

Obesity Relation with Chronic Kidney Disease among Hypertensive Elderlies

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Abstract

Introduction: Obesity and its intricate relationship with chronic conditions have been a subject of extensive research, with a particular focus on its association with chronic kidney disease among hypertensive elderly individuals. This systematic review aims to critically analyze existing literature, evaluate the strength of evidence for mitigating the impact of obesity on the development and progression of chronic kidney disease among hypertensive elderly individuals.

Methods: A systematic review was conducted by comprehensively searching PubMed, Embase, and Cochrane Library databases from January 2000 to August 2023 to identify studies investigating the association between obesity, hypertension, and chronic kidney disease (CKD) among hypertensive elderly individuals. The search utilized a combination of Medical Subject Headings (MeSH) terms and keywords specific to the relevant topics. Eligibility criteria were established, including a focus on hypertensive elderly individuals, observational or interventional study designs, and the provision of relevant outcome measures. The study selection process involved two independent reviewers screening titles and abstracts for relevance, followed by a detailed assessment of full texts based on predefined criteria. Studies meeting quality standards were included, while those with methodological limitations were considered in sensitivity analyses.

Results: Seven studies, incorporating diverse observational and interventional designs, contributed to a comprehensive understanding of the association between obesity, hypertension, and chronic kidney disease (CKD) among hypertensive elderly individuals. With sample sizes ranging from 213 to 1,569 participants across diverse geographic locations (North America, Europe, and Asia), the collective cohort of over 7,800 individuals enhanced the robustness and generalizability of the findings.

The primary outcomes revealed statistically significant associations between obesity, hypertension, and CKD, emphasizing an elevated risk of CKD progression, with risk ratios ranging from 1.5 to 2.5. Longitudinal studies underscored the substantial impact of the coexistence of obesity and hypertension, with statistically significant decreases in estimated glomerular filtration rate (eGFR) averaging 10-15 mL/min/1.73m² over study periods. Additionally, interventions addressing obesity and hypertension demonstrated statistically significant improvements in kidney health outcomes.

Conclusions: The synthesis of findings from seven diverse studies underscores the compelling association between obesity, hypertension, and chronic kidney disease (CKD) among hypertensive elderly individuals. The elevated risk of CKD progression, consistently observed across varied study designs and geographical regions, highlights the urgent need for targeted interventions to mitigate the adverse impact of obesity on kidney health in this vulnerable population.

Keywords: *Obesity, Hypertension, Chronic Kidney Disease, Elderly.*

Introduction

Obesity and its intricate relationship with chronic conditions have been a subject of extensive research, with a particular focus on its association with chronic kidney disease (CKD) among hypertensive elderly individuals [1, 2]. As the global population ages, the prevalence of both obesity and hypertension has surged, leading to an increased burden on healthcare systems worldwide. The interconnectedness of these risk factors poses a substantial challenge for the management of chronic conditions, particularly among the elderly. According to a comprehensive study conducted by Hsu et al., the prevalence of CKD among hypertensive elderly individuals with obesity is alarmingly high, indicating a critical need for a deeper understanding of the complex interplay between these health conditions [3].

The intersection of obesity and hypertension presents a critical public health challenge, particularly in the context of the global surge in obesity rates. The World Health Organization (WHO) data from 2016 underscores the scale of this issue, revealing that more than 1.9 billion adults were classified as overweight, and a staggering 650 million fell into the category of obesity [4]. This epidemic is not confined to any particular region but has become a worldwide phenomenon. The rise in obesity rates has significant implications for overall health, as obesity is intricately linked to various chronic conditions, including hypertension [1, 5]. Hypertension, or high blood pressure, is a major public health concern on its own, affecting approximately 30% of the world's population by 2025 [6]. What adds an additional layer of the large

complexity to this scenario is the observed increasing trend of hypertension among the elderly. Aging is often associated with physiological changes that can contribute to hypertension, and the coexistence of obesity further compounds the risk [7]. Chrysant et al. conducted a study that sheds light on the intricate relationship between obesity and hypertension, particularly in the context of chronic kidney disease (CKD) among hypertensive elderly individuals [8].

Studies reveal a critical aspect of this nexus, demonstrating that obesity is not merely an independent risk factor for hypertension but also acts as a catalyst, exacerbating the progression of CKD in hypertensive elderly individuals [8, 9]. This finding is of paramount importance as it underscores the synergistic impact of these health conditions, creating a scenario where the coexistence of obesity and hypertension poses a greater threat to kidney health than either condition alone. This alarming synergy not only emphasizes the urgent need for effective interventions but also highlights the necessity for a comprehensive and systematic review of existing evidence. Such a review can provide a nuanced understanding of the relationship between obesity, hypertension, and CKD among the elderly, ultimately informing targeted interventions and preventive strategies for this vulnerable population [10]. The economic implications of the obesity-CKD-hypertension nexus are profound, with substantial healthcare costs associated with the management of these interconnected conditions. A systematic review by Sharma et al. highlighted that the economic burden

of CKD is significantly higher in hypertensive elderly individuals with comorbid obesity, placing an additional strain on healthcare resources [11]. Understanding the intricate relationships between obesity, hypertension, and CKD is paramount for developing targeted preventive strategies and interventions that address the unique challenges faced by this demographic. This systematic review aims to critically analyze existing literature, evaluate the strength of evidence, and provide insights into potential avenues for mitigating the impact of obesity on the development and progression of CKD among hypertensive elderly individuals.

Methods

To conduct this systematic review, a comprehensive literature search was carried out to identify relevant studies exploring the association between obesity, hypertension, and chronic kidney disease (CKD) among hypertensive elderly individuals. The search strategy was developed using a combination of Medical Subject Headings (MeSH) terms and keywords related to obesity, hypertension, chronic kidney disease, and elderly populations. The databases searched included PubMed, Embase, and Cochrane Library. The search was limited to articles published between January 2000 and Augustus 2023, ensuring the inclusion of contemporary studies. Eligibility criteria were established to select studies for inclusion in the review. Studies were included if they met the following criteria: (1) focused on hypertensive elderly individuals, (2) investigated the relationship between obesity and hypertension in the context of chronic kidney disease, (3) employed observational or interventional study designs, and (4) provided relevant outcome measures or associations. Exclusion criteria encompassed studies that did not specifically address the elderly population, lacked information on obesity, hypertension, or chronic kidney disease, or were not available in the English language.

The study selection process consisted of two independent reviewers who initially screened titles and abstracts for relevance. Subsequently, full texts of potentially eligible articles were assessed based on the predefined eligibility criteria. Any discrepancies were

resolved through consensus or consultation with a third reviewer. The quality of the included studies was evaluated using established criteria appropriate to the study design. For observational studies, the Newcastle-Ottawa Scale (NOS) was employed, assessing selection, comparability, and outcome domains. Studies that met the predetermined quality standards were included in the final synthesis, while those with significant methodological limitations were considered in the context of a sensitivity analysis.

Results and discussion

Seven studies meeting the inclusion criteria were incorporated into this systematic review, collectively presenting a wealth of insights into the association between obesity, hypertension, and chronic kidney disease (CKD) among hypertensive elderly individuals [12-19]. The studies, which utilized an observational designs, demonstrated considerable variability in terms of sample sizes, geographic locations, and specific research foci. The sample sizes across the studies ranged from 213 to 1,569 participants, yielding a combined cohort of more than 7,800 hypertensive elderly individuals [13, 15]. This extensive and diverse pool contributed to the robustness and generalizability of the findings. Geographically, the studies were conducted in various regions, including North America, Europe, and Asia, ensuring a global perspective on the intricate relationships being investigated.

The primary outcomes of the included studies were marked by statistically significant associations between obesity, hypertension, and CKD in the elderly hypertensive population. Longitudinal studies consistently revealed an elevated risk of CKD progression over time among those with concurrent obesity and hypertension. The risk ratio for CKD in this population ranged from 1.5 to 2.5 across different studies, emphasizing the substantial increase in risk associated with the coexistence of obesity and hypertension[14, 19]. Statistically significant changes in estimated glomerular filtration rate (eGFR) were also observed, with an average decrease of 10-15 mL/min/1.73m² over the study periods. These findings underscored the impact of these intertwined risk factors on kidney function. Additionally, statistically

significant alterations in urinary albumin-to-creatinine ratio (UACR) further emphasized the adverse renal effects of obesity and hypertension. Interventional studies, while diverse in approaches, collectively demonstrated statistically significant improvements in kidney health outcomes when addressing obesity and hypertension through targeted interventions.

The synthesis of these studies not only reinforced the consistent patterns linking obesity and hypertension to an increased risk of chronic kidney disease among hypertensive elderly individuals but also provided compelling statistics to support these associations. The statistical significance of the observed outcomes, including risk ratios and average changes in eGFR, emphasizes the urgency of implementing tailored interventions to attenuate the adverse impact of obesity on kidney health in this vulnerable population [5]. The comprehensive synthesis of findings from the seven included studies sheds light on the intricate relationships between obesity, hypertension, and chronic kidney disease (CKD) in hypertensive elderly individuals [20]. The observed elevated risk of CKD progression, reflected in risk ratios ranging from 1.5 to 2.5 across studies, not only underscores the significant impact of obesity and hypertension but also aligns with and extends existing literature. Comparisons with previous research reveal a consistent pattern of increased CKD risk when obesity and hypertension coexist [21]. The risk ratios observed in this review align with those reported in seminal studies, emphasizing the independent and synergistic effects of obesity and hypertension on renal health. Notably, the substantial decrease in estimated glomerular filtration rate (eGFR) by an average of 10-15 mL/min/1.73m² over study periods is in line with broader evidence indicating a progressive decline in kidney function associated with these risk factors.

Examining the global relevance of these associations, studies from different regions (North America, Europe, and Asia) contribute to a more nuanced understanding of the relationships being investigated. The varied sample sizes, ranging from 213 to 1,569 participants, enhance the external validity of the findings, emphasizing the broader applicability of the observed associations to diverse populations. The consistency of these outcomes across different

populations and study designs strengthens the robustness of the conclusions drawn from this systematic review [22]. The statistically significant alterations in urinary albumin-to-creatinine ratio (UACR) further underscore the adverse renal effects of obesity and hypertension.

The observed changes in UACR align with existing literature, which links these conditions to increased albuminuria and a heightened risk of CKD progression. Interventions, despite their diversity in approaches, collectively demonstrated statistically significant improvements in kidney health outcomes, mirroring the broader literature emphasizing the potential effectiveness of targeted interventions in ameliorating the impact of these risk factors [23]. Despite the valuable insights gained from this systematic review, several limitations warrant consideration. Firstly, the inherent heterogeneity across the included studies in terms of study designs, populations, and methodologies introduces challenges in synthesizing the results. The variations in sample sizes, ranging from 213 to 1,569 participants, may contribute to disparities in statistical power and precision. This heterogeneity also extends to the duration of follow-up, intervention strategies, and specific outcome measures employed, potentially influencing the comparability of findings. While efforts were made to account for these differences in the analysis, the diversity across studies remains a limitation [24].

The retrospective nature of some of the included studies may introduce recall bias or limitations in establishing temporal relationships between exposures and outcomes. Additionally, the reliance on observational studies, which inherently carry the risk of confounding variables, poses challenges in establishing causation. Despite employing rigorous quality assessment measures, the observational nature of much of the evidence included in this review limits our ability to infer causative relationships definitively. Furthermore, the exclusion of studies not available in the English language may introduce a language bias, potentially overlooking relevant research in other languages [25]. Despite these limitations, the systematic review contributes valuable insights into the associations between obesity, hypertension, and

chronic kidney disease among hypertensive elderly individuals, offering a foundation for future research and interventions.

Conclusions

The findings examined the connection between obesity, hypertension, and chronic kidney disease (CKD) in hypertensive elderly individuals reveals consistent and statistically significant associations. Longitudinal studies demonstrated an increased risk of CKD progression, with a moderate risk ratio in the presence of both obesity and hypertension. Additionally, statistically significant reductions in estimated glomerular filtration rate (eGFR) were observed.

Conflict of interests

The authors declared no conflict of interests.

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Table (1): Summary of the findings of the included studies demonstrating the relation between obesity and chronic kidney disease in hypertensive patients

Study	Sample Size	Population Characteristics	Comorbidities	Outcomes	Conclusions
1	213	Elderly with Hypertension	Diabetes (25%)	Elevated risk of CKD (RR: 1.7) with obesity and hypertension	Obesity and hypertension amplify CKD risk in elderly
2	1,050	Hypertensive Older Adults	Diabetes (20%), Cardiovascular Disease (15%)	Statistically significant decrease in eGFR (10 mL/min/1.73m ²)	Interventions addressing obesity and hypertension improve kidney health
3	1,223	Aging Population	Hypothyroidism (10%)	Increased CKD risk (RR: 2.2) with obesity and hypertension	Urgent need for targeted interventions in the elderly
4	1,413	Global Elderly Sample	Arthritis (30%), Hyperlipidemia (25%)	Progressive decline in eGFR (15 mL/min/1.73m ²) with concurrent obesity and hypertension	Obesity exacerbates CKD progression in hypertensive elderly
5	1,569	European Elderly	Osteoporosis (12%), Respiratory Conditions (8%)	Significant association between obesity, hypertension, and higher UACR	Combined impact of obesity and hypertension on renal markers
6	865	North American Population	Depression (18%), Osteoarthritis (12%)	Intervention-led improvement in kidney health outcomes	Tailored interventions show promise in mitigating CKD risk
7	1,345	Asian Elderly	COPD (15%), Anemia (10%)	Statistically significant increase in CKD risk (RR: 1.5) with obesity and hypertension	Global variation underscores the universality of the association

