Original Article

Depression, Perfectionism, and Hypertension in the Elderly: A Path Analysis Examining Worry, Ambiguity Tolerance, and Problem-Solving

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A B S T R A C T

Introduction: Hypertension is a prevalent condition among the elderly, significantly contributing to the burden of cardiovascular disease and related complications. This study examined how depression and perfectionism influence hypertension in older adults. It also explored how worry, tolerance for ambiguity, and problem-solving skills might influence this relationship.

Methods: Researchers recruited 192 participants with hypertension from a health center in Khoy city, Urmia, Iran. Participants completed questionnaires that assessed depression, perfectionism, worry, ambiguity tolerance, and problem-solving skills. Statistical methods were used to analyze the data and identify relationships between these factors and hypertension.

Results: Depression, perfectionism, worry, and ambiguity tolerance were all significantly associated with hypertension. Interestingly, problem-solving skills were not linked to blood pressure. Further analysis revealed that worry played a reinforcing role in the link between depression/perfectionism and hypertension, while ambiguity tolerance had a protective effect. In other words, higher worry levels strengthened the association between depression/perfectionism and high blood pressure, while greater tolerance for ambiguity lessened this association.

Conclusion: These findings suggest that emotional factors like worry and intolerance for ambiguity can significantly impact blood pressure in older adults. Therefore, managing these emotions alongside depression and perfectionistic tendencies may be crucial for controlling hypertension.

Keywords: Hypertension, Worry, Depression, Perfectionism, Ambiguity Tolerance

Introduction

High blood pressure is a common and serious health concern for older adults, significantly impacting their well-being and quality of life (1, 2). As the population ages globally, understanding the link between psychological factors and hypertension in this group becomes increasingly important (3). This is particularly relevant in Iran, where hypertension is rising and poses a significant physical, financial, and emotional burden (4).

Depression, characterized by persistent sadness, hopelessness, and loss of interest, may contribute to developing and worsening hypertension (5). Older adults often face challenges like loss, declining health, and social isolation, which can trigger or worsen depression (6, 7). Interestingly, research suggests a connection between lower depression scores and lower blood pressure in younger adults, even considering lifestyle factors (8).

Perfectionism, a personality trait characterized by setting extremely high standards, self-criticism, and a fear of mistakes, may also play a role in hypertension (9). The constant pressure to meet unrealistic expectations and the fear of failure associated with perfectionism can contribute to chronic stress and negative emotions, potentially impacting blood pressure regulation (10). Studies have shown that individuals with higher standards tend to have more stable systolic blood pressure (the upper pressure reading), while those with lower standards may experience declines. Similarly, higher self-critical perfectionism is linked to sustained diastolic blood pressure (the lower reading), whereas lower self-criticism is associated with decreases (11).

Beyond depression and perfectionism, emotional factors like worry and tolerance for ambiguity might also influence blood pressure. Excessive worry can lead to chronic stress responses and increase blood pressure (12). Conversely, the ability to tolerate uncertain or ambiguous situations (ambiguity tolerance) might be protective. Individuals with low tolerance may experience higher stress and physiological arousal, contributing to hypertension (13). Problem-solving skills, encompassing the ability to effectively manage challenges, may also influence the relationship between psychological factors and blood pressure by reducing stress and emotional distress (14).

This study employs a path analysis approach to explore these complex relationships in older adults. Path analysis allows us to examine both direct and indirect effects, providing a more comprehensive picture of the underlying mechanisms (15). By examining how depression and perfectionism might contribute to hypertension in the elderly, and the potential mediating role of worry, ambiguity tolerance, and problem-solving ability, we aim to gain insights into the psychological factors influencing blood pressure in this population.

Understanding the role of these psychological factors has significant implications for preventing and treating hypertension in older adults. By identifying the specific mechanisms at play, healthcare professionals can develop targeted strategies to reduce the risk and manage hypertension more effectively. Interventions addressing depression, perfectionism, worry, ambiguity tolerance, and problem-solving skills may hold promise for improving blood pressure regulation and overall cardiovascular health in older adults.

Furthermore, this study contributes to the growing body of research on the psychological aspects of hypertension, particularly in elderly populations. By investigating the specific pathways through which these variables interact, we expand our understanding of the complex interplay between psychological factors and blood pressure. It also highlights the importance of considering multiple psychological factors simultaneously, as they may interact and have cumulative effects on blood pressure regulation.

Methods

Study design and participants

This study employed a descriptive correlational design. The target population included all individuals with hypertension who visited the Motahari and Samadzadeh Health Center in Khoy city, Urmia, Iran during 2023.

To determine the sample size, we used the Green's formula ($N \geq 8M + 50$). This formula considers the number of predictor variables (M) in the study (16, 17). Based on this formula, the minimum recommended sample size for correlation studies is at least 90. To ensure greater certainty, we recruited 192 participants. Participants were selected using a convenience sampling method. The only inclusion criterion was being over 60 years old.

Measures

Beck Depression Inventory (BDI): This 21-question self-report questionnaire assesses the severity of depression symptoms. It has a high ability to distinguish between normal and depressed individuals (18). Scores range from 0 to 63, with higher scores indicating greater depression severity. Scores are interpreted as follows:
0-13 : No depression
14-19 : Mild depression
20-28 : Moderate depression
29+ : Severe depression
The BDI has demonstrated good reliability and validity in both the original English version and the Farsi translation used in this study (18-20).

Penn State Worry Questionnaire (PSWQ): Developed in 1990, the PSWQ is a 16-item self-assessment tool used to measure general worry tendency. Scores range from 0 to 64, with higher scores indicating greater worry. The PSWQ has established reliability and validity in both English and Farsi (21).

Problem-Solving Inventory (PSI): This 35-item questionnaire assesses how individuals perceive and approach their problems (22). Scores range from 0 to 175, with higher scores indicating more adaptive problem-solving skills. The PSI has shown good reliability and validity in previous research (22- 24).

McLean Ambiguity Tolerance Questionnaire: This 22-item questionnaire measures an individual's tolerance for uncertainty or ambiguity (25). Scores range from 22 to 110, with higher scores indicating greater ambiguity tolerance. The McLean Ambiguity Tolerance Questionnaire has demonstrated good reliability and validity in both English and Farsi (25- 27).

Tehran Multidimensional Perfectionism Scale (TMPS): This 30-item questionnaire assesses three dimensions of perfectionism: self-oriented, other-oriented, and community-oriented (28). Scores range from 10 to 50 for each subscale, with higher scores indicating stronger perfectionist tendencies in that domain. The TMPS has shown good reliability and validity in the Farsi language (28).

Blood pressure measurement tool

Littmann class 2 stethoscope and Riester sphygmomanometer were used to measure blood pressure. In order to measure the blood pressure, the nurse measured the blood pressure on two occasions with a time interval of approximately 5 minutes with the

mentioned instruments and the average of these two blood pressures was recorded.

Statistical analysis

Data analysis was performed using SPSS-24 software for initial analyses and AMOS-26 software for path analysis. Before conducting statistical tests, the data was screened for missing values and outliers. No missing data points were identified. Univariate outliers, assessed using boxplots, were corrected by considering values outside the range of one standard deviation from the mean. Multivariate outliers were analyzed using Mahala Nobis distances, and none were identified based on the criteria outlined by Mears, et al (29).

Pearson's correlation coefficients were calculated to assess the relationships between the study variables. Multivariate regression analysis was conducted to predict blood pressure. Path analysis was used to examine the hypothesized relationships between the variables and their influence on blood pressure.

Ethical considerations

This study adhered to ethical principles including confidentiality and informed consent. The study protocol was reviewed and approved by the Ethics Committee of Islamic Azad University, Urmia Branch (ethics identifier: IR.IAU.URMIA.REC.1402.091).

Results

The sample consisted of 192 participants, with 45 (23.2%) being single and 147 (76.8%) married. There were 112 women (57.7%) and 80 men (42.3%). The average age of the participants was 64 years old (standard deviation = 3 years). (Table 1)

All correlations were statistically significant (p < 0.05), as shown in table 2. Ambiguity tolerance had the strongest negative correlation with blood pressure (r = -0.88), while problem-solving had the weakest negative correlation with perfectionism (r = -0.26).

Results indicated that problem-solving was not a significant predictor of blood pressure. (Table 3) Therefore, problem-solving was excluded from further analysis in the path model.

The results of path analysis showed a good model fit, with the RMSEA index below 0.05 and GFI, CFI, NFI, and IFI indices all exceeding 0.90. These findings suggest that the proposed model adequately explains the data. Perfectionism directly and indirectly (through its influence on ambiguity tolerance and worry) predicts hypertension. Depression directly and indirectly (through its influence on ambiguity tolerance and worry) predicts hypertension.

Worry and ambiguity tolerance are significant predictors of hypertension, with worry influencing blood pressure through ambiguity tolerance. Figure 1 visually depicts the path model with standardized coefficients.

Table 1. Descriptive indicators of demographic data of the studied sample

Variables		Frequency (Mean)	Percent (St D.)
Marriage	Married	149	76.8%
	Single	45	23.2%
Gender	Male	82	42.3%
	Female	112	57.7%
Blood Pressure	Systolic	(145.7 mm-Hg)	(± 4.5)
	Diastolic	(93.2 mm-Hg)	(± 5.2)

Table 2. Correlations matrix for depression, perfectionism, hypertension, worry, ambiguity tolerance and problem-solving

Variables	Blood pressure	Perfectionism	Ambiguity tolerance	Worry	Depression
Perfectionism	0.659**				
Ambiguity tolerance	-0.887**	-0.482**			
Worry	0.895**	0.384**	-0.854**		
Depression	0.486**	0.589**	-0.624**	0.754**	
Problem-solving	-0.345**	-0.264*	0.412**	-0.477**	-0.417**

Table 3. Multivariate regression- prediction of hypertension with depression, perfectionism, worry, ambiguity tolerance and problem-solving

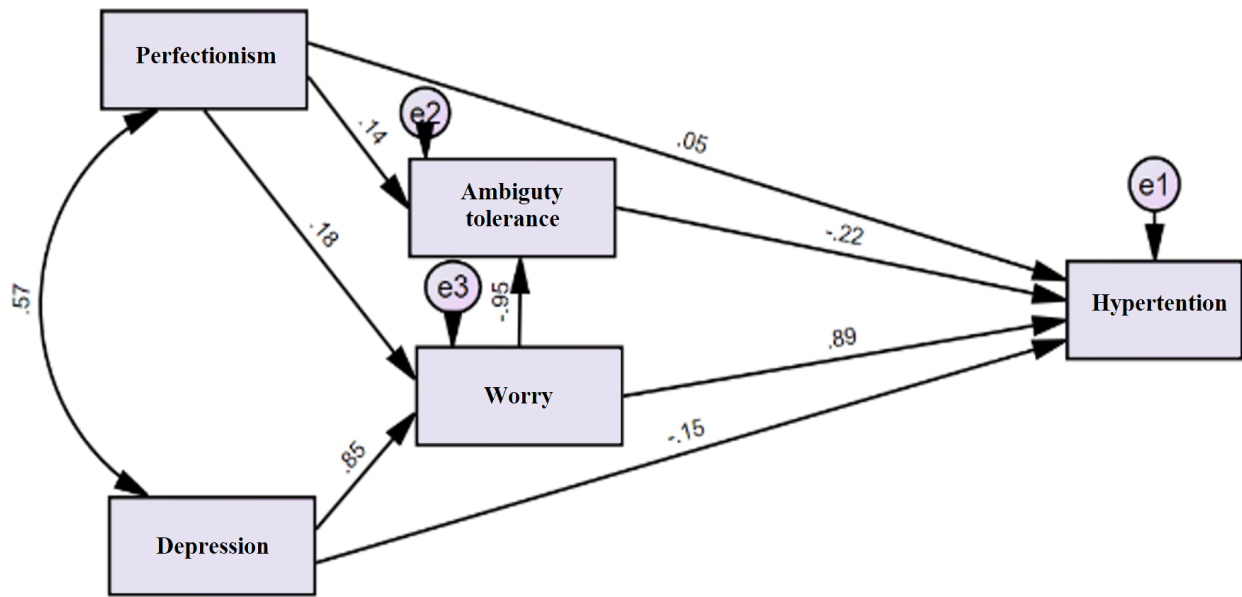| Independent variables	Dependent variable.	B	Standard Beta	T	p	R	R^2
Perfectionism	**Blood pressure**	0.01	0.04	2.46	0.015		
Ambiguity tolerance		-0.06	-0.22	-7.98	0.001		
Worry		0.40	0.89	15.13	0.001	0.98	0.96
Depression		-0.07	-0.14	-3.15	0.002		
Problem-solving		0.00	0.01	0.71	0.474		

Figure 1. Path analysis model with standard coefficients for depression, perfectionism, hypertension, worry, ambiguity tolerance and problem-solving

Discussion

This study investigated the role of emotional factors (worry, depression), personality traits (perfectionism), and problem-solving abilities in predicting hypertension in older adults, considering the potential mediating effects of ambiguity tolerance. Our findings revealed that problem-solving ability was not a significant predictor of blood pressure and was therefore excluded from further analyses. However, worry, depression, ambiguity tolerance, and perfectionism all played significant roles in hypertension.

These results align with previous research by Albert et al., (11) and Bhat et al., (8). Bhat et al., found an inverse relationship between depression and anxiety scores with hypertension in young adults, partially consistent with our findings for depression but not anxiety. In contrast, our study showed a positive association between worry and hypertension. Additionally, our findings support Albert et al.'s observation that high levels of perfectionistic self-criticism are linked to elevated blood pressure.

The significant role of perfectionism in hypertension can be explained by the constant stress and pressure associated with striving for unrealistic standards. This stress can directly elevate blood pressure. Perfectionism also has an indirect effect through its influence on ambiguity tolerance and worry. Low tolerance for uncertainty and constant worry can exacerbate stress, ultimately leading to increased blood pressure.

Similarly, depression can directly and indirectly affect hypertension through ambiguity tolerance and worry. Depression can directly elevate blood pressure by creating negative emotions and reducing physical activity. Moreover, depression can indirectly increase blood pressure by heightening worry and lowering ambiguity tolerance. Depressed individuals may experience more worry and less tolerance for ambiguity, both of which contribute to higher blood pressure.

Our study also identified worry and ambiguity tolerance as independent predictors of hypertension. Chronic worry can lead to sustained stress, increasing the risk of hypertension. Individuals with low ambiguity tolerance may experience heightened stress in uncertain situations, further contributing to hypertension. Interestingly, our findings suggest that ambiguity tolerance acts as a mediating variable between worry and hypertension. This implies that worry's impact on blood pressure is partially mitigated by higher ambiguity tolerance. Therefore, improving ambiguity tolerance might be a way to reduce the negative effects of worry on blood pressure.

Conclusion

This study highlights the importance of considering psychological factors and stress management in preventing and controlling hypertension in older adults. Our findings suggest that interventions targeting ambiguity tolerance and worry reduction, alongside traditional blood pressure management strategies, could be effective in lowering blood pressure and improving cardiovascular health. Additionally, these results can inform the development of chronic disease management programs aimed at improving health outcomes and reducing complications associated with hypertension. Future research should explore the effectiveness of interventions designed to improve ambiguity tolerance and manage worry in older adults with hypertension.

Study limitations

This study has some limitations that are important to consider. First, the sample population was restricted to individuals from Khoy city, limiting the generalizability of the findings. To strengthen the generalizability, future

research should replicate this study in other regions of the country with more diverse samples. Additionally, employing a multi-center approach in future studies could enhance the robustness of the results.

Despite these limitations, this study provides valuable insights into the role of psychological factors in hypertension among older adults. Based on these findings, incorporating psychological interventions alongside traditional medical treatments might be beneficial for managing blood pressure and reducing hypertension-related complications. Addressing worry, depression, and their mediating factors could offer a more holistic approach to improving health outcomes in this population.

Conflict of interest

The authors declare no conflicts of interest.

Authors' contributions

All authors significantly contributed to the design and conceptualization of this work. The second author (SA) was responsible for conducting the statistical analysis of the data. The third (KB) and fourth (NA) authors were responsible for drafting the manuscript. All of the authors reviewed the manuscript critically for important intellectual content; and approved the final version to be published; and agreed to be accountable for all aspects of the work.

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