Cost-of-illness of Pneumonia, Bacteremia or Meningitis in Colombian Adults: A Retrospective Database Study, 2015 to 2022

RWD45

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OBJECTIVE

- To describe the direct medical cost of pneumonia, bacteremia, or meningitis in adult patients at a health maintenance organization (HMO) in Colombia.

METHODS

- This observational study included adult patients with available healthcare resource data available who were diagnosed, without a documented etiology, with pneumonia, bacteremia, or meningitis—conditions arranged using International Classification of Diseases 10th Edition (ICD-10) codes—that recieved care from the HMO services between 2015 and 2022.
- ICD-10 codes for pneumonia were J13 – J22; for bacteremia A39.4, A39.9, A40.3, A41.3, A41.5, A41.8, A41.9, A49.2, A49.8, A49.9, B95.3; and for meningitis G00, G03.9 and A39.0.
- Key comorbidities designations were based on Shea et al.[1], and CDC[2], included conditions such as, diabetes and chronic lung diseases to indicate that patients were higher at-risk for pneumonia, bacteremia, or meningitis.
- The study sourced from the electronic health records the healthcare resource consumption; costs were calculated using national databases, such SISMED, the drug prices system[3] and the technical note of the "Study of Sufficiency" for the capitation payment unit[4] for hospital services, laboratories and outpatient consultations.
- Costs were adjusted to 2025 using the local consumer price index and converted to U.S. dollars (exchange rate of 3804.09 COP=1 USD).

RESULTS

- A total of 81,238 patients, median age of 53 years and 58.5% female, presented with a median value of 2 comorbidities, and 60.1% had been diagnosed before 2020. Approximately 8.6% were bacteremia, and less than 1% (n=412) had meningitis. Over 90% were pneumonia cases, primarily treated as outpatients (n=61,519), while 18.7% were managed by the inpatient services.
- Inpatient pneumonia cases and bacteremia cases tended to be older than 50 years of age, 75.4% and 71.4%, respectively, while outpatient pneumonia cases and meningitis cases ocurred mainly in patients under 50 years of age, 50.6% and 62.6%, correspondingly.

Table 1. Demographical characteristics

	81,238		61,519		15,189		412		7,006	
	All	**100%**	**Pneumonia Outpatients**	**75.7%**	**Pneumonia Inpatients**	**18.7%**	**Meningitis**	**0.5%**	**Bacteremia**	**8.6%**
Sex, n (%)										
Female	47,535	(58.5%)	37,108	(60.3%)	7,978	(52.5%)	190	(46.1%)	3,830	(54.7%)
Male	33,703	(41.5%)	24,411	(39.7%)	7,211	(47.5%)	222	(53.9%)	3,176	(45.3%)
Age, median (IQR)	53	(33)	49	(31)	66	(29)	43	(29.3)	63.5	(31)
Age group, n (%)										
18-24 yrs	5,717	(7.0%)	4,886	(7.9%)	510	(3.4%)	61	(14.8%)	345	(4.9%)
25-39 yrs	20,222	(24.9%)	17,427	(28.3%)	1,938	(12.8%)	128	(31.1%)	989	(14.1%)
40-49 yrs	10,641	(13.1%)	8,806	(14.3%)	1,290	(8.5%)	69	(16.7%)	667	(9.5%)
50-59 yrs	13,041	(16.1%)	10,207	(16.6%)	2,167	(14.3%)	52	(12.6%)	1,013	(14.5%)
60-69 yrs	12,536	(15.4%)	9,067	(14.7%)	2,685	(17.7%)	46	(11.2%)	1,227	(17.5%)
70-79 yrs	9,905	(12.2%)	6,211	(10.1%)	2,993	(19.7%)	37	(9.0%)	1,347	(19.2%)
80 and over	9,176	(11.3%)	4,915	(8.0%)	3,606	(23.7%)	19	(4.6%)	1,418	(20.2%)

RESULTS (cont)

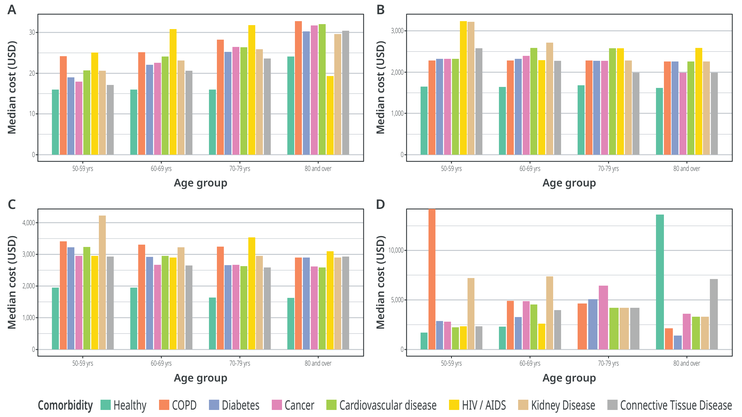
	81,238		61,519		15,189		412		7,006	
	All	**100%**	**Pneumonia Outpatients**	**75.7%**	**Pneumonia Inpatients**	**18.7%**	**Meningitis**	**0.5%**	**Bacteremia**	**8.6%**
Year of diagnosis, n (%)										
2015	5,791	(7.1%)	3,990	(6.5%)	1,430	(9.4%)	45	(10.9%)	789	(11.3%)
2016	7,071	(8.7%)	5,261	(8.6%)	1,467	(9.7%)	36	(8.7%)	696	(9.9%)
2017	9,592	(11.8%)	7,427	(12.1%)	1,786	(11.8%)	37	(9.0%)	805	(11.5%)
2018	12,158	(15.0%)	9,680	(15.7%)	1,978	(13.0%)	46	(11.2%)	823	(11.7%)
2019	14,230	(17.5%)	11,068	(18.0%)	2,418	(15.9%)	62	(15.0%)	1,129	(16.1%)
2020	10,052	(12.4%)	7,639	(12.4%)	1,781	(11.7%)	41	(10.0%)	839	(12.0%)
2021	10,821	(13.3%)	8,429	(13.7%)	1,751	(11.5%)	60	(14.6%)	819	(11.7%)
2022	11,523	(14.2%)	8,025	(13.0%)	2,578	(17.0%)	85	(20.6%)	1,106	(15.8%)
Body Mass Index, median (IQR)	26.2	(6.5)	26.4	(6.3)	25.3	(7.1)	25.1	(6.4)	25.2	(6.74)
Missing, n(%)	920	(1.1%)	509	(0.8%)	343	(2.3%)	1	(0.2%)	163	(2.3%)
Number of comorbidities										
Median (IQR)	2	(3)	1	(3)	3	(3)	1	(3)	3	(4)
0, n (%)	22,544	(27.8%)	19,719	(32.1%)	1,810	(11.9%)	133	(32.3%)	1,037	(14.8%)
1, n (%)	16,771	(20.6%)	13,857	(22.5%)	2,115	(13.9%)	97	(23.5%)	925	(13.2%)
2, n (%)	13,394	(16.5%)	10,039	(16.3%)	2,563	(16.9%)	62	(15.0%)	1,089	(15.5%)
3, n (%)	10,571	(13.0%)	7,290	(11.8%)	2,635	(17.3%)	45	(10.9%)	1,127	(16.1%)
4, n (%)	7,696	(9.5%)	4,863	(7.9%)	2,292	(15.1%)	37	(9.0%)	1,035	(14.8%)
5, n (%)	10,262	(12.6%)	5,751	(9.3%)	3,774	(24.8%)	38	(9.2%)	1,793	(25.6%)

- Inpatient pneumonia cases posed the largest total cost at $130,687,036 USD, followed by bacteremia cases ($53,409,057), meningitis cases ($2,385,970), and outpatient pneumonia cases ($1,859,643).
- The median cost per case diverged substantially by age between those under 50 years and those aged 50 and over: for meningitis cases the difference between these groups was $686.3 median cost (<50 = $2,573.9 vs. ≥50 = $3,260.2); for bacteremia cases, the difference was $365.2 (<50 =$ 2,253.2 vs. ≥50 = $2,618.4). For inpatient pneumonia cases this difference was $320.7 (<50 = $1,932.5 vs ≥50 = $2,253.2), while for outpatient pneumonia cases it was $5.1 (<50 = $16 vs. ≥50 = $21.1).
- Even further breakdowns within cases in patients ≥50 years old suggest that these costs vary greatly between healthy (no comorbidities) and those with comorbidities, because age presents itself as a divergent modulator.
- For outpatient pneumonia cases the median costs per patient increase with age, a phenomenon that generally persists regardless of comorbidity status. The gaps between healthy individuals and those with comorbidities remain, with healthy individuals consistently exhibiting lower median costs; for example, for healthy cases in the age group from 50 to 59 years old, the value was 16 USD (IQR 12.9, n=2,182) while for those over 80 years old the median cost per case was 24 USD (IQR 25.4, n= 60). Alternately, cases between 50 to 59 years old with comorbid conditions such chronic obstructive pulmonary disease (COPD) presented median cost of 24.2 USD (IQR 30.7, n=3,050) and those over 80 years old cost 32.8 (IQR 38.1, n= 3,359) (Figure 1).
- In hospital-managed cases, this gradient either diminishes entirely or exhibits greater variability. For inpatient pneumonia cases, the median cost of healthy cases of the 50 to 59 years old group was 1,641.2 USD (IQR=1,599, n=247) whilst fluctuating across other age groups, before finally reaching at 1,611.7 USD (IQR 2,245.1, n=69) among those aged 80 and over (Figure 1). Cases involving comorbidities demonstrated higher median costs than healthy cases (between 1.39-fold and 1.97-fold for those aged 50 and 59), although diverse patterns and did not show a consistent positive correlation with age. For instance, subjects with kidney disease presented a decreasing trend, those between 50 to 59 years old accrued a median cost of 3,215.4 USD (IQR= 7,227.9, n=367) while those 80 years old and over a value of 2,253.2 USD (IQR= 2,593.6, n= 1,165). By constrast, comorbid conditions like cancer showed high median costs in the 50–59 and 60–69 age groups, but lower costs in those aged 70–79 and 80 or above (Figure 1).
- Similarly, bacteremia cases ≥50 years old without comorbidities represented under 2,000 USD with a decreasing trend by age (lower values than the overall median cost); in contrast cases with comorbid conditions experienced higher median costs with heterogeneous shapes by age group, for example, cases with connective tissue diseases aged 50-59 years presented a U-shaped pattern, the median cost of cases aged 50-59 (n=115) and those 80 and over (n=102) exceeded the 2,900 USD value, and cases within those age groups (aged 60-69 and 70-79) did not surpass the 2,650 USD value (Figure 1).

RESULTS (cont)

- Finally, for patients diagnosed with meningitis the median costs were highly volatile, considering the small sample size. Healthy cases aged 50-59 presented a median cost of 1,655 USD (IQR= 4,326.5, n=11), while cases with COPD in this age group reached a median cost of 35,730.7 USD (IQR= 70,226.7, n=6). This implies a median cost increasing up to 21.6-fold. Cases with diabetes, for example, for those aged 80 years or older presented a median cost of 1,372.3 USD (IQR= 2,216.6, n=9) while this value for cases without comorbidities in the same age group was 13,586.8 USD (IQR=NA, n=1) (Figure 1).

Figure 1. Median cost per patient by disease, comorbidity and 50+ age group. A) Outpatient pneumonia, B) Inpatient pneumonia, C) Bacteremia and D) Meningitis



Note: The Y-axis scale differs across panels. To enhance readability, the Y-axis in Panel D has been limited to 13,500 USD and the 50-59 yo COPD value outside the graph's boundaries is 35,731 USD.

CONCLUSION

- Overall, inpatient pneumonia cases caused the largest economic impact despite only representing one-fifth of the total cases.
- The median cost per clinical case for each diagnosis was larger among the older age groups.
- Among individuals over 50 years old without underlying conditions, in-hospital cases of pneumonia, bacteremia, or meningitis had costs that were below the overall median. In contrast, those in the same age group who had underlying conditions typically experienced greater costs that increased up to 21-fold as compared with the healthy group.

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