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The Association between Hypertension and Depression and Anxiety: A Systematic Review

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Abstract:

Background: Hypertension (HTN) is a prevalent condition worldwide, and its association with mental health conditions, specifically depression and anxiety, has been a topic of increasing interest in the medical community.

Objective: This systematic review aimed to elucidate the relationship between hypertension and the prevalence of depression and anxiety, exploring various factors that might influence this association.

Methodology: Adhering to the PRISMA guidelines, a comprehensive search was conducted in October 2023, primarily using PubMed. The search focused on studies published in English that investigated the relationship between anxiety, depression, and blood pressure. Specific inclusion and exclusion criteria were established to ensure the relevance and quality of the studies reviewed.

Results: The review encompassed diverse studies from various geographical locations, with a predominant focus on middle-aged participants. A consistent trend emerged, highlighting a significant proportion of hypertensive patients suffering from depression and/or anxiety. External factors, such as physical activity and dietary habits, were identified as influential in the mental well-being of these individuals. Gender disparities were also observed, with females often presenting higher risks for depression and anxiety among hypertensive patients.

Conclusion: The intertwined nature of hypertension and mental health conditions is evident across different populations and settings. Factors such as regular physical activity and balanced diet can improve mental health in such patients. A holistic approach to patient care, emphasizing both physical and mental well-being, is crucial for optimal health outcomes.

Keywords; "Association," "Hypertension," “Depression,” “Between” and " Anxiety”

Introduction:

Hypertension, commonly referred to as high blood pressure, is a pervasive medical condition that is estimated to affect over 1.13 billion individuals globally [1]. Traditionally recognized for its detrimental effects on cardiovascular health, untreated hypertension is a key risk factor for severe conditions such as heart attacks, strokes, and renal disease [2]. On a parallel note, mental health disorders, especially depression and anxiety, have been the subject of increasing global concern. With over 264 million individuals affected by depression and countless others by various anxiety disorders, the gravity of these conditions is undeniable [3].

The potential interplay between mental and physical health has garnered significant attention in the realm of medical and psychological research. With numerous biopsychosocial mechanisms underlying both hypertension and mood disorders, understanding any association between them is paramount. An increasing body of evidence suggests that people with hypertension might be at a heightened risk for the onset of mood disturbances like

depression and anxiety [4]. Such findings emphasize the importance of comprehensive healthcare approaches that consider both the physiological and psychological dimensions of an individual's well-being.

The intricate relationship between physical and mental health has been a focal point of health research for decades. A burgeoning body of evidence points towards a reciprocal relationship between the two, suggesting that not only can physical health complications lead to mental health issues, but mental health disorders can also have profound implications for one's physical well-being [5].

Research has found that individuals with chronic physical conditions, such as cardiovascular diseases, diabetes, or obesity, are at a significantly increased risk of developing mental health disorders like depression and anxiety [6]. For instance, patients with coronary artery disease have been found to have a two to three times higher likelihood of experiencing depression compared to the general population [7]. Similarly, diabetes, which affects millions globally, has been associated with a doubled risk of concurrent depression [8].

On the flip side, mental health disorders can significantly impact one's physical health. Depression, for example, has been linked to a 50% increase in the risk of mortality from cardiac events [9]. Moreover, those with severe mental illnesses such as schizophrenia or bipolar disorder have a 10–20-year reduction in life expectancy, largely attributed to physical health issues including cardiovascular diseases, metabolic disorders, and infectious diseases [10].

Behavioral factors also serve as intermediaries in this relationship. People with mental health disorders might be less likely to engage in health-promoting behaviors such as exercising, following a balanced diet, or adhering to medication regimens. They might also be more prone to substance abuse, which can exacerbate physical health issues [11]. Additionally, physiological mechanisms, including stress-induced inflammatory responses, can mediate the relationship between mental and physical health [12].

Although individual studies have explored the relationship between hypertension and mood disorders, there is a need to synthesize the vast amount of literature on this topic to discern consistent patterns and provide a more holistic understanding. This systematic review intends to bridge this gap by critically evaluating the existing literature, shedding light on the association between hypertension and the prevalence or exacerbation of depression and anxiety symptoms [13].

Methodology

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines was followed for this systematic review.

Study Design and Duration

This was a systematic review conducted in October 2023.

Search strategy

To retrieve the relevant research, a thorough search was conducted across major databases, Using PubMed Mainly as a search engine for studies. We only searched in English. The following keywords were converted into PubMed Mesh terms and used to find studies that were related; "Association," "Hypertension," “Depression,” “Between” and " Anxiety”." The Boolean operators "OR" and "AND" matched the required keywords. Among the search results were publications in full English language, freely available articles, and human trials.

Selection criteria

Inclusion criteria

We considered the following criteria for inclusion in this review:

- Studies that investigate relationship between Anxiety, Depression and Blood pressure
- Clinical Trials were included.
- Observational Studies were included.
- Free accessible articles.

Exclusion criteria

- We excluded systemic reviews.
- We excluded studies that focused on erectile dysfunction
- We excluded article reviews.
- We excluded meta-analysis.
- We excluded studies older than 3 years.
- We excluded studies focused on pulmonary arterial hypertension
- We excluded studies that focused only on specific populations (Ex: Police officers)
- Case reports, letters to the editors, and replies to conflicts were excluded.
- Non-English language.

Data extraction

Duplicates in the search strategy output were found using Rayyan (QCRI) [14]. To determine the titles' and abstract relevance, the researchers used a set of inclusion/exclusion criteria to filter the combined search results. The reviewers carefully read each paper that matches the requirements for inclusion. The authors provided other methods of resolving disputes with some thought. The authors extracted data about the study titles, authors, study year, country, participants, gender, diagnostic tool, main outcomes, and conclusion.

Strategy for data synthesis

Summary tables were created using information from pertinent research to give a qualitative overview of the results and study components. Following data extraction for the systematic review, the most effective strategy for utilizing data from the included study articles was selected.

Risk of bias assessment

Using the ROBINS-I risk of bias assessment approach for non-randomized trials of therapies, the included studies' quality was assessed [15]. The seven themes that were assessed were confounding, participant selection for the study, classification of interventions, deviations from intended interventions, missing data, assessment of outcomes, and choosing of the reported result.

Results

Search results

A total of 270 study articles resulted from the systematic search, and 84 were automatically removed. Title and abstract screening were conducted on 222 studies, and 103 studies were excluded. 119 studies were sought for retrieval, and only 83 articles were retrieved. Finally, 83 studies were screened for full-text assessment; 76 Studies were excluded for either having inappropriate study methodology or results. 7 eligible study articles were included in this systematic review. A summary of the study selection process is presented in **Figure 1.**

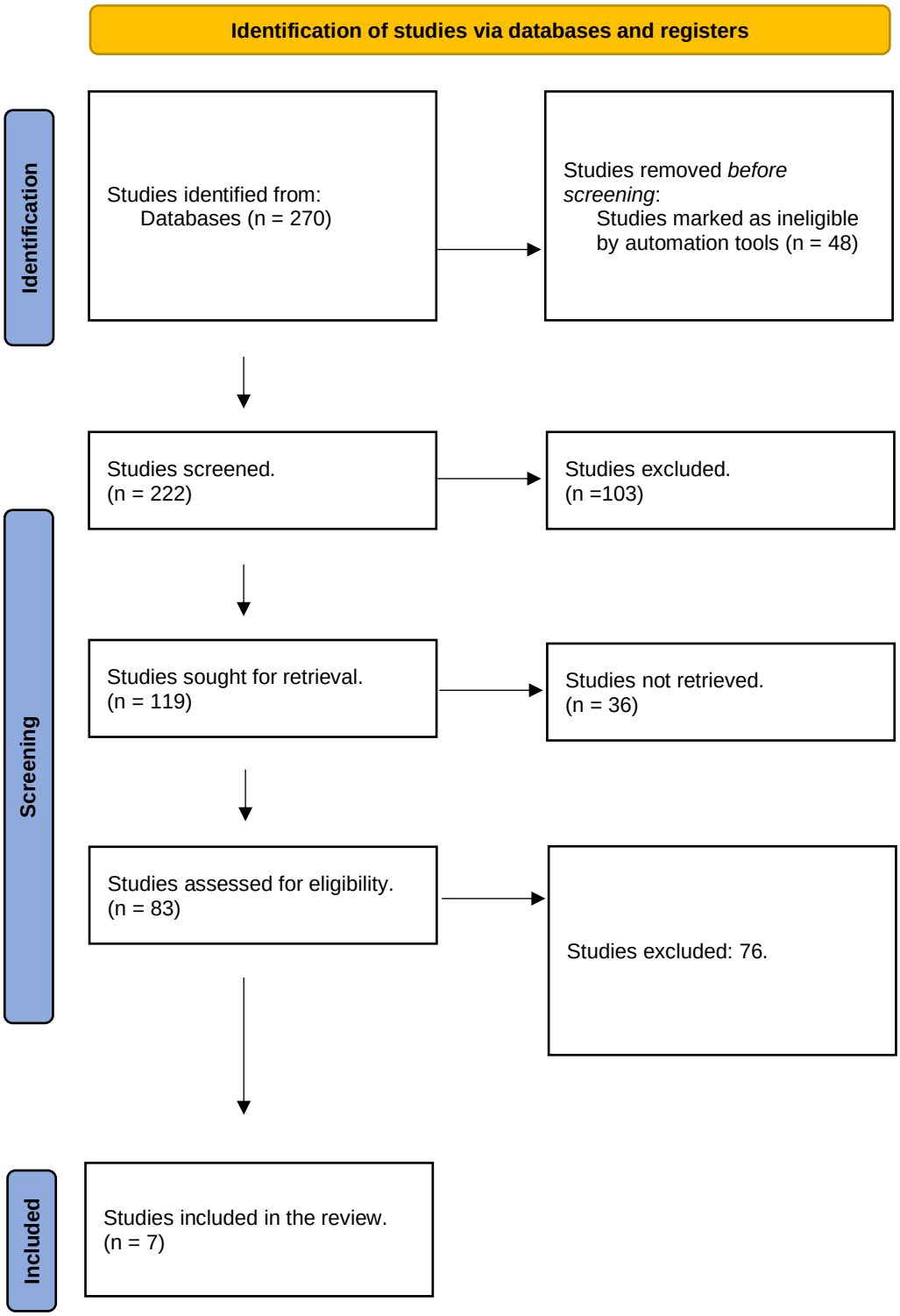

Figure (1): PRISMA flowchart summarizes the study selection process.

Characteristics of the included studies

Table 1: Sociodemographic Characteristics of Participants

Table (1) illustrates the sociodemographic details of participants from seven different studies, encapsulating a massive participant count of 74,290,094 from references [16-22], with exception of study [18] the number will be 4934 participants. The geographical breadth of these studies is expansive, encompassing countries such as India, Hungary, the USA, Ethiopia, Pakistan, Spain, and China.

Regarding the representation of males, Ranjan, R., et al. 2020 [16] exhibited the highest male percentage at 87%. Conversely, Nemcsik-Bencze, Z., et al. 2022 [17] recorded a male percentage of 43.5%, which was the lowest among the studies that provided gender data. Shah, R. M., et al. 2023 [18] and Denche-Zamorano, A., et al. 2023. [21] did not specify the gender ratio in their studies. Abdisa, L., Letta, S., & Nigussie, K. 2022 [19] noted a male representation of 51.2%, whereas Yousuf, F. S., et al. 2022 [20] documented a slightly lower percentage at 50.3%. Liu, Y., et al. 2021 [22] highlighted a significant male representation, standing at 62%.

All the studies reviewed implemented a cross-sectional design for their research methodology. In terms of participant age, while the age range was predominantly centered around the 50-year mark, there were variations. Specifically, Ranjan, R., et al. 2020 [16] reported an age range with a mean of 50.20 ±6.0 years. Nemcsik-Bencze, Z., et al. 2022 [17] detailed a mean age of 50.4 years, Abdisa, L., et al. 2022 [19] highlighted a mean age of 50 years, and Liu, Y., et al. 2021 [22] observed a slightly younger mean age of 46 years. Denche-Zamorano, A., et al. 2023 [21] solely indicated their participants' age to be over 15 years, while Shah, R. M., et al. 2023 [18] and Yousuf, F. S., et al. 2022 [20] did not provide specific age details.

Conclusively, from a broad perspective of all studies, the general trend points towards a primary focus on middle-aged participants with the mean age gravitating around the 50-year mark in the sociodemographic investigations presented in Table (1).

Table (2) Clinical Characteristics and Outcomes of the Included Studies:

Several studies examined the interplay between depression, anxiety, hypertension, and various associated factors. Ranjan, R., Nath, S., & Sarkar, S. (2020) [16], Abdisa, L., et al. (2022) [19], and Shah, R. M., et al. (2023) [18] delved into the prevalence of depression and anxiety among hypertensive patients. Ranjan et al. [16] found that a notable portion of patients with hypertension and/or diabetes showcased increased anxiety and depressive scores. This was echoed by Abdisa et al. [19] where over a quarter of hypertension patients in Eastern Ethiopia reported symptoms of both conditions. On the other hand, Shah et al. [18] unveiled that low-income adults in the U.S. who displayed symptoms of anxiety or depression were at an elevated risk of hypertension, especially if they were on medication for these mental conditions.

Nemcsik-Bencze, Z., et al. (2022) [17] and Yousuf, F. S., et al. (2022) [20] assessed the connection between hypertension and psychopathological parameters. While Nemcsik-Bencze et al. [17] found a psychopathological link between white-coat hypertension and resistant hypertension, Yousuf et al. [20] discovered no direct connection between depression or anxiety and hypertensive crisis. However, Yousuf et al. noted that approximately half of the patients with hypertensive crises showed symptoms of either depression or anxiety.

Denche-Zamorano, A., et al. (2023) [21] and Liu, Y., et al. (2021) [22] investigated the roles of physical activity and diet respectively. Denche-Zamorano et al. discerned that physically inactive hypertensive individuals exhibited higher rates of depression and anxiety and were more likely to be on medication. Conversely, physically active males outnumbered females, and females had more prevalent symptoms of these mental health conditions. In a dietary context, Liu et al. [22] deduced that a higher consumption of dietary fiber was inversely related to depression and anxiety scores in hypertensive patients.

In summation, a consistent trend emerges: hypertension has a significant correlation with symptoms of depression and anxiety. External factors like physical inactivity and diet can exacerbate or ameliorate these symptoms, suggesting that a comprehensive, multidimensional approach is required for optimal patient care.

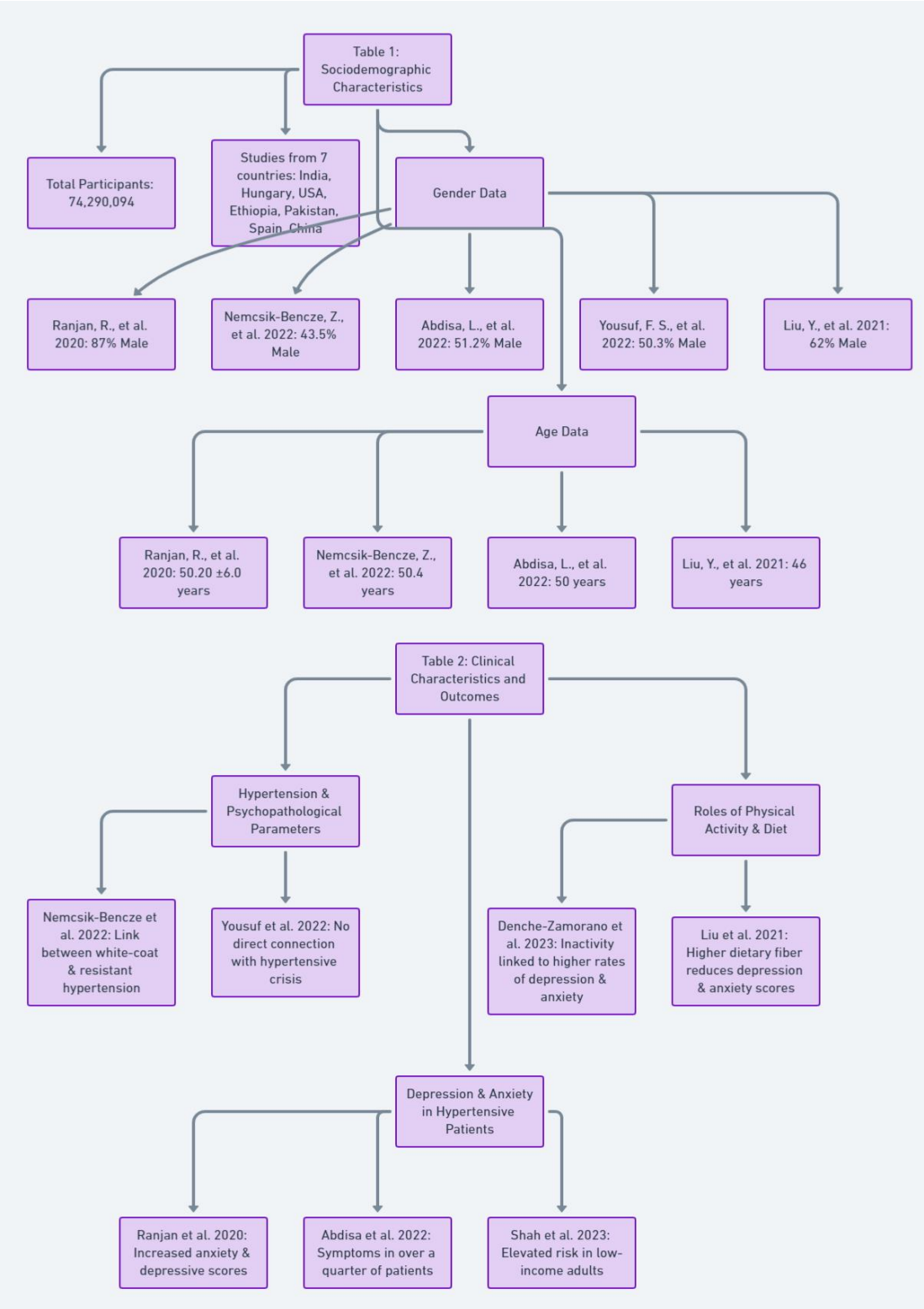

Figure (2) summarization of included studies:

Table (1): Sociodemographic characteristics of the included participants.

Study	Study design	Location	Participants	Age range (mean) in years	Males (%)
Ranjan, R., Nath, S., & Sarkar, S. (2020). [16]	Cross-sectional study	India	123	(50.20 ±6.0)	87%.
Nemcsik-Bencze, Z., et al. 2022 [17]	Cross-sectional study	Hungary	363	(50.4)	43.5%
Shah, R. M., et al. (2023) [18]	Cross-sectional study	USA	74,285,160	-	-
Abdisa, L., Letta, S., & Nigussie, K. (2022). [19]	Cross-sectional study	Ethiopia	471	(50)	51.2%
Yousuf, F. S., et al. 2022. [20]	Cross-sectional study	Pakistan	290	-	50.3%
Denche-Zamorano, A., et al. 2023. [21]	Cross-sectional study	Spain	3228	Over 15	-
Liu, Y., et al. (2021) [22]	Cross-sectional study	China	459	(46)	62%

Table (2): Clinical characteristics and outcomes of the included studies.

Study	Objective	Results	Outcomes/Conclusion
Ranjan, R., Nath, S., & Sarkar, S. (2020). [16]	aimed to evaluate the association between depression, anxiety, and quality of life in patients with DM and/or HTN.	The sample had 53.7% with HTN, 12.2% with diabetes, and 34.1% with both conditions. Mean HADS scores for anxiety and depression were 3.6 each. Approximately 10.6% and 17.1% of participants had scores surpassing the cutoff for HADS anxiety and depression respectively. The WHOQOL-BREF highest scores pertained to the environmental domain, with lower scores in psychological, physical, and social domains.	A significant portion of patients with HTN and/or diabetes exhibited heightened anxiety and depressive scores, indicating poor quality of life. This underscores the need for early detection of these mental health challenges in such patients to ensure comprehensive management.
Nemcsik-Bencze, Z., et al. 2022 [17]	aimed to examine psychometric parameters in patients with different hypertension phenotypes	Beck Depression Inventory (BDI) and the Hamilton Anxiety Scale (HAM-A) scores were notably higher in WhHT (White-coat hypertensive patients) and ResHT (Patients with chronic, resistant hypertension) groups when contrasted with Cont (Healthy controls). ResHT and WhHT displayed specific associations with	Findings indicate a psychopathological parallelism between white-coat hypertension and resistant hypertension, emphasizing a possible need for specialized

	compared to healthy controls.	certain HAM-A and BDI scale thresholds, suggesting a correlation between hypertension types and anxiety/depression levels.	interventions to enhance patient outcomes in these categories.
Shah, R. M., et al. (2023) [18]	aimed to determine associations between symptoms of depression/anxiety and hypertension status in low-income participants using data from the 2017–2018 NHANES.	Participants who reported taking medications for depression or anxiety were more likely to have hypertension. Those who experienced depressive feelings daily, monthly, and a few times a year, as well as those with daily and weekly anxiety symptoms, showed a higher likelihood of hypertension.	Low-income adults in the U.S. displaying symptoms of anxiety or depression are at a higher risk of hypertension. Moreover, those taking medications for these mental health disorders are more likely to be diagnosed with hypertension.
Abdisa, L., Letta, S., & Nigussie, K. (2022). [19]	aimed to determine the prevalence and associated factors of depression, and anxiety symptoms among people with hypertension in public hospitals of Eastern Ethiopia.	27.2% of participants showed symptoms of depression and 32.7% showed symptoms of anxiety. Several factors like gender, education level, presence of other medical illnesses, family history of depression, and social support level were linked with these symptoms.	Over a quarter of people with hypertension in the studied population reported symptoms of depression and anxiety. Female gender, additional medical illnesses, and poor social support were notable risk factors
Yousuf, F. S., et al. 2022. [20]	investigated the relationship between depression or anxiety and hypertensive crisis in patients, considering the effects of age and gender.	40 (48.3%) of the patients had a hypertensive crisis. 60 (49.3%) of those with a hypertensive crisis showed signs of depression and 83 (59.3%) showed signs of anxiety. Depression and anxiety were most prevalent in the 61-75 age group among these patients. Both genders had similar anxiety rates, while females showed a slightly higher rate of depression.	No direct link between depression or anxiety and hypertensive crisis was identified, and this link was unaffected by age or gender. Yet, about half of the patients with hypertensive crises demonstrated symptoms of either depression or anxiety.
Denche-Zamorano, A., et al. 2023. [21]	aimed to understand the associations between Depression and Anxiety prevalence, medication usage for these disorders, and Physical Activity Level (PAL) in individuals diagnosed with Hypertension (HTN)	People with HTN showed dependence between Depression and Anxiety prevalence, medication use, and their PAL. Inactivity was associated with higher rates of Depression and Anxiety, along with increased medication use. Physically active males outnumbered females, while women had a higher prevalence of Depression, Anxiety, and related medication use.	Physical inactivity in hypertensive individuals is linked with a higher prevalence of Depression and Anxiety, as well as increased medication usage. Maintaining higher levels of physical activity correlates with better mental health outcomes in this population.
Liu, Y., et al. (2021) [22]	aimed to understand the association	atients were studied with a daily DFI of 10.4 g. Incidences of hypertension combined with	Higher consumption of dietary fiber was

	between dietary fiber intake (DFI) and the incidence of depression and anxiety in hypertensive patients.	depression and anxiety were 19.6% and 18.5%, respectively. Higher DFI showed significant associations with lower depression and anxiety scores.	identified as a protective factor against depression and anxiety in hypertensive patients.

Discussion:

The studies presented here shed light on the intricate relationship between hypertension (HTN) and mental health conditions, specifically depression and anxiety. The interplay between these conditions is multifaceted, and the studies provide valuable insights into the prevalence, associated factors, and potential implications for patient care.

Comprehensive overview of the sociodemographic characteristics of participants from seven studies, collectively involving over 74 million participants from diverse countries including India, Hungary, the USA, Ethiopia, Pakistan, Spain, and China. The studies, all employing a cross-sectional design, revealed a predominant focus on middle-aged participants, with ages centering around the 50-year mark. Gender representation varied across studies, with Ranjan et al. (2020) [16] showing the highest male percentage at 87% and Nemcsik-Bencze et al. (2022) [17] recording the lowest at 43.5%. The data underscores the extensive geographical and demographic breadth of research into hypertension and associated conditions.

Ranjan et al. (2020) [16] embarked on a comprehensive exploration of the connection between depression, anxiety, and the quality of life among individuals diagnosed with diabetes mellitus (DM) and/or HTN. The study revealed that a significant fraction of individuals with these conditions manifested higher scores for anxiety and depression. This directly correlated with a diminished quality of life, particularly in the physical and psychological domains of the WHOQOL-BREF evaluation. Notably, females presented significantly higher depression scores compared to males. This finding is consistent with Abdisa et al. (2022) [19], where females were found to be at a higher risk for both depression and anxiety symptoms among hypertensive patients in Eastern Ethiopia. The gender disparity in the prevalence of these mental health conditions underscores the need for gender-specific interventions and strategies in managing patients with HTN.

Nemcsik-Bencze et al. (2022) [17] provided a unique perspective by focusing on specific subtypes of hypertension: white-coat hypertension (WhHT) and resistant hypertension (ResHT). Their findings illuminated a significant psychopathological connection between these subtypes and elevated scores on the BDI and HAM-A scales, which assess depression and anxiety, respectively. This is particularly intriguing given recent discoveries that WhHT is not a benign condition. The results from this study emphasize the potential importance of early interventions tailored to these hypertension subtypes.

Shah et al. (2023) [18] took a different approach by evaluating the potential links between depression and anxiety symptoms and the diagnosis of hypertension among low-income participants in the United States. Their findings indicate a considerable association between these mental health symptoms and the likelihood of hypertension. Notably, respondents who were on medication for these conditions or exhibited symptoms had a higher probability of being diagnosed with hypertension. This suggests that there might be an underlying physiological or behavioral mechanism that connects mental health conditions and hypertension, especially among low-income populations.

Abdisa et al. (2022) [19] conducted a study in Eastern Ethiopia, aiming to understand the co-occurrence of depression and anxiety among hypertensive patients. The study found a significant proportion of these patients suffering from either depression, anxiety, or both. Notably, being female, having another medical illness, and receiving poor social support were identified as significant risk factors. This aligns with the findings of Ranjan et al. (2020) [16], where females presented with higher depression scores. The emphasis on the need for regular screening and targeted interventions, especially for high-risk groups, is a recurring theme in both studies.

Yousuf et al. (2022) [20] took a slightly different approach by focusing on the potential association between depression or anxiety and the onset of hypertensive crisis. Interestingly, while there was a high prevalence of depression and anxiety symptoms among patients with hypertensive crises, the study did not find a direct correlation between these mental health conditions and the hypertensive crisis itself. This suggests that while there might be a co-occurrence, one does not necessarily cause the other. The study also highlighted the need for more extensive research to fully understand this association.

Denche-Zamorano et al. (2023) [21] explored the correlations between depression, anxiety, medication usage, and physical activity levels among hypertensive individuals. The study underscored the pivotal role of physical activity in promoting mental health. Inactivity was closely associated with heightened risks of depression and anxiety and a consequential rise in medication usage. This is particularly noteworthy as it suggests that promoting physical activity could be a significant strategy for better mental health outcomes in hypertensive individuals. The findings resonate with the broader understanding of the benefits of physical activity on mental well-being.

Lastly, Liu et al. (2021) [22] delved into the impact of dietary fiber intake on the mental health of hypertensive patients. The study found a protective quality to consuming higher amounts of dietary fiber. Specifically, those with higher fiber intake seemed to have a reduced likelihood of suffering from depression and anxiety. This aligns with the growing body of research suggesting the potential role of gut health, influenced by dietary habits, in mental well-being.

In comparing the outcomes of these studies, several themes emerge. Firstly, there's a consistent trend of a significant proportion of hypertensive patients suffering from depression and/or anxiety across different populations and settings. Secondly, external factors, such as physical activity and dietary habits, play a crucial role in influencing the mental well-being of these individuals. The studies collectively highlight the importance of a holistic approach to patient care, which not only addresses the physical manifestations of hypertension but also the associated mental health challenges.

Conclusion:

In conclusion, the studies reviewed provide compelling evidence of the intertwined nature of hypertension and mental health conditions. The consistent findings across diverse populations and settings underscore the global relevance of this issue. Healthcare providers and policymakers need to recognize the importance of a holistic approach to patient care, which not only addresses the physical manifestations of hypertension but also the associated mental health challenges. Early identification, regular screening, and comprehensive management of these conditions can significantly improve the quality of life and overall well-being of affected individuals.

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