A medical representative from each coordinating center was assigned to collect the data, which was completed through a single online form. The principal investigator consistently maintained the data using a guide and records approved in the research protocol to prevent possible interviewer, information, and recall biases. When the standard deviation of the data was unclear, corrections were made through onsite reviews of anomalous data. Two researchers independently analyzed each record in duplicate, and the variables were entered into the database after confirming their agreement.

### Study size

The sample was probabilistic. Ecuador has a population of 17,980,083 inhabitants (2023), with an incidence rate of CKD of 21,394 cases as of 2022. Using EPI Info™ (Stat Calc, Epi Info, CDC, Atlanta. Version 7.2.6 [October 2023]), with an expected MM frequency of 13.0%, a confidence limit of 5%, and a confidence level of 99.99%, the sample size was 664 cases.

### Quantitative variables

The results are presented as frequencies and percentages.

### Statistical analysis

The variables were analyzed via frequencies and percentages. The 95% confidence interval is presented for each proportion.

## Results

### Participants

A total of 2919 patients were included, fulfilling the expected sample size.

### Main results

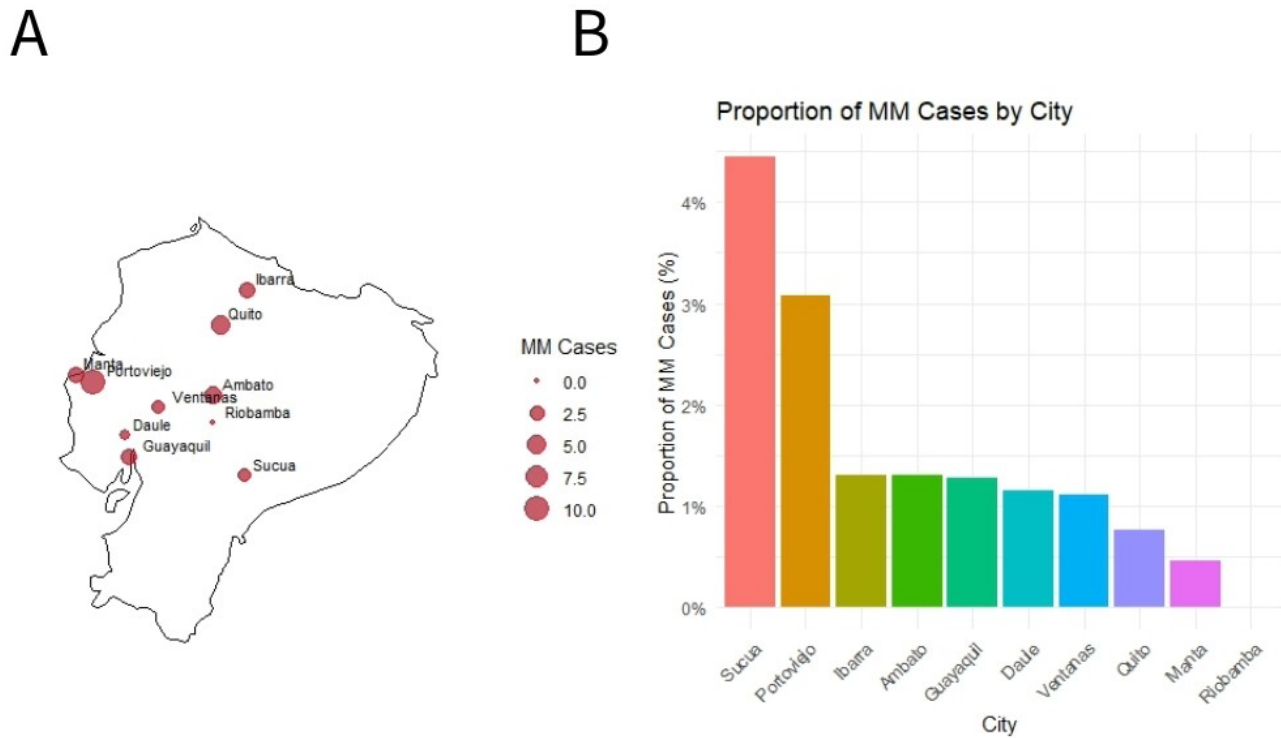
The prevalence of multiple myeloma was reported as 33 cases, which represents 1.1% (95% CI 0.7% to 1.6%). This translates to 11.3 cases per 1000 patients in hemodialysis programs.

The total number of patients varies significantly between cities, ranging from 45 in Sucua to 658 in Quito. The number of MM cases reported by the town also varies, with the highest number of cases observed in Portoviejo (10 cases) and no cases reported in Riobamba.

In Ambato, 307 patients were registered, with 4 cases of multiple myeloma (MM). Daule reported a total of 87 patients, including 1 with MM. Guayaquil had 235 patients, with 3 cases of MM. In Ibarra, there were 229 patients, including 3 with MM. Manta registered 650 patients and reported 3 cases of MM. Portoviejo had 325 patients, reporting the highest number of MM cases (10). Quito, the city with the highest number of patients (658), reported 5 cases of MM. Sucua, with 45 patients, reported 2 cases of MM. Ventanas had 180 patients, with 2 cases of MM. Finally, Riobamba had 203 patients, with no reported cases of MM. Large groups of patients in the provinces of Azuay, Cañar, Loja, Zamora Chinchipe, Esmeraldas, and El Oro did not respond to the survey ([Figure 1](#)).



**Figure 1.** Geolocation of cases with multiple myeloma in hemodialysis programs.



## Discussion

One of the consequences of the proliferation of plasma cells observed in multiple myeloma is the excessive production of free light chains (kappa or lambda). Likewise, kidney failure in multiple myeloma is primarily caused by the overproduction of nephrotoxic immunoglobulins, particularly C<sub>N</sub>s, where the production of free light chains exceeds tubular reabsorption, leading to their deposition and subsequent inflammation, fibrosis, and progressive loss of function [8].

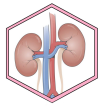
It has been reported that in Latin American patients diagnosed with MM, 8% may require hemodialysis upon diagnosis of the disease, a condition with a significant impact on quality of life and survival [9].

In the present study, we found a prevalence of 11.3 cases per 1000 hemodialysis patients (95% CI 7.4--15.6), which corresponds to 1.1% (95% CI 0.7%-1.6%) of the total population of hemodialysis patients.

This value agrees with other reports in the international literature. In the United States, the estimated incidence of multiple myeloma (MM) in patients with end-stage renal disease was 1.0% in 2012, whereas the prevalence rate in the same population was 0.3% [10]. In contrast, a registry that included Japanese patients reported that the prevalence of paraproteinaemia, including myeloma as the main cause of end-stage kidney disease, was 0.1% [10].

In the region, an absolute frequency of MM of 0.7% was reported in Argentina in 2022 [11]. In Peru, MM has been reported as a cause of end-stage kidney disease in hemodialysis patients, with a prevalence of 0.6% due to unspecified neoplasms or tumors [12]. In Chile, in 2023, the prevalence of MM in dialysis patients was 0.5% [13].

The main limitation of this study is that it was based on a survey conducted by nephrologists, who provided the number of patients diagnosed with multiple myeloma at each institution. This approach left us without demographic or clinical data for each patient. However, the strengths of this study include its potential to generate hypotheses and highlight the need for a national registry of myeloma patients on



hemodialysis. Such a registry could help address your specific needs, both in terms of renal replacement therapy and specific cancer treatment and survival. In this context, further studies employing a prospective methodology are needed to corroborate these findings and gain a deeper understanding of the reality faced by these patients [14-19].

## Conclusion

In Ecuador, a prevalence of 1.1% (95% CI: 0.7% to 1.6%) of patients with multiple myeloma in hemodialysis units was reported. However, due to the limitations of the study design, it is essential to establish a national registry to corroborate these findings and gain a deeper understanding of the needs of this population.

### Abbreviations

MM: Multiple myeloma.

### Supplementary information

The supplementary materials have not been declared.

### Acknowledgments

Does not apply.

### Authors' contributions

**David Garrido:** Conceptualization, methodology, research, writing – Original draft, Project management, Supervision, validation, visualization, Writing – revision and editing.

**Omar Seminar:** Conceptualization, Project Management, Supervision, Validation, Visualization, Writing – Revision and Editing.

**Juan Santacruz:** Conceptualization, Project Management, Supervision, Validation, Visualization, Writing – Proofreading and Editing.

**Evelyn Moreira:** Conceptualization, Data Curation, Formal Analysis, Acquisition of Funds, Research and Methodology.

**Rosalía Lituma:** Conceptualization, methodology, research, Writing – Original draft.

**Jorge Moscoso:** Conceptualization, Data Curation, Formal Analysis, Acquisition of Funds, Research, and Methodology.

**Ubelis Rosales:** Conceptualization, Data Curation, Formal Analysis, Acquisition of Funds, Research and Methodology.

**Alfonso Silva Contreras:** Conceptualization, Data Curation, Formal Analysis, Acquisition of Funds, Research and Methodology.

**Victor Hugo Ortega:** Conceptualization, Data Curation, Formal Analysis, Acquisition of Funds, Research, and Methodology.

**Ángel de Jesús Quevedo Pereira:** Conceptualization, Data Curation, Formal Analysis, Acquisition of Funds, Research and Methodology.

**Franklin Mora Bravo:** Conceptualization, Data Curation, Formal Analysis, Acquisition of Funds, Research and Methodology.

**Santiago Silva Tobar:** Conceptualization, methodology, research.

**Daniel Arias:** Conceptualization, methodology, research.

**Willan Robles:** Conceptualization, methodology, research.

**Norlán Rodríguez Apolinario:** Conceptualization, methodology, research.

**Juan Carlos Pérez Chil:** Conceptualization, methodology, research.

**Cristian Mejía:** Conceptualization, methodology, research.

**Ailiyomar Pérez:** Conceptualization, methodology, research.

**Graysi Virla:** Conceptualization, methodology, research.

**James Muñoz:** Conceptualization, methodology, research.

**Juan Carlos Paz:** Conceptualization, methodology, research, Writing – Original draft.

**Isabel León Baquero:** Conceptualization, methodology, research, Writing – Original draft.

**Sandra Valarezo:** Conceptualization, methodology, research, Writing – Original draft.

**Washington Osorio:** Conceptualization, methodology, research, Writing – Original draft.

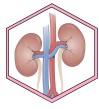
**Jorge Huertas:** Conceptualization, methodology, research, Writing – Original draft. All the authors read and approved the final version of the manuscript.

### Financing

The study was self-financed by the authors.

### Availability of data or materials

Does not apply.



## Declarations

### Ethics committee approval and consent to participate

The Bioethics Committee of the Ecuadorian Society of Nephrology, Dialysis and Transplantation approved the study.

### Consent for publication

It does not apply when specific images, radiographs, or photographs of patients are not published.

### Conflicts of interest

The authors declare that they have no conflicts of interest.

### Author information

Not declared.

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