Chronic Kidney Disease and Multiple Myeloma: Trends and Inequities in US Mortality (1999- 2023)

Abbas Hussain MD[1], Muhammad Abdullah MBBS[2], Muhammad Maheer Mubashir MBBS[3], Khadija Mohib MD[1], Muhammad Asjad Saleem MBBS[4], Ayesha Ahmed Cheema MBBS[5]

[1]Kirk Kerkorian School of Medicine at UNLV, Las Vegas, NV, [2]Shalamar Medical and Dental College, Lahore, Pakistan, [3]King Edward Medical University, Lahore, Pakistan, [4]Indus Hospital, Karachi, Pakistan,
[5]Al Tibri Medical College, Karachi, Pakistan

KIRK KERKORIAN SCHOOL OF MEDICINE | UNLV

Introduction

Chronic kidney disease (CKD) is a prevalent, often life-limiting complication that significantly contributes to both morbidity and mortality in patients with multiple myeloma (MM). MM patients are especially vulnerable to CKD due to the nephrotoxic effects of some treatments, as well as kidney damage caused by the disease itself. Despite significant therapeutic advances in both MM and CKD, the long-term population-level impact of CKD on MM-related mortality has been underexplored. Understanding trends in CKD-related mortality among MM patients and identifying disparities by age, sex, race, ethnicity, region, and urbanization is critical for designing targeted public health interventions and improving patient outcomes. This study aims to fill this gap by evaluating trends in CKD-related mortality among MM patients in the U.S. over the past two decades (1999-2023), while also assessing demographic and geographic inequities in mortality.

Objectives

1. To evaluate trends in CKD-related mortality among MM patients in the U.S. from 1999 to 2023.
2. To examine disparities in CKD-MM mortality by sex, age, race/ethnicity, region, and urbanization.
3. To identify areas with the highest burden of CKD-MM mortality to inform targeted public health strategies and interventions.
4. To assess the impact of medical advancements in MM and CKD on mortality trends.

Methods

This study utilized mortality data from the CDC WONDER Multiple Cause of Death database (1999–2023). We identified deaths that listed both multiple myeloma (MM) (ICD-10 code: C90.0) and chronic kidney disease (CKD) (ICD-10 codes: N18.0–N18.9) as underlying or contributing causes of death in individuals aged 25–85+. Age-adjusted mortality rates (AAMRs) per 100,000 were calculated using the 2000 U.S. standard population. Joinpoint regression analysis (v5.3.0) was used to estimate annual percentage change (APC) and average annual percentage change (AAPC) with 95% confidence intervals (CIs). Trends were analyzed across demographic categories, including sex, race/ethnicity, region (Northeast, Midwest, South, West), and urbanization (rural vs. urban areas). Statistical significance was set at $p < 0.05$.

Results

- **Total Mortality:** Between 1999 and 2023, a total of 24,870 deaths from CKD-MM were recorded.
- **Overall Mortality Trends:** The overall AAMR for CKD-MM increased significantly over the study period, with an AAPC of 1.14%.
- **Sex-based Trends:** Males had a significantly higher mortality rate than females. The AAPC for males was 1.34%, with a 2023 AAMR of 6.06, while females had an AAPC of 0.66% and a 2023 AAMR of 3.64.
- **Racial Disparities:** Non-Hispanic Black individuals had the highest AAMR in 2023 (11.35 per 100,000), followed by non-Hispanic White individuals (4.08) and Hispanic individuals (3.75).
- **Regional Trends:** The Midwest (AAPC: 1.62%), West (1.45%), and South (1.11%) exhibited significant increases in mortality rates, while the Northeast had the smallest, nonsignificant change (AAPC: 0.18%).
- **Urbanization Differences:** Rural areas had higher mortality rates than urban areas. In 2020, rural areas had an AAMR of 5.16, with an AAPC of 1.42%, whereas urban areas had a lower AAMR of 4.85, with a smaller increase (AAPC: 0.97%).
- **Age-specific Trends:** The 65+ age group had the highest mortality rates, with an AAMR of 20.27 per 100,000 in 2023 and an AAPC of 1.46%. In contrast, mortality rates for individuals aged 25–64 declined (AAPC: -0.33%) to 0.88 per 100,000 in 2023.

Discussion

- CKD-MM mortality has increased steadily over the past 20 years in the U.S.
- Disparities in mortality are evident by sex, race/ethnicity, age, and geographic location.
- Older adults (≥65 years), males, non-Hispanic Black individuals, and rural populations experience the highest burden.
- Structural and social determinants of health, including limited access to care and healthcare inequities, contribute significantly to these disparities.
- Advances in MM and CKD treatments may improve outcomes, but benefits are unequally distributed across populations.
- Targeted public health interventions are needed to improve access to early diagnosis, effective treatments, and preventive care.
- Addressing rural healthcare gaps and racial/ethnic inequities is crucial for reducing mortality disparities.
- Further research is needed to identify underlying causes of disparities and develop strategies to improve outcomes for all CKD-MM patients.

References

1. Dimopoulos MA, Terpos E, Chanan-Khan A, Leung N, Ludwig H, Garcia-Sanz R, et al. Renal impairment in patients with multiple myeloma: A consensus statement on behalf of the International Myeloma Working Group. J Clin Oncol. 2016;34(13):1544–57.
2. Palumbo A, Avet-Loiseau H, Oliva S, Lokhorst HM, Goldschmidt H, Rosinol L, et al. International Myeloma Working Group guidelines for the management of multiple myeloma patients with renal impairment. Blood. 2011;118(18):4835–43.
3. Collins AJ, Foley RN, Chavers B, Gilbertson D, Herzog C, Ishani A, et al. US Renal Data System 2013 Annual Data Report: Epidemiology of kidney disease in the United States. Am J Kidney Dis. 2014;63(1 Suppl):A7.