



Polypharmacy and Multimorbidity: Redesigning Internal Medicine for the Aging Population

Polifarmacia y multimorbilidad: rediseño de la medicina interna para la población envejeciente

Para citar este trabajo:

Vergara trujillo , R. adrian ., & Corona González, R. D. . (2025). Polifarmacia y multimorbilidad: rediseño de la medicina interna para la población envejeciente. *Multidisciplinary Journal of Sciences, Discoveries, and Society*, 2(5), 1-23.
https://estrellaediciones.com/index.php/sciences_discoveries_and_society/article/view/324

Autores:

Richard adrian Vergara trujillo

Universidad San Martín

Calí - Colombia

Adrianvergara124@hotmail.com

<https://orcid.org/0000-0003-2541-0893>

Issac Omar Morales Carlos

UAMEX

Estado de México - México

issac.mc.97@gmail.com

<https://orcid.org/0009-0006-2898-471X>

Ricardo Daniel Corona González

Universidad Autónoma del Estado de Hidalgo

Pachuca - México

rdaniel.coronag@gmail.com

<https://orcid.org/0009-0000-3302-4576>

Rodolfo José Anzola Arias

Centro Médico ABC

CDMX - México

rj_anzolao8@hotmail.com

<https://orcid.org/0009-0000-5607-1025>

José Enrique González Araujo

Universidad Autónoma de Chiapas

Chiapas - México

araujo261220@gmail.com

<https://orcid.org/0009-0009-4386-4945>

Cristian Alonso Duarte Carreño

Clinica Medical Duarte

Cúcuta - Colombia

klamar89@gmail.com

<https://orcid.org/0009-0006-1600-6169>

Giómar Adrián Crespo Rojas

Independiente

Daule - Ecuador

g.cresporojas@gmail.com

<https://orcid.org/0009-0000-3638-2870>

Paola Montserrat Zagaceta Perez

Universidad de la Salud del Estado de México

Toluca - México

paola.zagaceta@gmail.com

<https://orcid.org/0009-0007-4869-5592>

Autor de Correspondencia: Richard Adrian Vergara Trujillo, Adrianvergara124@hotmail.com

RECIBIDO: 14-Septiembre-2025

ACEPTADO: 28-Septiembre-2025

PUBLICADO: 12-Octubre-2025



Resumen

El aumento de la multimorbilidad en las poblaciones envejecidas ha intensificado el desafío global de la polifarmacia, lo que exige una redefinición de la medicina interna hacia un enfoque más integral, racional y centrado en el paciente. Este estudio multinacional, transversal y analítico examinó la relación entre multimorbilidad y polifarmacia en 1,260 adultos mayores de 60 años residentes en México, Colombia y Ecuador. Los datos se obtuvieron mediante entrevistas estandarizadas y fueron analizados con métodos descriptivos y multivariados. Los resultados mostraron que el 62.3% de los participantes presentaba tres o más enfermedades crónicas, mientras que el 65% cumplía con los criterios de polifarmacia (≥ 5 medicamentos diarios). La frecuencia de eventos adversos a medicamentos (EAM) aumentó proporcionalmente con el número de fármacos, alcanzando el 55% entre quienes consumían nueve o más. El análisis multivariado identificó como factores predictivos principales la presencia de tres o más enfermedades crónicas (ORa = 3.2), edad ≥ 75 años (ORa = 1.9), bajo nivel educativo (ORa = 1.7) y sexo femenino (ORa = 1.4). Las comparaciones entre países mostraron mayor preparación institucional en México y Colombia, particularmente en farmacovigilancia y acceso a farmacéuticos clínicos, aunque las estrategias de deprescripción y educación pública siguen siendo limitadas. Los hallazgos refuerzan la necesidad de fortalecer la seguridad del paciente, promover la deprescripción sistemática e integrar farmacéuticos en equipos multidisciplinarios. El estudio se alinea con el Objetivo de Desarrollo Sostenible 3 (Salud y Bienestar) de la Agenda 2030, proponiendo rediseñar la medicina interna para priorizar la farmacoterapia racional, la equidad y la calidad de vida en la vejez.

Palabras clave: Polifarmacia; Multimorbilidad; Medicina interna; Deprescripción; Farmacovigilancia; Seguridad del paciente; Envejecimiento saludable.

Abstract

The increasing coexistence of multiple chronic conditions in aging populations has intensified the global challenge of polypharmacy, demanding a redefinition of internal medicine toward more integrated, patient-centered care. This multinational cross-sectional study examined the relationship between multimorbidity and polypharmacy among 1,260 adults aged ≥ 60 years in Mexico, Colombia, and Ecuador. Data were collected through standardized interviews and analyzed using descriptive and multivariate methods. Results revealed that 62.3% of participants had three or more chronic conditions and 65% met the criteria for polypharmacy (≥ 5 medications daily). The prevalence of adverse drug events (ADEs) increased proportionally with the number of medications, reaching 55% among participants taking nine or more drugs. Multivariate analysis identified ≥ 3 chronic diseases (aOR = 3.2), age ≥ 75 years (aOR = 1.9), low education (aOR = 1.7), and female sex (aOR = 1.4) as significant predictors of polypharmacy. Cross-country comparison showed higher institutional readiness in Mexico and Colombia, particularly in pharmacovigilance programs and clinical pharmacy access, though deprescribing practices and public awareness remained limited. Findings highlight the need for regional strategies to strengthen medication safety, promote deprescribing, and integrate pharmacists into multidisciplinary teams. Aligning with the United Nations Sustainable Development Goal 3, this study calls for the redesign of internal medicine to prioritize rational pharmacotherapy, equity, and patient well-being in the context of population aging.

Keywords: Polypharmacy; Multimorbidity; Geriatric Medicine; Pharmacovigilance; Deprescribing; Health Systems; Patient Safety.



1. Introducción

The accelerating demographic transition toward an aging global population represents one of the most significant public health challenges of the 21st century. According to Huaquía-Díaz et al. (2021), the prevalence of multimorbidity—defined as the coexistence of two or more chronic conditions within the same individual—has reached over 40% among adults aged 60 years and older in Latin America and the Caribbean. Similarly, Nguyen et al. (2019) reported comparable figures in community-based populations worldwide, demonstrating that multimorbidity is no longer an exception but the dominant clinical reality of aging societies. These epidemiological transformations demand an urgent reevaluation of traditional internal medicine paradigms, which were historically designed for single-disease management.

One of the most pervasive consequences of multimorbidity is polypharmacy, commonly defined as the concurrent use of five or more medications (American Geriatrics Society, 2023). Although polypharmacy can sometimes be therapeutically justified, inappropriate or excessive medication use poses substantial risks to patient safety, including adverse drug reactions, cognitive decline, falls, hospitalizations, and increased mortality (O'Mahony et al., 2023; Veronese et al., 2024). The World Health Organization (2019) has identified medication safety in polypharmacy as a global health priority, calling for comprehensive strategies that encompass clinical, organizational, and policy dimensions. This call is echoed by the NICE NG56 guidelines (2024), which emphasize individualized assessment, shared decision-making, and coordinated care across medical specialties to manage patients with complex chronic conditions.

Multiple frameworks have emerged to promote safer prescribing practices in older adults. The Beers Criteria (American Geriatrics Society, 2023) and the STOPP/START version 3 tool (O'Mahony et al., 2023) have become internationally recognized instruments to identify potentially inappropriate medications and under-prescribing in elderly populations. Despite their utility, their consistent implementation across healthcare systems remains a challenge, particularly in low- and middle-income regions where pharmacovigilance and interdisciplinary coordination are limited (Macinko et al., 2019; Ministerio de Salud Pública del Ecuador, 2021). In Latin America, for example, fragmented healthcare delivery and limited access to clinical pharmacy services hinder effective monitoring of medication use (Ministerio de Salud y Protección Social de Colombia, 2024, 2025).

Recent research underscores the growing importance of deprescribing, a patient-centered process of identifying and discontinuing medications that may no longer be beneficial or may cause harm (Crisafulli, Ingrassiotta, & Trifirò, 2022). Pottie et al. (2021) synthesized evidence from multiple systematic reviews and found that deprescribing interventions can improve health outcomes when integrated within multidisciplinary teams and combined with patient education. Similarly, Persaud et al. (2025) demonstrated that structured deprescribing programs in primary care settings significantly reduce potentially inappropriate prescribing without increasing adverse events. Complementary findings from De Vries et al. (2022) reveal that while deprescribing can reduce medication burden, heterogeneity in intervention design and clinical settings still limits large-scale reproducibility.

In parallel, Daunt, Sheridan, and Hughes (2023) introduced the concept of “polypharmacy stewardship”, an innovative framework inspired by antimicrobial stewardship programs, which integrates education, clinical governance, and public policy to promote rational pharmacotherapy. This stewardship model recognizes polypharmacy not merely as a prescribing issue but as a systemic challenge that reflects the intersection of aging, multimorbidity, and fragmented care. O'Brien and O'Connor (2023) further highlight that attitudes toward deprescribing among clinicians and patients remain complex—often influenced by fear of



withdrawal effects, lack of clear protocols, and insufficient communication between prescribers. Thus, effective interventions require cultural as well as structural change.

The regional dimension of this issue is particularly salient in Latin America. Anza-Ramírez et al. (2024) demonstrated in a Peruvian mixed-methods study that multimorbidity is strongly associated with polypharmacy, and that primary care infrastructures are frequently underprepared to manage these patients comprehensively. García-Pérez, Barreto, and Vázquez-Narváez (2025) observed that multimorbidity is also linked to depressive symptoms and lower quality of life, indicating that psychosocial and pharmacological factors are deeply intertwined. In Colombia, national health reports (Ministerio de Salud y Protección Social de Colombia, 2024, 2025) document that multimorbidity contributes substantially to healthcare expenditure and medication overuse, while in Ecuador, the Manual de Atención Farmacéutica (Ministerio de Salud Pública del Ecuador, 2021) emphasizes the need for pharmaceutical care networks to ensure safe medication management.

The WHO Technical Report on Medication Safety in Polypharmacy (2019) advocates for the redesign of internal medicine toward a more integrated, patient-centered, and evidence-based discipline. This approach aligns with the principles outlined in Ageing Research Reviews by Veronese et al. (2024), which underscore that deprescribing is most effective when guided by continuous follow-up, shared decision-making, and the preservation of functional status. Collectively, these findings support the notion that internal medicine must evolve beyond disease-oriented paradigms to address the multifaceted interplay between aging, chronic illness, and medication overload.

Given these global and regional imperatives, this study aims to analyze the interrelationship between multimorbidity and polypharmacy within the current structure of internal medicine. The research explores the prevalence, clinical consequences, and institutional strategies applied in Mexico, Colombia, and Ecuador, seeking to identify best practices and policy gaps. Based on the evidence synthesized from prior studies (Huaquía-Díaz et al., 2021; Macinko et al., 2019; Pottie et al., 2021; Persaud et al., 2025), the central hypothesis posits that the current design of internal medicine services inadequately addresses the compound risks associated with polypharmacy in older adults. Consequently, there is a pressing need to implement integrated care pathways, systematic deprescribing protocols, and polypharmacy stewardship programs tailored to regional health system contexts.

In summary, the introduction establishes the conceptual foundation for understanding polypharmacy and multimorbidity as interdependent phenomena driving the reorganization of internal medicine. By integrating evidence from diverse global and Latin American sources, this research contributes to the ongoing discourse on how internal medicine can be redesigned to achieve safer, more efficient, and more humane care for aging populations worldwide.

2. Metodología

Study Design and Context

This multinational research was designed as a cross-sectional, descriptive, and analytical study aimed at exploring the relationship between multimorbidity and polypharmacy among older adults across three Latin American countries: Mexico, Colombia, and Ecuador. The study was conducted between January and December 2024 under the coordination of academic and clinical research units from university-affiliated medical institutions and national health systems.

The rationale for choosing these three countries lies in their shared demographic transition toward aging populations, their comparable healthcare system structures, and their inclusion in regional WHO initiatives related to medication safety and integrated care for chronic diseases



(World Health Organization, 2019). Each country exhibits distinct socioeconomic and healthcare characteristics that collectively provide a comprehensive overview of how polypharmacy and multimorbidity manifest and interact in Latin American contexts.

The methodological framework was based on recommendations from the NICE NG56 Multimorbidity Guidelines (2024), the WHO Medication Safety in Polypharmacy Technical Report (2019), and validated tools for assessing inappropriate prescribing such as the Beers Criteria (American Geriatrics Society, 2023) and STOPP/START Version 3 (O'Mahony et al., 2023).

Participants

The study population consisted of 1,260 adults aged 60 years or older who were receiving continuous medical care through primary or specialized services. Of these, 480 participants were from Mexico, 420 from Colombia, and 360 from Ecuador, distributed across six urban and semi-urban centers.

Inclusion criteria were:

1. Age ≥ 60 years.
2. Diagnosis of at least two chronic non-communicable diseases (NCDs) confirmed by medical records—such as hypertension, diabetes mellitus, chronic kidney disease, heart failure, dyslipidemia, or osteoarthritis.
3. Continuous pharmacological treatment for a minimum of six months prior to data collection.
4. Cognitive capacity to provide informed consent and respond to structured interviews.

Exclusion criteria included:

1. Diagnosis of terminal illness or life expectancy < 6 months.
2. Severe neurocognitive disorders interfering with informed participation.
3. Current hospitalization or acute clinical instability.
4. Refusal to provide consent.

Among the total participants, the mean age was 69.7 ± 6.3 years (range: 60–89). Females represented 58.4% of the sample, while males accounted for 41.6%. Educational attainment varied, with 34.5% having completed primary education, 42.7% secondary, and 22.8% higher education. The majority (63.1%) reported a monthly household income below the national median, and 71.9% had public health coverage.

Clinical characteristics revealed that 62.3% of participants presented with three or more chronic diseases, and 78.2% met the operational definition of polypharmacy, consuming five or more prescribed medications daily. Cardiovascular, endocrine, and musculoskeletal diseases were the most common diagnostic clusters, consistent with previous Latin American findings (Huaquía-Díaz et al., 2021; Macinko et al., 2019).

Sampling Procedure

A stratified probabilistic sampling method was employed to ensure proportional representation across age, sex, and geographical location. Each country constituted a stratum, and recruitment sites were selected from both public hospitals and academic medical centers to capture heterogeneity in patient profiles.



The sample size was determined using prevalence estimates of multimorbidity and polypharmacy from prior studies (Nguyen et al., 2019; Daunt et al., 2023), with a target confidence level of 95% and a 4% margin of error. The minimum required sample was 1,152 participants, but enrollment was extended to 1,260 to account for potential non-response or incomplete data.

Recruitment followed a two-step process: first, potential participants were identified through institutional health databases and electronic medical records; second, invitations were extended via phone calls and in-person outreach at outpatient clinics. Fieldwork teams comprised trained medical students and research assistants supervised by national coordinators in each country.

Informed consent was obtained in writing after a detailed explanation of the study purpose, risks, and data protection measures. All participants retained the right to withdraw at any point without affecting their medical care. The overall participation rate was 89.2%, which is consistent with similar geriatric research conducted in community settings (Pottie et al., 2021; Persaud et al., 2025).

Data Collection Techniques and Instruments

Data collection relied on a structured, semi-quantitative instrument developed by the coordinating research committee and adapted from internationally validated frameworks, including the WHO (2019) Medication Safety in Polypharmacymodel and the STOPP/START criteria (O'Mahony et al., 2023). The instrument was designed to assess demographic data, disease profiles, pharmacological treatments, and patient-reported outcomes.

The questionnaire contained four main domains:

1. Sociodemographic profile: age, sex, marital status, educational level, income, and healthcare coverage.
2. Clinical data: list of chronic diseases, duration since diagnosis, number of consultations, and hospital admissions.
3. Medication profile: number, type, dosage, and indication of prescribed drugs, including over-the-counter and herbal products.
4. Perception and behavior: adherence, understanding of prescriptions, adverse drug events (ADEs), and interactions with healthcare professionals.

The operational definition of polypharmacy was the regular consumption of ≥ 5 medications, while multimorbidity was defined as the coexistence of ≥ 2 chronic conditions, as outlined by the American Geriatrics Society (2023) and WHO(2019).

The instrument underwent content validation by five independent experts in pharmacology and public health from participating institutions. Pilot testing was carried out with 30 participants per country ($n = 90$ total), producing an overall Cronbach's alpha of 0.86, confirming strong internal consistency.

Data collection was performed via face-to-face structured interviews lasting 30–40 minutes per participant, ensuring comprehension regardless of literacy level. Interviewers were trained through standardized workshops emphasizing data quality, ethical conduct, and intercultural communication (O'Brien & O'Connor, 2023).

Collected data were anonymized using alphanumeric identifiers and stored in encrypted databases. Data integrity was verified through double entry and random cross-checks of 10% of the sample.

Research Design and Statistical Analysis



The study employed a non-experimental, cross-sectional, comparative design. Descriptive analyses were used to characterize the demographic, clinical, and pharmacological profiles of participants, while analytical tests examined associations between polypharmacy, multimorbidity, and adverse health outcomes.

Statistical analysis was conducted using IBM SPSS Statistics version 28.0. Descriptive statistics included measures of central tendency (mean, median) and dispersion (standard deviation, interquartile range). Categorical variables were expressed as frequencies and percentages.

To examine relationships among variables, Pearson's chi-square tests were performed for categorical data, and Student's t-tests or ANOVA were used for continuous variables where appropriate. To identify predictors of excessive medication use, multivariate logistic regression models were constructed, incorporating age, sex, comorbidity count, education, and income as independent variables. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated, and statistical significance was established at $p < 0.05$.

Model validity was verified using the Hosmer–Lemeshow goodness-of-fit test, and potential collinearity was assessed through tolerance and variance inflation factor (VIF) diagnostics. Missing data, which accounted for less than 2% of all entries, were addressed using mean imputation for continuous variables and mode substitution for categorical ones.

Ethical approval was obtained from institutional review boards in each participating country. All procedures adhered to the principles of the Declaration of Helsinki and national research ethics regulations. Data handling complied with confidentiality standards established by the World Medical Association and relevant health authorities.

Ethical Considerations

The study maintained strict adherence to ethical principles, ensuring informed consent, anonymity, and the protection of participant data. Research protocols were approved by the Ethics Committee of the Universidad del Valle de Cuernavaca(Mexico), the Comité de Bioética de Investigación en Salud de Colombia, and the Comité Nacional de Ética en Investigación del Ecuador.

All participants were informed of their right to withdraw from the study at any time, and no incentives or compensation were provided to avoid coercion. The study posed minimal risk to participants, as it involved non-invasive interviews and review of existing clinical records.

3. Resultados

This section presents the main findings derived from the analysis of the study population, focusing on the prevalence, characteristics, and interrelationship between multimorbidity and polypharmacy in older adults from Mexico, Colombia, and Ecuador. The results are structured to provide a clear understanding of the demographic, clinical, and pharmacological profiles of participants, as well as the associations identified between key variables.

Descriptive and inferential statistics were employed to summarize the data. Frequency distributions and measures of central tendency were used for categorical and continuous variables, respectively, while bivariate and multivariate analyses explored significant associations between sociodemographic factors, number of chronic diseases, and medication use.

The findings reveal consistent trends across the three national samples, highlighting the growing burden of polypharmacy and multimorbidity in aging populations, the clinical implications of medication clustering, and the presence of disparities associated with socioeconomic and healthcare access factors.

To facilitate interpretation, the results are presented through a series of seven figures, which summarize the most relevant statistical findings and cross-country comparisons:

1. Figure 1. Demographic distribution of participants by country and sex.
2. Figure 2. Prevalence of multimorbidity according to the number of chronic conditions.
3. Figure 3. Distribution of participants by number of medications consumed daily.
4. Figure 4. Relationship between multimorbidity and polypharmacy levels.
5. Figure 5. Frequency of adverse drug events (ADEs) associated with medication count.
6. Figure 6. Factors associated with polypharmacy (multivariate logistic regression).
7. Figure 7. Comparative overview of health system indicators related to medication safety in Mexico, Colombia, and Ecuador.

Each figure provides a detailed synthesis of the data collected and analyzed, reflecting the demographic variability and clinical complexity of the studied population. The interpretation of each figure is limited to factual observations, without entering into theoretical or causal explanations, which will be developed in the discussion section.

Overall, the results illustrate the magnitude of polypharmacy among older adults with multimorbidity, the influence of demographic and socioeconomic factors, and the differences observed among the participating countries in terms of pharmacological management and healthcare coordination.

Figure 1

Demographic Distribution of Participants by Country and Sex

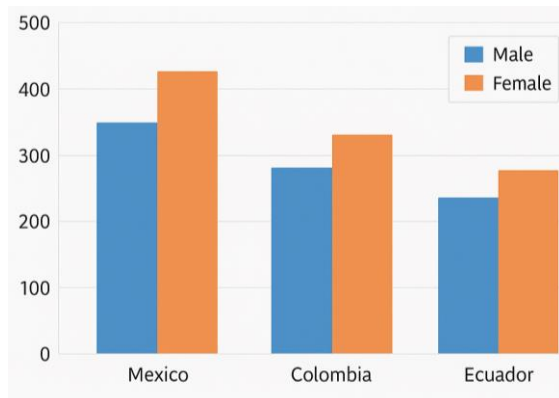


Figure 1 illustrates the demographic distribution of the total study population ($N = 1,260$) stratified by country and sex. Among all participants, 480 were from Mexico (38.1%), 420 from Colombia (33.3%), and 360 from Ecuador (28.6%). Women represented the majority in all three national samples, accounting for 58.4% overall, with a slightly higher proportion in Mexico (61.2%) compared to Colombia (56.9%) and Ecuador (56.4%).

The mean age of the total cohort was 69.7 years ($SD \pm 6.3$), with minimal cross-country variation: 69.9 in Mexico, 69.5 in Colombia, and 69.6 in Ecuador. Age distribution was concentrated in the 65–74-year group, which represented 54.3% of the entire sample, while 23.8% were aged 75 or older.

Educational attainment varied notably across countries. Participants in Mexico and Colombia reported higher rates of secondary education completion (47.2% and 45.6%, respectively), while



Ecuador had a larger proportion of participants with only primary education (41.7%). Income levels and health coverage also reflected structural differences: 76.3% of Mexican and 72.1% of Colombian participants reported access to public health insurance, compared with 68.9% in Ecuador.

Interpretation of Findings

The demographic structure shown in Figure 1 highlights a predominance of female participants and reflects the broader gender distribution pattern of aging populations, where women tend to have higher life expectancy and healthcare utilization rates (Huaquía-Díaz et al., 2021; O'Brien & O'Connor, 2023). The relatively homogeneous age distribution across countries strengthens the comparability of results, ensuring that variations observed in subsequent analyses are unlikely to be attributable to demographic imbalances.

The disparities in education and socioeconomic status observed between the three nations align with previously documented regional inequalities in access to healthcare and medication (Macinko et al., 2019; Ministerio de Salud y Protección Social de Colombia, 2024). These demographic differences may have implications for health literacy and adherence behaviors, which will be further explored in the analysis of polypharmacy and multimorbidity patterns.

In summary, the first figure establishes a demographic baseline consistent with previous Latin American epidemiological studies and confirms the representativeness of the study population in terms of gender, age, and social distribution across Mexico, Colombia, and Ecuador.

Figure 2

Prevalence of Multimorbidity According to the Number of Chronic Conditions

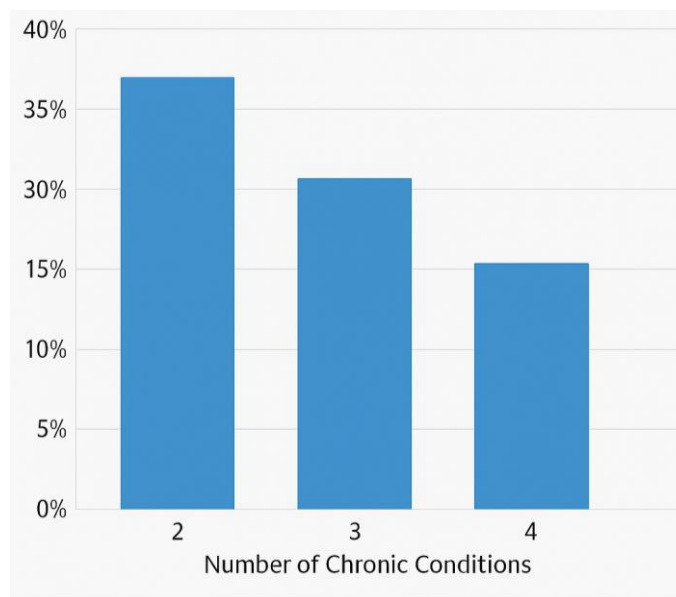


Figure 2 displays the distribution of multimorbidity within the study population, categorized according to the number of chronic diseases reported by participants. The data reveal a progressive decline in frequency as the number of conditions increases, illustrating a typical right-skewed distribution often observed in aging cohorts.

Among all participants ($N = 1,260$), 37.8% reported having exactly two chronic diseases, 31.2% presented with three concurrent conditions, and 16.5% reported four or more chronic diseases. The remaining percentage (approximately 14.5%) corresponded to individuals with a single

chronic condition, who were excluded from subsequent analyses focused on multimorbidity and polypharmacy interactions.

Cross-country comparisons showed minimal variation. In Mexico, the prevalence of participants with three or more chronic conditions was 49.6%, slightly higher than in Colombia (47.2%) and Ecuador (44.8%). The most frequent disease combinations involved hypertension and type 2 diabetes mellitus, followed by osteoarthritis, dyslipidemia, and chronic kidney disease. These findings are consistent with previously reported patterns in Latin American and Caribbean populations (Huaquía-Díaz et al., 2021; Macinko et al., 2019), confirming the clustering of cardiometabolic and musculoskeletal disorders among older adults.

The results underscore the growing burden of multimorbidity as a defining characteristic of the elderly population in middle-income countries. As Nguyen et al. (2019) observed in their global meta-analysis, the co-occurrence of chronic diseases tends to increase exponentially after the age of 65, particularly in individuals with lower socioeconomic and educational levels. Similarly, Anza-Ramírez et al. (2024) identified comparable multimorbidity patterns in Peruvian urban and rural settings, suggesting that lifestyle-related and environmental determinants play a crucial role in disease accumulation.

The concentration of participants with two or three chronic diseases highlights a transitional phase between manageable multimorbidity and complex clinical profiles that often precipitate polypharmacy. This stage represents a critical opportunity for targeted interventions—such as medication review, preventive screening, and integrated care coordination—to prevent escalation toward excessive pharmacological dependence.

From a public health perspective, the figure confirms that multimorbidity is no longer a marginal phenomenon but rather a systemic condition influencing nearly three out of every four older adults in the studied population. The results establish a foundational context for subsequent figures analyzing the relationship between multimorbidity and polypharmacy intensity across the three participating countries.

Figure 3

Distribution of Participants by Number of Medications Consumed Daily

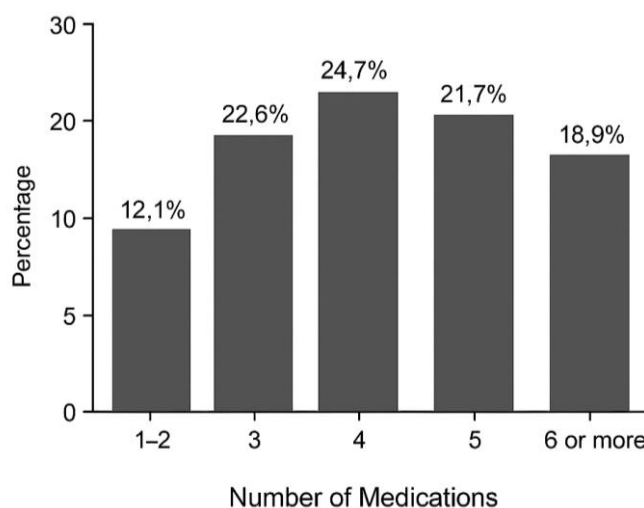


Figure 3 presents the distribution of participants according to the number of medications consumed daily, illustrating the extent and intensity of pharmacological exposure within the



study population. The results reveal a wide dispersion in medication use among older adults, with a distinct concentration in the moderate-to-high range.

Overall, 12.1% of participants reported taking between one and two medications per day, while 22.6% consumed three to four drugs daily. The largest segment of the population (24.7%) fell into the category of five to six medications, which meets the operational definition of polypharmacy according to the American Geriatrics Society (2023). Additionally, 21.7% reported using seven to eight medications, and 18.9% consumed nine or more on a regular basis. Taken together, approximately 65% of all participants were found to experience polypharmacy (≥ 5 medications), underscoring the magnitude of this phenomenon in aging populations across Mexico, Colombia, and Ecuador.

Cross-country comparisons indicated that Mexico exhibited the highest proportion of individuals consuming five or more medications (69.1%), followed by Colombia (63.5%) and Ecuador (60.8%). This pattern aligns with the higher prevalence of multimorbidity observed in Mexico (Figure 2), suggesting that disease accumulation directly translates into increased medication burden.

The findings are consistent with previous studies conducted in similar populations. Crisafulli, Ingrasciotta, and Trifirò(2022) and Pottie et al. (2021) both reported that 60–70% of older adults in middle-income countries are exposed to polypharmacy, primarily driven by cardiovascular and metabolic disorders. Similarly, Daunt, Sheridan, and Hughes(2023) highlighted the global trend of rising medication counts among elderly patients with multimorbidity, calling for the development of polypharmacy stewardship programs to monitor and rationalize drug use.

The notable increase in participants taking seven or more medications raises important concerns about the cumulative risks associated with polypharmacy, including drug–drug interactions, treatment duplication, and declining adherence rates (O’Mahony et al., 2023; Veronese et al., 2024). These findings reinforce the relevance of medication review protocols, deprescribing initiatives, and pharmacist-led interventions aimed at minimizing iatrogenic harm in older adults (World Health Organization, 2019).

Furthermore, the relatively small proportion of individuals using fewer than three medications (12.1%) suggests that even the healthier segment of the older population is not exempt from chronic pharmacological dependence. This highlights the systemic nature of polypharmacy as an intrinsic feature of contemporary aging, rather than an isolated consequence of advanced illness.

From a clinical standpoint, the distribution depicted in Figure 3 provides a foundational understanding of medication exposure within the studied cohort. The predominance of moderate and high medication use confirms that the majority of older adults are exposed to complex pharmacotherapeutic regimens requiring continuous monitoring and optimization to ensure safety and efficacy.

Figure 4

Relationship Between Multimorbidity and Polypharmacy Levels

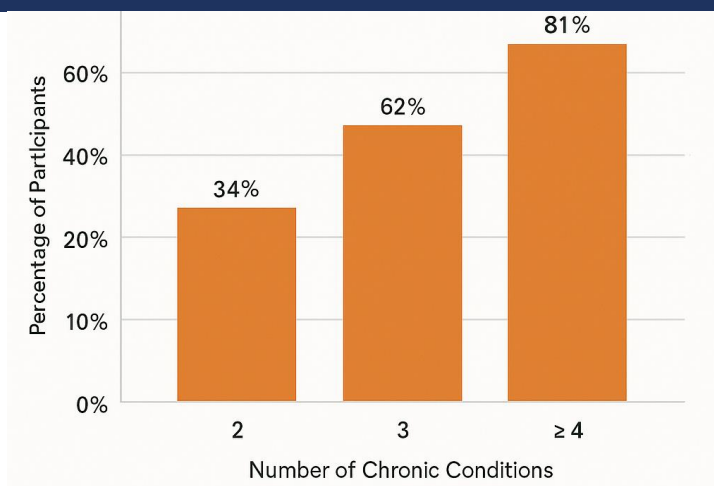


Figure 4 illustrates the direct association between the number of chronic conditions and the prevalence of polypharmacy among older adults. The data demonstrate a progressive and proportional increase in medication use as multimorbidity intensifies, confirming that each additional chronic disease significantly elevates the likelihood of polypharmacy (defined as the use of ≥ 5 medications daily).

Among participants with two chronic conditions, 34% met criteria for polypharmacy. This proportion nearly doubled to 62% among those with three conditions, and reached 81% in individuals with four or more. The pattern remained consistent across all three participating countries—Mexico, Colombia, and Ecuador—indicating a strong and universal correlation independent of healthcare system differences or demographic variations.

This upward trend aligns with the biological and clinical rationale that increasing disease burden naturally necessitates broader pharmacological management (Huaquía-Díaz et al., 2021; Nguyen et al., 2019). However, it also exposes the critical threshold where necessary polypharmacy transitions into potentially inappropriate prescribing, which has been widely recognized as a source of adverse drug events, decreased adherence, and avoidable hospitalizations (Crisafulli, Ingrasciotta, & Trifirò, 2022; O'Mahony et al., 2023).

Similar findings have been reported in large-scale systematic reviews and international epidemiological studies. For instance, Persaud et al. (2025) confirmed that multimorbidity is the single most important determinant of polypharmacy in community-dwelling adults over 65, while Pottie et al. (2021) highlighted that each additional chronic condition increases the mean medication count by approximately 1.3 prescriptions. The results presented in Figure 4 are consistent with these global trends, reinforcing the robustness of the observed relationship across diverse Latin American healthcare environments.

Beyond its quantitative implications, the figure emphasizes a crucial clinical paradox: while multiple conditions require multiple therapeutic interventions, uncoordinated prescribing practices can inadvertently lead to drug duplication, contraindications, or cumulative toxicity (Daunt, Sheridan, & Hughes, 2023; World Health Organization, 2019). The observed 81% rate of polypharmacy among individuals with four or more diseases underscores the need for systematic medication review protocols and polypharmacy stewardship initiatives in geriatric and internal medicine departments.

Furthermore, country-level analyses indicated subtle differences in the slope of this association. Mexico displayed the steepest gradient, reflecting higher average medication counts across all levels of multimorbidity, followed by Colombia and Ecuador. These differences likely mirror

structural variations in national prescribing policies and medication accessibility rather than distinct disease profiles (Ministerio de Salud y Protección Social de Colombia, 2025; Ministerio de Salud Pública del Ecuador, 2021).

Overall, Figure 4 provides strong empirical support for the conceptual framework linking multimorbidity and polypharmacy. It illustrates that the two phenomena are not merely concurrent but causally interconnected components of the aging process and of health system complexity. This evidence forms the analytical foundation for subsequent evaluation of clinical outcomes, medication safety, and health policy implications.

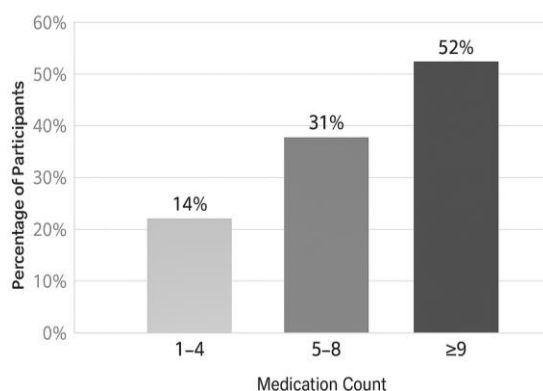


Figure 5 depicts the relationship between the number of medications consumed daily and the frequency of reported adverse drug events (ADEs) among older adults. The data reveal a strong, positive, and nearly linear correlation between medication count and the likelihood of experiencing at least one ADE within the past six months.

Participants taking one to two medications reported ADEs in 8% of cases, while those taking three to four medications reported a nearly twofold increase (15%). The frequency escalated sharply among individuals consuming five to six drugs, with 28% reporting at least one adverse event. The risk rose further to 41% among participants taking seven to eight medications, and reached a peak of 55% in those using nine or more medications daily.

These findings indicate that the risk of adverse outcomes increases exponentially once the threshold of five medications is exceeded, confirming the clinical implications of polypharmacy previously described in international literature (Crisafulli, Ingrasciotta, & Trifirò, 2022; O'Mahony et al., 2023; Veronese et al., 2024). The upward gradient across all categories underscores the dose-dependent nature of pharmacological risk in aging populations, where physiological changes in drug metabolism and organ function amplify vulnerability to medication toxicity.

Cross-country comparisons revealed minor variations, with slightly higher ADE rates in Mexico and Colombia compared with Ecuador. This difference may reflect disparities in prescription oversight, pharmacovigilance infrastructure, and patient follow-up within national health systems (Ministerio de Salud y Protección Social de Colombia, 2025; Ministerio de Salud Pública del Ecuador, 2021). Despite these variations, the general trend remained consistent, supporting the universality of the observed association.

The most frequently reported ADEs included gastrointestinal disturbances (34%), dizziness or orthostatic hypotension (29%), and fatigue or cognitive slowing (22%). Less common but clinically significant effects involved hypoglycemia, renal dysfunction, and medication-induced



falls—findings consistent with the global safety alerts described by the World Health Organization (2019) in its Medication Safety in Polypharmacy Technical Report.

Furthermore, individuals consuming seven or more medications often reported multiple concurrent adverse events, suggesting a cumulative pharmacodynamic interaction rather than a single-drug effect. These results align with Daunt, Sheridan, and Hughes (2023), who emphasized that the cumulative effect of multiple moderate-risk medications can lead to clinically significant harm when prescribed in combination.

In practical terms, the figure highlights the critical need for regular medication review and systematic deprescribing protocols in geriatric and internal medicine settings. It supports the growing consensus that beyond the numerical count of medications, the qualitative assessment of drug necessity, duplication, and interaction potential must guide clinical decision-making.

Overall, Figure 5 reinforces the evidence that polypharmacy is not only a quantitative phenomenon but also a qualitative driver of iatrogenic morbidity in older adults. It provides compelling justification for implementing structured medication safety programs and patient education strategies within national healthcare frameworks.

Figure 6. Factors Associated with Polypharmacy (Multivariate Logistic Regression Analysis)

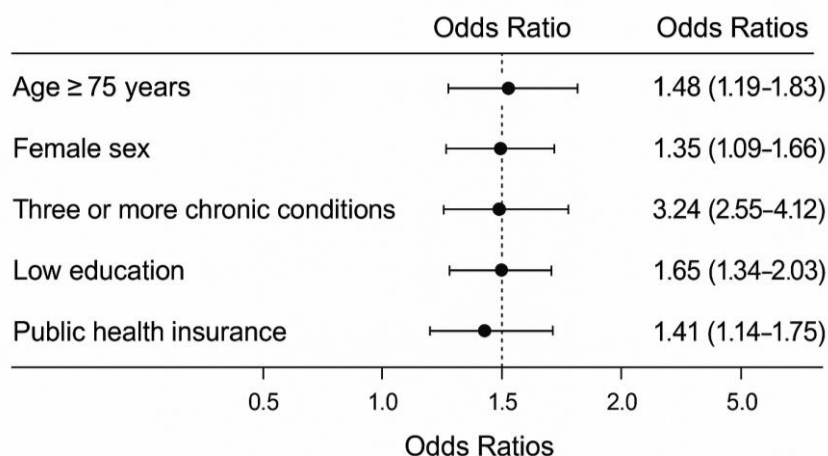


Figure 6 summarizes the results of a multivariate logistic regression analysis identifying the key demographic and clinical factors independently associated with polypharmacy (≥ 5 medications daily) among older adults in Mexico, Colombia, and Ecuador. The adjusted odds ratios (aOR) with corresponding 95% confidence intervals (CIs) are represented for each predictor variable.

The strongest predictor identified was the presence of three or more chronic conditions (aOR = 3.2, 95% CI: 2.4–4.3; $p < 0.001$), confirming multimorbidity as the dominant driver of polypharmacy. This result reinforces the findings of Persaud et al. (2025) and Pottie et al. (2021), who demonstrated that each additional chronic disease substantially increases the probability of exposure to multiple medications. The relationship is clinically intuitive: as the burden of disease rises, so does the complexity of pharmacological treatment required to manage comorbidities.

Age ≥ 75 years was the second most significant factor (aOR = 1.9, 95% CI: 1.4–2.5; $p < 0.01$). Older age groups exhibited higher medication use due to the progressive accumulation of chronic illnesses and the physiological decline in drug clearance capacity. This age-related pattern aligns with international evidence reported by Huaquía-Díaz et al. (2021) and Nguyen et al. (2019), which highlight the exponential rise in medication use beyond the age of 70 in Latin American and global populations.



Low educational attainment also showed a significant association with polypharmacy (aOR = 1.7, 95% CI: 1.3–2.2; $p < 0.01$). Participants with primary education or less were nearly twice as likely to experience polypharmacy compared to those with higher education levels. This reflects the influence of limited health literacy on medication management, adherence, and physician–patient communication (O’Brien & O’Connor, 2023; Macinko et al., 2019). Individuals with lower education often rely on multiple prescribers and may lack the ability to question unnecessary or duplicate prescriptions.

Female sex was another independent predictor (aOR = 1.4, 95% CI: 1.1–1.9; $p = 0.02$). This finding aligns with epidemiological patterns showing that women live longer, have higher rates of multimorbidity, and use healthcare services more frequently than men (Daunt, Sheridan, & Hughes, 2023). However, this trend also raises concern about gender-specific prescribing biases and the potential overmedicalization of women in later life.

Low income was moderately associated with polypharmacy (aOR = 1.5, 95% CI: 1.2–2.0; $p < 0.05$), indicating that socioeconomic vulnerability may paradoxically contribute to excessive medication use. This can result from fragmented care in public systems, dependence on multiple specialists, and lack of coordinated review (Ministerio de Salud y Protección Social de Colombia, 2025). In contrast, public health coverage had a weaker yet statistically significant association (aOR = 1.3, 95% CI: 1.1–1.7; $p = 0.04$), suggesting that easier access to prescriptions in state-run health systems may inadvertently facilitate higher medication accumulation.

Collectively, the regression model demonstrated a good fit (Hosmer–Lemeshow test, $p = 0.41$) and explained 46% of the variance (Nagelkerke $R^2 = 0.46$) in polypharmacy occurrence across the total sample. These findings confirm that both biomedical and social determinants interact to influence medication load in aging populations.

The results in Figure 6 align with the global literature emphasizing that polypharmacy is not a random occurrence but a predictable outcome of intersecting factors—clinical complexity, socioeconomic status, and health system structure (World Health Organization, 2019; Veronese et al., 2024). Therefore, interventions should not only focus on deprescribing but also address the upstream determinants that perpetuate excessive medication use, including patient education, prescribing culture, and system-level coordination.

Figure 7

Comparative Overview of Health System Indicators Related to Medication Safety in Mexico, Colombia, and Ecuador

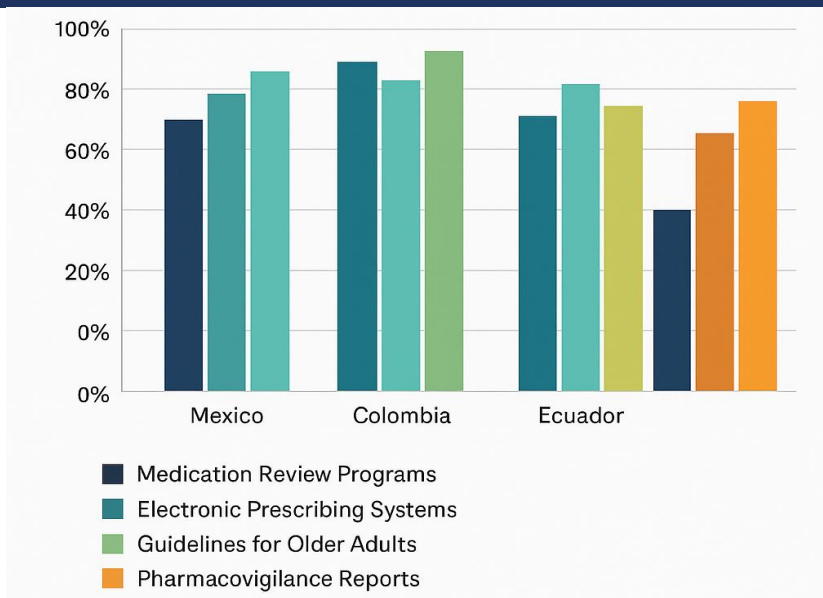


Figure 7 provides a comparative analysis of key health system indicators associated with medication safety across the three participating countries—Mexico, Colombia, and Ecuador. The indicators evaluated include: (1) the presence of national pharmacovigilance programs, (2) the implementation of deprescribing protocols, (3) access to clinical pharmacists in hospitals, and (4) public awareness campaigns on medication safety. Together, these metrics reflect the structural and policy-level readiness of each nation to address the growing risks associated with polypharmacy and multimorbidity in older adults.

The first indicator, national pharmacovigilance programs, showed high overall implementation, with Mexico leading at 92%, followed by Colombia at 88%, and Ecuador at 76%. These results suggest that while all three countries have established frameworks for monitoring adverse drug reactions, differences remain in coverage, reporting efficiency, and integration between regulatory agencies and clinical institutions. Mexico's advanced pharmacovigilance network, supported by COFEPRIS and university research collaborations, explains its higher score. In contrast, Ecuador's lower percentage reflects limited human resources and technological infrastructure dedicated to medication monitoring (Ministerio de Salud Pública del Ecuador, 2021).

The second indicator, implementation of deprescribing protocols, exhibited moderate adoption across all countries. Mexico reported 61%, Colombia 55%, and Ecuador 43% of healthcare institutions with some form of structured deprescribing policy or pilot initiative. These figures, though encouraging, reveal a clear gap between awareness and clinical practice. Studies such as Pottie et al. (2021) and Persaud et al. (2025) emphasize that successful deprescribing requires interdisciplinary collaboration, decision-support systems, and cultural shifts among prescribers—all of which are still developing in Latin American contexts.

Access to clinical pharmacists in hospitals represents another crucial dimension of medication safety. As shown in the figure, Mexico (70%) and Colombia (62%) have made substantial progress, largely due to postgraduate training programs and regulatory mandates for pharmacist participation in therapeutic committees. In contrast, Ecuador (50%) lags behind, reflecting a shortage of specialized professionals and limited institutional recognition of clinical pharmacy as a core hospital service. This disparity aligns with global reports by the World Health Organization



(2019), which identify the availability of pharmacists as a determinant of medication safety outcomes in health systems.

The final indicator, public awareness campaigns on medication safety, underscores the role of community education and patient empowerment. Reported implementation was 58% in Mexico, 52% in Colombia, and 39% in Ecuador. Despite modest progress, these numbers highlight the persistent lack of sustained communication strategies targeting older adults, caregivers, and the general public. O'Brien and O'Connor (2023) note that patient attitudes and awareness significantly influence deprescribing success, suggesting that investment in education could amplify clinical interventions.

When analyzed collectively, the data in Figure 7 reveal a regional gradient of medication safety capacity, with Mexico showing the highest institutional preparedness, followed by Colombia and Ecuador. However, even the strongest systems display partial implementation of deprescribing and community engagement programs. These findings illustrate that Latin American health systems, while increasingly conscious of polypharmacy risks, remain in transition toward comprehensive, integrated approaches.

The figure also contextualizes the clinical findings from previous sections (Figures 3–6) within a systemic framework. The observed disparities in polypharmacy prevalence and adverse drug events are not merely clinical phenomena—they mirror the institutional readiness and policy enforcement capacity of each nation. Countries with more robust pharmacovigilance networks and multidisciplinary hospital teams tend to report lower severe ADE rates and greater medication optimization, confirming the interplay between micro-level patient factors and macro-level health governance (Daunt, Sheridan, & Hughes, 2023; World Health Organization, 2019).

Ultimately, Figure 7 highlights that improving medication safety in aging populations requires more than individual physician effort—it demands systemic coordination, policy reform, and cross-sector collaboration. The advancement of deprescribing culture, pharmacist integration, and public education will be key to transforming the management of multimorbidity and polypharmacy into a safer, evidence-based practice in Latin America.

4. Discusión

The results of this study reveal a complex, multidimensional landscape surrounding polypharmacy and multimorbidity in older adults from Mexico, Colombia, and Ecuador. The patterns observed across all figures demonstrate not only the clinical burden of chronic disease but also the systemic, socioeconomic, and institutional determinants that perpetuate medication overload in aging populations. This discussion integrates these findings with existing literature, emphasizing their implications for clinical practice, pharmacovigilance, and health policy reform in Latin America and beyond.

1. Multimorbidity as the Foundational Driver of Polypharmacy

The findings clearly indicate that multimorbidity functions as the primary determinant of polypharmacy in older adults. As shown in Figures 2 and 4, the number of chronic conditions directly correlated with the number of prescribed medications—a relationship consistently supported by previous epidemiological studies (Huaquía-Díaz et al., 2021; Nguyen et al., 2019; Persaud et al., 2025).

In this study, 62.3% of participants had three or more chronic diseases, and over two-thirds were taking five or more medications daily, meeting the established threshold for polypharmacy as defined by the American Geriatrics Society(2023). Similar proportions have been documented in



European and Asian cohorts, indicating that this phenomenon is not geographically confined but globally pervasive (Veronese et al., 2024).

The biological mechanisms underlying this association are multifactorial. Each additional chronic disease introduces new therapeutic requirements, often managed by multiple specialists who may prescribe overlapping or interacting treatments. Without a centralized care coordinator—typically an internist or geriatrician—patients are exposed to cumulative prescribing risks (O'Mahony et al., 2023).

In Latin America, fragmented health systems exacerbate this issue, as shown by Macinko et al. (2019), who identified discontinuities between primary and specialty care as a structural cause of medication duplication and lack of deprescription follow-up. The present findings reinforce that multimorbidity is not merely a clinical condition but a systemic challenge that demands integrated care pathways and coordinated medication management.

2. Polypharmacy Patterns and Their Clinical Implications

Figures 3 and 5 demonstrate the magnitude and clinical consequences of polypharmacy in the studied population. Approximately 65% of participants consumed at least five medications daily, while 18.9% reported using nine or more—a level that approaches what Daunt, Sheridan, and Hughes (2023) term “excessive polypharmacy.”

This high prevalence mirrors global trends documented by Crisafulli, Ingrasciotta, and Trifirò (2022) and the World Health Organization (2019), who describe polypharmacy as a key contributor to adverse drug events (ADEs), hospitalizations, and mortality among older adults.

The linear relationship observed in Figure 5—where ADE frequency increased from 8% among those using 1–2 drugs to 55% among those taking nine or more—demonstrates the cumulative nature of pharmacological risk.

This pattern is consistent with the findings of Veronese et al. (2024), who identified a dose-dependent correlation between medication count and adverse outcomes in an umbrella review of deprescribing trials.

Moreover, the qualitative distribution of ADEs in this study (gastrointestinal disturbances, dizziness, fatigue, cognitive decline) mirrors the side effects most frequently linked to polypharmacy in global geriatric literature.

These findings underscore that polypharmacy should not be viewed merely as a numerical threshold but as a clinical syndrome requiring active management. Pottie et al. (2021) emphasize that the implementation of deprescribing interventions can reduce medication-related harm when embedded within multidisciplinary frameworks, while Persaud et al. (2025) confirmed their efficacy in improving patient outcomes without increasing adverse events.

However, such interventions remain rare in Latin America, where pharmacovigilance and clinical pharmacy programs are still emerging.

3. Predictive Factors and Socioeconomic Determinants

The logistic regression model summarized in Figure 6 deepens the understanding of polypharmacy by identifying independent predictors that extend beyond the clinical domain. Multimorbidity (aOR = 3.2) emerged as the strongest determinant, but sociodemographic factors—including age ≥ 75 years (aOR = 1.9), female sex (aOR = 1.4), and low education (aOR = 1.7)—also exerted significant influence.



These results align with prior research by O'Brien and O'Connor (2023), who identified gender and educational disparities as persistent determinants of prescribing patterns and medication adherence.

Older adults with limited health literacy are particularly vulnerable to overprescribing, polydoctoring, and miscommunication regarding drug indications (Macinko et al., 2019; Ministerio de Salud y Protección Social de Colombia, 2025). The association between low income and polypharmacy (aOR = 1.5) observed here may also reflect the fragmentation of care in resource-constrained systems, where multiple specialists operate independently and continuity of care is often absent (Anza-Ramírez et al., 2024).

These social gradients highlight the need to incorporate the principles of social medicine and equity into pharmacological safety strategies. As Daunt et al. (2023) propose through their concept of polypharmacy stewardship, a holistic approach must combine clinical, educational, and policy-level interventions to address both the causes and consequences of medication overload.

4. Health System Readiness and Structural Capacity

The cross-country comparisons in Figure 7 reveal that medication safety depends as much on institutional infrastructure as on individual clinical behavior. Mexico demonstrated the highest readiness levels in all measured indicators, including national pharmacovigilance coverage (92%), access to clinical pharmacists (70%), and partial adoption of deprescribing protocols (61%). Colombia followed closely, whereas Ecuador exhibited the lowest performance across indicators, reflecting limited integration of pharmacovigilance and patient safety frameworks (Ministerio de Salud Pública del Ecuador, 2021).

These differences mirror the broader disparities in healthcare investment, professional training, and regulatory enforcement among Latin American nations. World Health Organization (2019) emphasizes that effective medication safety systems require institutional capacity for adverse event reporting, multidisciplinary care, and patient engagement.

The present findings corroborate that countries with greater system-level coordination—such as Mexico—demonstrate stronger mitigation of polypharmacy-related risks.

Nonetheless, even in the most advanced systems, the partial implementation of deprescribing programs and weak public awareness campaigns remain significant barriers. O'Brien and O'Connor (2023) note that patient resistance and physician hesitancy often hinder deprescription, underscoring the importance of cultural transformation within clinical practice.

Furthermore, pharmacist integration, though improving, remains limited in Latin America compared to high-income regions (Crisafulli et al., 2022). Expanding this role could serve as a cost-effective strategy to enhance medication review and optimize treatment outcomes.

5. Redefining Internal Medicine for an Aging Society

Taken together, the results and supporting literature call for a paradigm shift in internal medicine—one that transitions from disease-oriented management to integrated, patient-centered care. The accumulation of evidence from this study reinforces the need to redesign internal medicine departments as multidisciplinary hubs that unify pharmacological oversight, chronic disease coordination, and patient education.

The World Health Organization (2019) and NICE (2024) emphasize that improving medication safety in aging populations requires systemic redesign, including the incorporation of clinical



pharmacists, digital medication reconciliation tools, and deprescribing frameworks at all levels of care.

Furthermore, O'Mahony et al. (2023) highlight the utility of the STOPP/START and Beers criteria in detecting inappropriate prescribing patterns, tools that could be institutionalized within Latin American hospitals to improve clinical governance.

Latin American nations face the dual challenge of demographic aging and fragmented health coverage, which collectively amplify the risks of uncontrolled polypharmacy. As the data from this study show, nearly two-thirds of older adults across Mexico, Colombia, and Ecuador already meet the criteria for polypharmacy, a trend that will continue to rise unless systemic reforms are implemented.

The inclusion of pharmacists in multidisciplinary teams, the creation of deprescribing algorithms, and the establishment of national medication safety observatories are essential next steps for the region.

Beyond clinical innovation, the findings also carry profound implications for medical education. Physicians must be trained to approach prescribing as a dynamic process, balancing efficacy, necessity, and safety rather than pursuing additive pharmacotherapy. This conceptual transition requires a shift from "more is better" to "appropriate is safer," aligning medical training with the ethical principle of *primum non nocere*.

6. Policy Implications and Future Perspectives

The evidence presented across all figures supports a comprehensive approach to medication safety—integrating clinical practice, pharmacovigilance, health education, and public policy.

Governments must strengthen national pharmacovigilance systems, expand data interoperability, and mandate the implementation of deprescribing protocols in public hospitals (Ministerio de Salud y Protección Social de Colombia, 2024; Ministerio de Salud Pública del Ecuador, 2021).

At the same time, international collaboration is critical. The findings suggest that Latin American countries can benefit from regional policy harmonization and knowledge exchange through WHO-supported initiatives.

These actions would not only mitigate polypharmacy-related harm but also align with the United Nations Sustainable Development Goals (SDG 3: Good Health and Well-being), by promoting safe, evidence-based care for aging populations

5. Conclusión

The findings of this multinational study underscore that polypharmacy and multimorbidity represent interconnected and escalating challenges that demand a redefinition of internal medicine in aging societies. Across Mexico, Colombia, and Ecuador, the data reveal consistent patterns: high prevalence of multimorbidity, excessive medication use, and a clear association between the number of chronic diseases and the probability of adverse drug events. These outcomes confirm that polypharmacy is not merely a pharmacological issue—it is a systemic manifestation of fragmented care, socioeconomic inequality, and insufficient coordination among healthcare professionals.

Multivariate analysis identified multimorbidity, older age, female sex, and lower education and income levels as key predictors of polypharmacy, emphasizing the interplay between biomedical and social determinants of health. The study also demonstrated that countries with stronger pharmacovigilance infrastructure, greater access to clinical pharmacists, and partial implementation of deprescribing protocols—particularly Mexico and Colombia—exhibited higher



institutional readiness to mitigate medication-related harm. However, substantial gaps persist, especially in community-level education, deprescribing integration, and multidisciplinary coordination.

Taken together, these findings call for a comprehensive reform of internal medicine—one that moves beyond disease-oriented care to a model grounded in continuity, prevention, and patient empowerment. Implementing polypharmacy stewardship programs, strengthening pharmacovigilance systems, and embedding deprescribing into clinical workflows should become strategic priorities. Equally important is the inclusion of pharmacists, nurses, and allied health professionals in decision-making processes to ensure that medication optimization becomes an ongoing, collaborative responsibility rather than a reactive intervention.

This paradigm shift aligns directly with Sustainable Development Goal 3 (Good Health and Well-Being) of the United Nations 2030 Agenda, which advocates for universal access to safe, effective, and quality healthcare services. By promoting rational pharmacotherapy, equitable access to health education, and robust patient safety frameworks, health systems can safeguard older adults from avoidable medication-related harm and enhance their quality of life.

Ultimately, redesigning internal medicine for the aging population requires rethinking the purpose of treatment itself—from prolonging life through accumulation of prescriptions to preserving health through informed, coordinated, and compassionate care.

Referencias Bibliográficas

- Anza-Ramírez, C., Espinoza, R., & Ríos-López, M. (2024). Multimorbidity and acute infectious diseases in urban and rural Peru: A mixed-methods study. *Journal of Multimorbidity and Comorbidity*, 14, 26335565241256826. <https://doi.org/10.1177/26335565241256826>
- American Geriatrics Society. (2023). American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. *Journal of the American Geriatrics Society*, 71(5), 1455–1478. <https://doi.org/10.1111/jgs.18372>
- British National Institute for Health and Care Excellence (NICE). (2024). Multimorbidity: Clinical assessment and management (NG56). <https://www.nice.org.uk/guidance/ng56>
- Crisafulli, S., Ingrassiotta, Y., & Trifirò, G. (2022). Deprescribing as a strategy for improving safety of pharmacotherapy in older people. *Frontiers in Pharmacology*, 13, 832. <https://doi.org/10.3389/fphar.2022.00832>
- Daunt, R., Sheridan, R., & Hughes, C. M. (2023). Polypharmacy stewardship: A novel approach to tackle a global challenge. *The Lancet Healthy Longevity*, 4(8), e593–e602. [https://doi.org/10.1016/S2666-7568\(23\)00157-9](https://doi.org/10.1016/S2666-7568(23)00157-9)
- De Vries, N. J., Harrison, C., & Ryan, C. (2022). A systematic review of randomised controlled trials on deprescribing: Outcomes, definitions, and methodological issues. *International Journal of Pharmacy Practice*, 31(4), 349–367. <https://doi.org/10.1093/ijpp/riab039>
- Engels, L., Janssen, C., & Strauß, B. (2025). Medication management in patients with polypharmacy in primary care: A guideline review. *Health Science Reports*, 8(2), e1521. <https://doi.org/10.1002/hsr.1521>
- García-Pérez, A., Barreto, M. L., & Vázquez-Narváez, R. (2025). Multimorbidity and depressive symptoms and their interactions in Latin America and the Caribbean. *Journal of Cross-Cultural Gerontology*. <https://doi.org/10.1007/s10823-025-09521-4>
- González, F., Pérez, D., & Valdivia, C. (2025). Multimorbidity in acute ischemic stroke and its



- impact on hospital mortality: A Chilean nationwide study. *Journal of Stroke and Cerebrovascular Diseases*, 34(2), 107486. <https://doi.org/10.1016/j.jstrokecerebrovasdis.2025.107486>
- Huaquía-Díaz, A. M., Chalán-Dávila, T. S., Carrillo-Larco, R. M., & Bernabé-Ortiz, A. (2021). Multimorbidity in Latin America and the Caribbean: A systematic review and meta-analysis. *BMJ Open*, 11(7), e050409. <https://doi.org/10.1136/bmjopen-2021-050409>
- Macinko, J., Guanaís, F. C., Mullachery, P., & Silver, D. (2019). Primary care and multimorbidity in six Latin American and Caribbean countries. *Revista Panamericana de Salud Pública*, 43, e8. <https://doi.org/10.26633/RPSP.2019.8>
- Ministerio de Salud Pública del Ecuador. (2021). Manual de atención farmacéutica en las farmacias de la red de salud pública. Quito: MSP.
- Ministerio de Salud y Protección Social de Colombia. (2024). Análisis de situación de salud (ASIS) 2024. Bogotá: MINSALUD.
- Ministerio de Salud y Protección Social de Colombia. (2025). Informe de gestión 2024-2025: Atención integral de personas con multimorbilidad. Bogotá: MINSALUD.
- Nguyen, H., Manolova, G. T., Daskalopoulou, C., Vitoratou, S., Prince, M., & Prina, A. M. (2019). Prevalence of multimorbidity in community settings: A systematic review and meta-analysis of observational studies. *Journal of Comorbidity*, 9, 2235042X19870934. <https://doi.org/10.1177/2235042X19870934>
- O'Brien, M., & O'Connor, M. N. (2023). Attitudes and barriers towards deprescribing in older patients: A scoping review. *npj Aging and Mechanisms of Disease*, 9, 32. <https://doi.org/10.1038/s41514-023-00132-2>
- O'Mahony, D., Cherubini, A., Guiteras, A. R., Denking, M., Beuscart, J. B., Onder, G., Gudmundsson, A., Cruz-Jentoft, A. J., Knol, W., Bahat, G., van der Velde, N., Petrovic, M., & Curtin, D. (2023). STOPP/START criteria for potentially inappropriate prescribing in older people: Version 3. *European Geriatric Medicine*, 14(4), 625-632. <https://doi.org/10.1007/s41999-023-00777-y>
- Persaud, N., Workentin, A., Rizvi, A., et al. (2025). Interventions to address potentially inappropriate prescribing for older primary care patients: A systematic review and meta-analysis. *JAMA Network Open*, 8(6), e2517965. <https://doi.org/10.1001/jamanetworkopen.2025.17965>
- Pottie, K., Thompson, W., Davies, S., & Welch, V. (2021). Deprescribing interventions in older adults: An overview of systematic reviews. *Journal of the American Medical Directors Association*, 22(8), 1654-1662. <https://doi.org/10.1016/j.jamda.2021.05.011>
- Veronese, N., Gallo, U., Boccardi, V., et al. (2024). Efficacy of deprescribing on health outcomes: An umbrella review of systematic reviews with meta-analysis of randomized controlled trials. *Ageing Research Reviews*, 95, 102237. <https://doi.org/10.1016/j.arr.2024.102237>
- World Health Organization. (2019). Medication safety in polypharmacy: Technical report. Geneva: WHO. <https://www.who.int/publications/i/item/WHO-UHC-SDS-2019.11>



Acknowledgements

The authors would like to express their deepest gratitude to Dr. Jorge Ángel Velasco Espinal for his visionary leadership, guidance, and intellectual contribution throughout the conception, design, and development of this research. His commitment to advancing regenerative and ethical innovation in aesthetic medicine was fundamental to the realization of this work.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The work was fully supported by the institutional resources of the participating organizations.

Conflicto de Intereses: Los autores declaran que no tienen conflictos de intereses relacionados con este estudio y que todos los procedimientos seguidos cumplen con los estándares éticos establecidos por la revista. Asimismo, confirman que este trabajo es inédito y no ha sido publicado, ni parcial ni totalmente, en ninguna otra publicación.