



Systolic Blood Pressure Reduction and Risk of Cardiovascular Disease and Mortality

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ABSTRACT

Background: The relationship between systolic blood pressure (SBP) reduction and the risk of cardiovascular disease (CVD) and mortality has garnered significant attention in recent years, as evidenced by a series of studies that illuminate various aspects of this critical health issue. **Literature Review:** The initial study by (Dinesh Jani et al., 2016) highlights the dual role of elevated SBP and depressive symptoms as independent predictors of major adverse cardiovascular events (MACE) in patients with cardiometabolic disease. Further emphasizing the need for careful management, (Thomas Manapurathe et al., 2019) examined the implications of hypertension in patients with peripheral artery disease (PAD), demonstrating that antihypertensive treatment could reduce cardiovascular events significantly. The systematic review by (Baffour-Awuah et al., 2020) further supports the argument for lower BP treatment targets in older adults, linking lower SBP levels with reduced rates of major cardiovascular events and mortality. In recent contributions, (Nawata, 2022) reinforced the connection between SBP reduction and lower cardiovascular risk, while (Kodala et al., 2023) highlighted the effectiveness of non-pharmacological interventions in managing hypertension. These lifestyle modifications not only aid in controlling blood pressure but also reduce reliance on medications, thus improving overall health outcomes. **Conclusion:** In conclusion, the literature collectively emphasizes the necessity for a nuanced approach to SBP management, considering individual patient profiles and the potential risks associated with both high and low blood pressure levels. The evidence supports the assertion that effective SBP reduction is pivotal in lowering the risk of cardiovascular disease and mortality, necessitating tailored management strategies that integrate both pharmacological and lifestyle interventions.

Keyword: Systolic Blood Pressure Reduction, Risk of Cardiovascular Disease, Mortality

INTRODUCTION

The relationship between systolic blood pressure (SBP) reduction and the risk of cardiovascular disease (CVD) and mortality has garnered significant attention in recent years, as evidenced by a series of studies that illuminate various aspects of this critical health issue. In 2016, (Dinesh Jani et al., 2016) explored the interplay between blood pressure values, depressive symptoms, and cardiovascular outcomes in patients with cardiometabolic disease. Their findings indicated that both SBP and depressive symptoms at baseline were independent predictors of major adverse cardiovascular events (MACE) over a four-year period, suggesting that close monitoring of SBP in this vulnerable population could be beneficial (Dinesh Jani et al., 2016).

Building on this foundation, (Park, 2018) conducted a systematic review and meta-analysis that examined the association of blood pressure lowering with mortality and cardiovascular disease across different blood pressure levels. This comprehensive analysis highlighted the effects of antihypertensive treatment in intermediate-risk individuals without prior cardiovascular disease, emphasizing the need for careful consideration of treatment strategies to optimize outcomes (Park, 2018).

In 2019, (Thomas Manapurathe et al., 2019) focused specifically on patients with peripheral artery disease (PAD), revealing that hypertension significantly increases the risk of complications in this group. They reported that administering antihypertensive medications could reduce cardiovascular events by 20% to 30%, though the optimal blood pressure targets for these patients remain a topic of debate (Thomas Manapurathe et al., 2019). (Sobieraj et al., 2019) further contributed to this discourse by analyzing data from the Systolic Blood Pressure Intervention Trial (SPRINT), which demonstrated that achieving SBP levels below 120 mmHg was associated with reduced risks of major cardiovascular events and overall mortality. However, they also raised concerns regarding the potential risks associated with excessively low diastolic blood pressure (DBP), highlighting the complexity of managing blood pressure in clinical practice (Sobieraj et al., 2019).

(Baffour-Awuah et al., 2020) conducted a systematic review that underscored the importance of managing blood pressure in older adults, where the balance between reducing cardiovascular risk and avoiding hypotension-related adverse events was emphasized. Their findings supported the notion that lower blood pressure treatment targets can be effective and safe, aligning with the latest hypertension guidelines (Baffour-Awuah et al., 2020). (Leontsinis et al., 2020) echoed this sentiment, emphasizing the global burden of hypertension and its association with cardiovascular morbidity and mortality. They highlighted the need for aggressive blood pressure management in certain populations, particularly in light of the SPRINT study's findings (Leontsinis et al., 2020).

In 2022, (Nawata, 2022) provided a comprehensive overview of the relationship between hypertension and heart disease, reinforcing the notion that lowering SBP can significantly reduce cardiovascular risk and mortality rates. His analysis of various studies, including the SPRINT trial, further solidified the understanding of the impact of SBP on cardiovascular outcomes (Nawata, 2022). Most recently, (Kodela et al., 2023) emphasized the role of non-pharmacological interventions in managing hypertension, highlighting lifestyle modifications as effective strategies to lower blood pressure and mitigate cardiovascular complications. Their narrative review pointed out that such interventions could reduce the reliance on medications and improve patient outcomes (Kodela et al., 2023).

Together, these studies illustrate a multifaceted approach to understanding the implications of systolic blood pressure reduction on cardiovascular disease and mortality, underscoring the need for tailored management strategies that consider individual patient profiles and broader public health implications.

LITERATURE REVIEW

The article "Relationship between blood pressure values, depressive symptoms and cardiovascular outcomes in patients with cardiometabolic disease" by (Dinesh Jani et al., 2016) provides a critical examination of the interplay between systolic blood pressure (SBP), depressive symptoms, and major adverse cardiovascular events (MACE) in a substantial cohort of patients with pre-existing cardiometabolic conditions. The study involved 35,537 patients who had a history of stroke, coronary heart disease, or diabetes, and it aimed to elucidate the independent predictors of cardiovascular outcomes over a four-year follow-up period.

One of the key insights from the article is the identification of SBP and depressive symptoms as significant independent predictors of MACE, which includes cardiovascular death or hospitalization due to myocardial infarction, stroke, or heart failure. This finding underscores the importance of monitoring SBP in this vulnerable population, as both elevated and low SBP levels, when coupled with depressive symptoms, can exacerbate cardiovascular risk. The authors highlight that the presence of depressive symptoms not only increases the likelihood of adverse outcomes but also complicates the risk assessment across different SBP categories. This finding is particularly relevant in the context of patients with very high SBP, where the compounded risk poses a significant clinical challenge.

The study also presents a critical contrast to the findings of the SPRINT trial, which emphasized aggressive SBP reduction as a means to lower cardiovascular risk. (Dinesh Jani et al., 2016) suggest that the discrepancies may arise from differences in study design and patient populations. This raises important considerations for clinical practice, as the implications of SBP management may vary significantly based on the presence of comorbid conditions such as depression.

Furthermore, the article emphasizes the potential benefits of closer monitoring of blood pressure in patients with both cardiometabolic disease and depressive symptoms. This recommendation aligns with the growing body of evidence supporting integrated care approaches that address both physical and mental health conditions to optimize patient outcomes. The lack of data on cardiac-

related medications in the study is a limitation that could have provided additional insights into the management strategies employed in this population.

The article by (Park, 2018) presents a comprehensive systematic review and meta-analysis that examines the relationship between blood pressure reduction and the incidence of cardiovascular disease and mortality across various blood pressure levels. The analysis focuses particularly on populations with normal-to-hypertensive blood pressures, providing critical insights into the efficacy and safety of antihypertensive drug treatments in individuals previously classified with high-normal blood pressure.

One of the central findings of this review is the association between blood pressure lowering and reduced mortality and cardiovascular events in intermediate-risk individuals who do not yet exhibit cardiovascular disease. This is particularly significant as it suggests that proactive management of blood pressure in these populations could lead to substantial health benefits. The systematic review meticulously evaluates existing randomized trials, highlighting that while blood pressure-lowering treatments can effectively reduce the incidence of adverse cardiovascular outcomes, they also carry the risk of discontinuation due to adverse drug events. This duality underscores the necessity for careful patient selection and monitoring when implementing treatment strategies.

Furthermore, (Park, 2018) discusses the J-curve phenomenon observed between diastolic blood pressure and the risk of all-cause and cardiovascular death. This concept is critical as it illustrates that excessively low diastolic blood pressure may paradoxically increase mortality risk, emphasizing the importance of achieving a balanced approach to blood pressure management. The findings from the ONTARGET and TRANSCEND trials, as referenced in the article, reinforce the notion that while aggressive blood pressure control is beneficial in high-risk patients, it must be approached with caution to avoid potential adverse outcomes.

The article titled "Cohort Study Examining the Association Between Blood Pressure and Cardiovascular Events in Patients With Peripheral Artery Disease" by (Thomas Manapurathe et al., 2019) provides a comprehensive analysis of the

relationship between systolic blood pressure (SBP) and cardiovascular events in patients diagnosed with peripheral artery disease (PAD). The authors highlight hypertension as a significant risk factor for complications in this population, with prevalence rates ranging from 35% to 55%. This statistic underscores the importance of managing blood pressure effectively in patients with PAD to mitigate the risks associated with cardiovascular events.

The article discusses prior research indicating that antihypertensive medications can reduce the incidence of cardiovascular events by 20% to 30% in hypertensive patients with PAD. This evidence supports the clinical guidelines recommending pharmacological intervention for patients with blood pressure readings exceeding 140/90 mm Hg. However, the authors point out a concerning trend of poor blood pressure control within this demographic, suggesting that despite the availability of treatment options, many patients may not be receiving adequate management.

A critical aspect of the article is its examination of the ongoing debate regarding the optimal target for SBP reduction in patients with PAD. The authors reference recent large-scale trials that have explored the efficacy of intensive SBP lowering to less than 120 mm Hg versus the more conventional target of less than 140 mm Hg. The conflicting outcomes of these trials highlight the complexities involved in determining the most effective blood pressure targets for this patient population. Notably, one trial reported that the lowest incidence of cardiovascular events occurred among patients with an average SBP between 135 and 145 mm Hg, suggesting that overly aggressive SBP reduction may not always confer additional benefits and could potentially pose risks.

The study conducted by (Thomas Manapurathe et al., 2019) contributes valuable insights into the nuanced relationship between SBP and cardiovascular events in patients with PAD. By analyzing a large and heterogeneous patient cohort, the authors reinforce the notion that while managing hypertension is crucial, the approach to SBP targets requires careful consideration. The article emphasizes the need for further research to establish clear guidelines that balance the benefits of

blood pressure reduction with the potential risks associated with overly stringent targets.

The article titled "Low on-treatment diastolic blood pressure and cardiovascular outcome: A post-hoc analysis using NHLBI SPRINT Research Materials" by (Sobieraj et al., 2019) provides a critical examination of the relationship between systolic blood pressure (SBP) control and cardiovascular outcomes, particularly in the context of the Systolic Blood Pressure Intervention Trial (SPRINT). The authors highlight the significant finding that maintaining an SBP of less than 120 mmHg is associated with a reduction in both fatal and nonfatal cardiovascular events as well as overall mortality in high-risk patients. This finding aligns with the evolving recommendations for antihypertensive therapy, which emphasize the importance of achieving target blood pressure values.

One of the pivotal discussions in the article revolves around the J-curve phenomenon, which suggests that excessively low diastolic blood pressure (DBP) may paradoxically increase the risk of adverse cardiovascular events, such as myocardial infarction. The authors note that while lower SBP is beneficial, the implications of low DBP are less clear, with the J-curve being more pronounced for DBP than SBP. Specifically, they indicate that DBP values below 75 mmHg could be associated with heightened risks of myocardial infarction and mortality, raising important considerations for clinical practice.

The article also contrasts the findings from the SPRINT study with those from the ACCORD study, which suggested that similar reductions in SBP did not yield significant changes in cardiovascular morbidity and mortality. This discrepancy underscores the complexity of blood pressure management and the need for tailored approaches based on individual patient profiles.

The article "Blood pressure control in older adults with hypertension: A systematic review with meta-analysis and meta-regression" by (Baffour-Awuah et al., 2020) provides a comprehensive examination of the relationship between blood pressure management and the risk of cardiovascular disease (CVD) in older adults. The authors conduct a systematic review and meta-analysis to evaluate the efficacy

of intensive blood pressure (BP) treatment, focusing on major cardiovascular events (MCEs) and mortality outcomes.

The authors emphasize that hypertension is a significant global health concern, being the primary risk factor for CVD, which remains the leading cause of mortality worldwide. Their analysis highlights the well-established benefits of blood pressure reduction in mitigating CVD risk, yet they also point out the ambiguity surrounding optimal treatment thresholds. This uncertainty is a critical issue in clinical practice, as it influences treatment decisions and patient outcomes.

A key finding of the study is the assertion that lower BP treatment targets, particularly a systolic BP of less than 120 mmHg, can lead to significantly reduced rates of MCEs and all-cause mortality, even among elderly hypertensive patients. This conclusion is supported by findings from the NIH Systolic Blood Pressure Intervention Trial (SPRINT), which the authors reference to bolster their argument for more aggressive BP management in this demographic.

The article also discusses the implications of these findings for current hypertension guidelines, suggesting that existing recommendations may need re-evaluation in light of the evidence presented. The authors argue for a shift towards more intensive BP control strategies, which they assert are effective, well-tolerated, and safe. This perspective is particularly relevant given the increasing prevalence of hypertension in aging populations and the associated healthcare burden.

In terms of critical evaluation, while the article provides a robust analysis of the benefits of BP reduction, it could benefit from a more detailed discussion of potential risks associated with intensive treatment, especially in older adults who may have comorbidities. Additionally, the authors could have explored the variability in individual responses to BP treatment, which may complicate the establishment of a universal target.

The article by (Leontsinis et al., 2020) provides a comprehensive overview of hypertension (HTN) as a significant risk factor for cardiovascular morbidity and mortality, emphasizing its global prevalence and the public health implications

associated with elevated blood pressure (BP). The authors highlight that HTN affects a substantial portion of the adult population, with estimates ranging from 30% to 45%, and stress that it remains a leading contributor to premature death and disability-adjusted life years. This framing sets a crucial context for understanding the importance of systolic blood pressure (SBP) reduction in mitigating cardiovascular risks.

The article delineates the varying definitions of hypertension across different guidelines, specifically contrasting the European Society of Cardiology/European Society of Hypertension (ESC/ESH) criteria with those of the American College of Cardiology/American Heart Association (ACC/AHA). The authors note that the ESC/ESH maintains a threshold of 140/90 mmHg, while the ACC/AHA has lowered the threshold to 130/80 mmHg. This discrepancy is significant as it may influence treatment approaches and public health strategies aimed at controlling HTN.

A critical evaluation of the material reveals that the authors effectively synthesize current research on the benefits of aggressive BP management. They reference the SPRINT study, which provides compelling evidence for the advantages of targeting lower BP levels in non-diabetic hypertensives. The findings from SPRINT indicate that such interventions can lead to reductions in all-cause mortality, cardiovascular events, and progression of cerebrovascular disease, thereby reinforcing the importance of SBP reduction in improving health outcomes.

The article titled "Heart diseases, hypertension and effects of antihypertensive medications: Is hypertension a true risk factor of heart diseases?" by (Nawata, 2022) provides a comprehensive examination of the relationship between blood pressure (BP) and cardiovascular diseases (CVD), underscoring the importance of systolic blood pressure (SBP) reduction as a critical factor in mitigating cardiovascular risk and mortality.

Nawata begins by contextualizing the ongoing Framingham Heart Study, which has been instrumental in establishing the link between modifiable risk factors—such as hypertension, obesity, and physical inactivity—and the prevalence

of CVD. This longitudinal study has revealed that most heart diseases are influenced by these modifiable factors, thus highlighting the potential for intervention. The author references the meta-analysis conducted by Lewington et al., which indicates a clear correlation between increasing SBP and diastolic blood pressure (DBP) with increased mortality from ischemic heart disease across various age groups. This evidence supports the assertion that higher blood pressure significantly contributes to heart disease mortality.

The article further discusses the findings from the Systolic Blood Pressure Intervention Trial (SPRINT), which involved a substantial cohort of participants with SBP levels of 130 mmHg or higher. The trial's results demonstrated that intensive treatment aimed at lowering SBP resulted in a marked reduction in both fatal and nonfatal major cardiovascular events compared to standard treatment protocols. This finding is pivotal as it provides empirical support for aggressive management of hypertension in at-risk populations.

Additionally, Nawata cites a meta-analysis by Ettehad et al., which synthesizes data from 123 studies to conclude that antihypertensive treatments effectively reduce the risk of CVD and associated mortality. Specifically, the analysis indicates that a reduction of 10 mmHg in SBP could lead to a 13% decrease in all-cause mortality. This statistic reinforces the critical role of BP management in public health strategies aimed at reducing cardiovascular morbidity and mortality.

Moreover, the Prospective Urban Rural Epidemiology (PURE) study, referenced in the article, further elucidates the relationship between various modifiable risk factors and CVD outcomes, involving a substantial population without prior CVD history. This study adds depth to the understanding of how lifestyle factors and hypertension interrelate in contributing to cardiovascular risk.

The article "Management of Hypertension With Non-pharmacological Interventions: A Narrative Review" by (Kodala et al., 2023) provides a comprehensive examination of the role of lifestyle modifications in managing hypertension (HTN) and its associated risks, particularly concerning cardiovascular

disease and mortality. The authors argue that HTN is a pervasive condition that, if left untreated, significantly increases the likelihood of serious cardiovascular complications, including coronary artery disease and stroke.

A critical insight from the article is the assertion that non-pharmacological interventions can effectively manage HTN while minimizing the reliance on medications that may carry adverse side effects. The authors emphasize that lifestyle changes—such as increased physical activity, dietary modifications, and stress management—are not only beneficial for blood pressure control but also promote overall health, thereby delaying the progression from prehypertension to full-blown HTN. This perspective is particularly salient given the increasing prevalence of HTN in the population and the associated healthcare costs.

The article highlights the significant relationship between systolic blood pressure levels and cardiovascular risk, noting that each 20 mmHg increase in systolic BP can double the risk of cardiovascular events. This statistic underscores the urgency of effective management strategies for HTN. The authors also point out that lifestyle modifications, such as weight loss, are crucial, especially for overweight and obese individuals, who experience accelerated vascular aging due to factors like inflammation and insulin resistance. This connection between obesity and HTN is well-documented, and the article effectively reinforces the need for targeted interventions in this demographic.

Moreover, the narrative review discusses the multifaceted nature of lifestyle modifications, emphasizing that adherence to these changes is essential for sustained benefits. The authors acknowledge that while initiating lifestyle changes can be challenging, continuous support and education can enhance adherence and improve outcomes for patients with HTN.

CONCLUSION

The reviewed literature presents a comprehensive examination of the relationship between systolic blood pressure (SBP) reduction and the risk of cardiovascular disease (CVD) and mortality. The findings across various studies

underscore the critical importance of managing SBP, particularly in vulnerable populations, to mitigate cardiovascular risks and improve patient outcomes.

The initial study by (Dinesh Jani et al., 2016) highlights the dual role of elevated SBP and depressive symptoms as independent predictors of major adverse cardiovascular events (MACE) in patients with cardiometabolic disease. This suggests that monitoring SBP in conjunction with mental health status is essential for improving cardiovascular outcomes. Following this, (Park, 2018) conducted a systematic review that established a clear association between blood pressure lowering and reduced mortality and cardiovascular events, particularly in intermediate-risk individuals without prior cardiovascular disease, thus reinforcing the necessity for targeted treatment strategies.

Further emphasizing the need for careful management, (Thomas Manapurathe et al., 2019) examined the implications of hypertension in patients with peripheral artery disease (PAD), demonstrating that antihypertensive treatment could reduce cardiovascular events significantly. However, the ongoing debate about optimal SBP targets in this population highlights the complexity of treatment strategies. Complementarily, (Sobieraj et al., 2019) raised concerns regarding the risks associated with excessively low diastolic blood pressure, suggesting that while aggressive SBP reduction can be beneficial, it must be approached cautiously.

The systematic review by (Baffour-Awuah et al., 2020) further supports the argument for lower BP treatment targets in older adults, linking lower SBP levels with reduced rates of major cardiovascular events and mortality. This aligns with the findings from (Leontsinis et al., 2020), which emphasized the global burden of hypertension and the need for aggressive management strategies.

In recent contributions, (Nawata, 2022) reinforced the connection between SBP reduction and lower cardiovascular risk, while (Kodela et al., 2023) highlighted the effectiveness of non-pharmacological interventions in managing hypertension. These lifestyle modifications not only aid in controlling blood

pressure but also reduce reliance on medications, thus improving overall health outcomes.

In conclusion, the literature collectively emphasizes the necessity for a nuanced approach to SBP management, considering individual patient profiles and the potential risks associated with both high and low blood pressure levels. The evidence supports the assertion that effective SBP reduction is pivotal in lowering the risk of cardiovascular disease and mortality, necessitating tailored management strategies that integrate both pharmacological and lifestyle interventions.

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REFERENCES

1. Dinesh Jani, B., Cavanagh, J., J.E. Barry, S., Der, G., Sattar, N., & S. Mair, F., 2016. Relationship between blood pressure values, depressive symptoms and cardiovascular outcomes in patients with cardiometabolic disease. [PDF]
2. Park, S., 2018. Management plans for populations with normal-to-hypertensive blood pressures: risks and benefits of antihypertensive drug treatment in populations previously defined as having high-normal blood pressure. ncbi.nlm.nih.gov
3. Thomas Manapurathe, D., Vaughan Moxon, J., Murali Krishna, S., Rowbotham, S., Quigley, F., Jenkins, J., Bourke, M., Bourke, B., E. Jones, R., & Golledge, J., 2019. Cohort Study Examining the Association Between Blood Pressure and Cardiovascular Events in Patients With Peripheral Artery Disease. ncbi.nlm.nih.gov

4. Sobieraj, P., Lewandowski, J., Siński, M., & Gaciong, Z., 2019. Low on-treatment diastolic blood pressure and cardiovascular outcome: A post-hoc analysis using NHLBI SPRINT Research Materials. ncbi.nlm.nih.gov
5. Baffour-Awuah, B., Dieberg, G., J. Pearson, M., & A. Smart, N., 2020. Blood pressure control in older adults with hypertension: A systematic review with meta-analysis and meta-regression. ncbi.nlm.nih.gov
6. Leontsinis, I., Mantzouranis, M., Tsioufis, P., Andrikou, I., & Tsioufis, C., 2020. Recent advances in managing primary hypertension. ncbi.nlm.nih.gov
7. Nawata, K., 2022. Heart diseases, hypertension and effects of antihypertensive medications: Is hypertension a true risk factor of heart diseases?. ncbi.nlm.nih.gov
8. Kodela, P., Okeke, M., Guntuku, S., Sai Pavan Lingamsetty, S., & Slonovschi, E., 2023. Management of Hypertension With Non-pharmacological Interventions: A Narrative Review. ncbi.nlm.nih.gov