PC070

Epidemiology of AL Amyloidosis: A Real-World Study Using US Claims Data

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INTRODUCTION

- Amyloid light chain (AL) amyloidosis is a rare, progressive, and typically fatal disease caused by extracellular deposition of misfolded immunoglobulin light chains (LCs)[1]
- Soluble toxic aggregates and deposited fibrils (amyloid) lead to progressive failure of vital organs, including the heart, kidneys, and nervous system, causing significant morbidity and mortality[2,3]
- There is a lack of recent data on the epidemiology of AL amyloidosis in the United States[4]
- The objective of this study was to provide an up-to-date estimate of the prevalence and incidence of AL amyloidosis in the United States

METHODS

Study Design and Data Source

- Retrospective, cross-sectional study using 2007-2015 Truven MarketScan® commercial and Medicare supplement databases
  - Covering approximately 65 million commercially insured patients and their dependents and 5.3 million Medicare-eligible retired employees

Study Population

- Adults ≥18 years of age with AL amyloidosis identified if they
  - Had ≥1 inpatient claim or ≥2 outpatient claims consistent with AL amyloidosis (*International Classification of Diseases, Ninth Revision, Clinical Modification* [*ICD-9-CM*] code 277.30 or 277.39; *International Classification of Diseases, Tenth Revision, Clinical Modification* [*ICD-10-CM*] code E85.4x, E85.8x, or E85.9x) in any diagnosis field within each calendar year
  - Underwent 1 AL amyloidosis–specific treatment (eg, chemotherapy, hematopoietic stem cell transplantation) on or after the first amyloidosis diagnosis (index date)
- Given the poor prognosis for patients with AL amyloidosis (estimated median survival, 6 months to 3 years from diagnosis), continuous enrollment was not required[5]

Study Measures

- Prevalence was calculated as the number of patients with AL amyloidosis divided by the number of enrollees on June 30th of each calendar year and reported as cases per million in each year
- Incidence was calculated as the number of patients with AL amyloidosis who were disease-free and were enrolled in a health plan for the previous year, divided by the number of enrollees enrolled from July 1st of the previous year to June 30th of each calendar year and reported as per million person-years (PMPY)

Statistical Analysis

- Yearly prevalence proportions were reported for each calendar year from 2007 through 2015
- Yearly incidence rates were reported from 2008 through 2015
- Age-gender–adjusted rates to the 2010 US census population were also reported
- To characterize trends in AL amyloidosis prevalence and incidence rates over time, annual percentage change (APC) was calculated by fitting a linear regression line to the natural logarithm of the rates, using the calendar year as a regressor variable. APC is used to describe rates over time; with this approach, rates are assumed to change at a constant percentage of the previous year's rate[6]

RESULTS

- The overall study sample included 7326 prevalent patients with AL amyloidosis (368-1080 unique cases per year) and 2207 incident patients with AL amyloidosis (189-377 cases per year)
  - Mean (SD) age for prevalent patients was 63.6 years (12.1); 45% were women; all US regions were represented, and most patients had commercial insurance (**Table 1**)

Table 1. Patient Demographic Characteristics Among Prevalent Cases

	2007	2008	2009	2010	2011	2012	2013	2014	2015	All[a]
N	368	595	741	837	1021	1080	1063	1061	825	7591
Age, years, mean (SD)	63 (12)	63 (12)	62 (12)	62 (12)	64 (12)	64 (12)	65 (12)	63 (12)	64 (13)	63 (12)
18-34, n (%)	5 (1.4)	5 (0.8)	6 (0.8)	18 (2.2)	17 (1.7)	15 (1.4)	8 (0.8)	13 (1.2)	12 (1.5)	99 (1.3)
35-54, n (%)	73 (19.8)	132 (22.2)	176 (23.8)	198 (23.7)	195 (19.1)	195 (18.1)	194 (18.3)	210 (19.8)	161 (19.5)	1534 (20.2)
55-64, n (%)	128 (34.8)	230 (38.7)	282 (38.1)	300 (35.8)	366 (35.8)	387 (35.8)	346 (32.5)	392 (36.9)	296 (35.9)	2727 (35.9)
65+, n (%)	162 (44.0)	228 (38.3)	277 (37.4)	321 (38.4)	443 (43.4)	483 (44.7)	515 (48.4)	446 (42.0)	356 (43.2)	3231 (42.6)
Female, n (%)	168 (45.7)	276 (46.4)	346 (46.7)	380 (45.4)	467 (45.7)	467 (43.2)	466 (43.8)	468 (44.1)	389 (47.2)	3427 (45.1)
Region										
Midwest, n (%)	129 (35.1)	182 (30.6)	244 (32.9)	236 (28.2)	282 (27.6)	258 (23.9)	248 (23.3)	250 (23.6)	193 (23.4)	2022 (26.6)
Northeast, n (%)	45 (12.2)	93 (15.6)	135 (18.2)	171 (20.4)	226 (22.1)	269 (24.9)	242 (22.8)	282 (26.6)	205 (24.8)	1668 (22.0)
South, n (%)	138 (37.5)	217 (36.5)	225 (30.4)	276 (33.0)	316 (31.0)	351 (32.5)	352 (33.1)	382 (36.0)	304 (36.8)	2561 (33.7)
West, n (%)	56 (15.2)	103 (17.3)	137 (18.5)	154 (18.4)	197 (19.3)	202 (18.7)	221 (20.8)	147 (13.9)	123 (14.9)	1340 (17.7)
Insurance type										
Commercial, n (%)	208 (56.5)	377 (63.4)	479 (64.6)	527 (63.0)	589 (57.7)	608 (56.3)	558 (52.5)	626 (59.0)	483 (58.5)	4455 (58.7)
Medicare supplement (Medigap),[b] n (%)	160 (43.5)	218 (36.6)	262 (35.4)	310 (37.0)	432 (42.3)	472 (43.7)	505 (47.5)	435 (41.0)	342 (41.5)	3136 (41.3)

[a]Patients might be included in multiple years.
[b]A Medicare supplement insurance (Medigap) policy, sold by private companies, can help pay some of the health care costs that original Medicare does not cover, such as copayments, coinsurance, and deductibles.

  - Mean (SD) age for incident patients was 64.0 years (13.0); 54% were men; all US regions were represented, and most patients had commercial health insurance (**Table 2**)

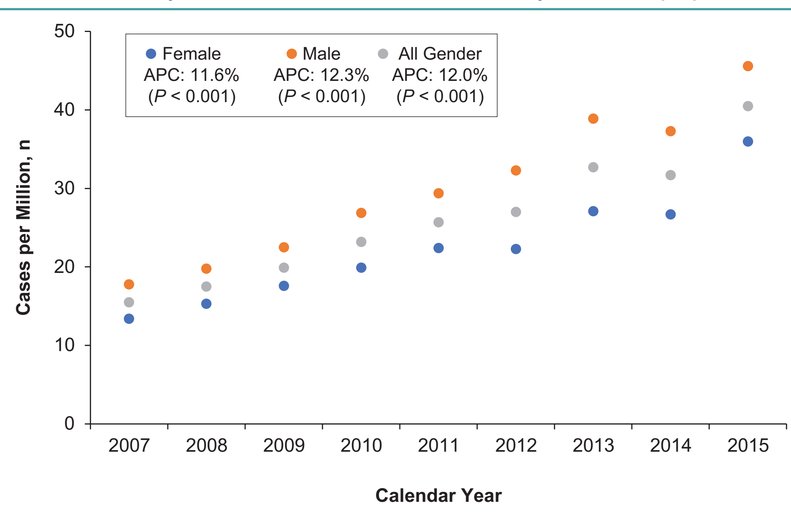
Table 2. Patient Demographic Characteristics Among Incident Cases

	2008	2009	2010	2011	2012	2013	2014	2015	All
N	213	252	245	295	377	339	297	189	2207
Age, years, mean (SD)	63 (12)	64 (13)	63 (13)	65 (13)	64 (13)	65 (14)	63 (12)	63 (13)	64 (13)
18-34, n (%)	3 (1.4)	1 (0.4)	6 (2.4)	3 (1.0)	7 (1.9)	4 (1.2)	4 (1.3)	3 (1.6)	31 (1.4)
35-54, n (%)	44 (20.7)	66 (26.2)	58 (23.7)	44 (14.9)	73 (19.4)	72 (21.2)	62 (20.9)	39 (20.6)	458 (20.8)
55-64, n (%)	88 (41.3)	67 (26.6)	78 (31.8)	107 (36.3)	121 (32.1)	101 (29.8)	98 (33.0)	71 (37.6)	731 (33.1)
65+, n (%)	78 (36.6)	118 (46.8)	103 (42.0)	141 (47.8)	176 (46.7)	162 (47.8)	133 (44.8)	76 (40.2)	987 (44.7)
Female, n (%)	95 (44.6)	122 (48.4)	110 (44.9)	150 (50.8)	153 (40.6)	153 (45.1)	143 (48.1)	94 (49.7)	1,020 (46.2)
Region									
Midwest, n (%)	69 (32.4)	85 (33.7)	74 (30.2)	89 (30.2)	89 (23.6)	77 (22.7)	71 (23.9)	43 (22.8)	597 (27.1)
Northeast, n (%)	23 (10.8)	40 (15.9)	53 (21.6)	56 (19.0)	104 (27.6)	71 (20.9)	69 (23.2)	41 (21.7)	457 (20.7)
South, n (%)	79 (37.1)	74 (29.4)	78 (31.8)	97 (32.9)	127 (33.7)	126 (37.2)	122 (41.1)	73 (38.6)	776 (35.2)
West, n (%)	42 (19.7)	53 (21.0)	40 (16.3)	53 (18.0)	57 (15.1)	65 (19.2)	35 (11.8)	32 (16.9)	377 (17.1)
Insurance type									
Commercial, n (%)	136 (63.8)	136 (54.0)	142 (58.0)	157 (53.2)	200 (53.1)	177 (52.2)	164 (55.2)	119 (63.0)	1,231 (55.8)
Medicare supplement,[a] n (%)	77 (36.2)	116 (46.0)	103 (42.0)	138 (46.8)	177 (46.9)	162 (47.8)	133 (44.8)	70 (37.0)	976 (44.2)

[a]A Medicare supplement insurance (Medigap) policy, sold by private companies, can help pay some of the health care costs that original Medicare does not cover (eg, copayments, coinsurance, and deductibles).

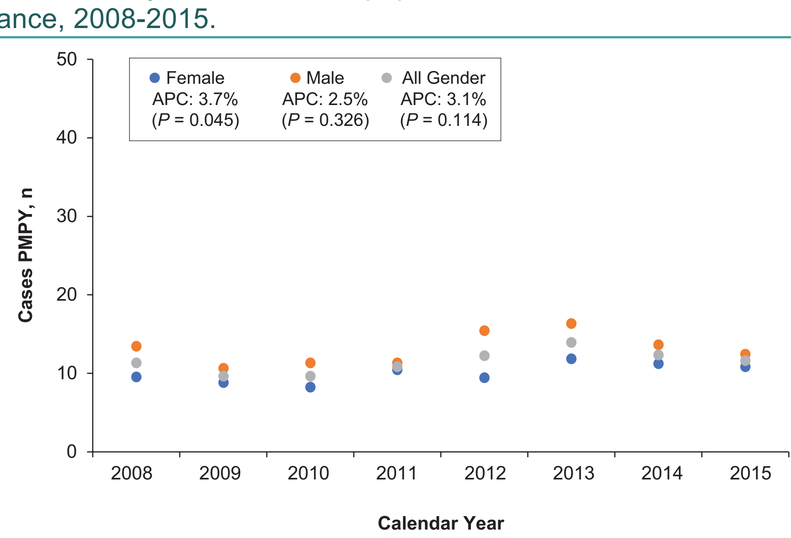
  - Men older than 65 had the highest prevalence and the highest incidence rates of AL amyloidosis
- The prevalence of AL amyloidosis increased significantly during the study period: from 15.5 cases per million in 2007 to 40.5 cases per million in 2015, an APC of 12.0% ($P < 0.0001$) (**Figure 1**)
  - The age-gender–adjusted prevalence rose from 20.1 per million in 2007 to 50.1 per million in 2015, an APC of 11.9 ($P < 0.001$).
- The incidence of AL amyloidosis ranged from 9.7 to 14.0 cases PMPY, with no statistically significant increase (APC, 3.1%; $P = 0.114$) (**Figure 2**)
  - The age-gender–adjusted incidence ranged from 10.8 to 15.2 PMPY; the APC was not statistically significant (3.1%; $P = 0.098$)

Figure 1. Prevalence of AL amyloidosis in a US commercially insured population, 2007-2015.



AL, amyloid light chain; APC, annual percentage change.

Figure 2. Incidence of AL amyloidosis in a US population with commercial and Medicare supplement insurance, 2008-2015.



AL, amyloid light chain; APC, annual percentage change; PMPY, per million person-years.

DISCUSSION AND CONCLUSIONS

- This study showed a pattern of increased prevalence of AL amyloidosis coupled with stable incidence
  - Although our study could not determine the mechanisms responsible for the observed change, a nationwide Swedish study in 1430 patients with AL amyloidosis diagnosed between 1995 and 2013 found significant improvement in overall survival over time, a change that could explain our findings[5]
- Extrapolating from our study data, there were ≥12,000 adults in the US living with AL amyloidosis in 2015, and the number seems likely to continue to rise
- Limitation
  - Given the absence of *ICD-9-CM* or *ICD-10-CM* codes for AL amyloidosis, we selected codes for this study with input from clinical experts to eliminate as many patients without AL amyloidosis as possible. This requirement would be expected to decrease the sensitivity but to increase the specificity of our identification algorithm. However, a small proportion of patients with transthyretin-related hereditary amyloidosis would still likely have been included in our sample

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