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Research Article

ADDRESSING HYPERTENSION IS CRUCIAL TO MITIGATING COGNITIVE DECLINE AND IMPROVING PATIENTS' QUALITY OF LIFE

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Abstract
Hypertension, a condition characterized by persistent elevated blood pressure, often places individuals at risk of developing complications that can adversely impact their quality of life. One notable complication associated with hypertension is cognitive dysfunction. A study published in the Journal of Alzheimer's Disease (2020) demonstrated that individuals with long-standing hypertension exhibited an elevated risk of developing cognitive impairment and Alzheimer's disease. Preliminary research suggests that approximately 12.5 percent of hypertensive deaths may be attributable to underlying factors. Aims: This study aims to examine the cognitive deficits in patients with hypertension and summarise research on the relationship between hypertension and cognitive impairment. This analytical research study with a cross-sectional design, total sample of 84 individuals who suffer from hypertension, the ages of 60 and 79 years old. The sample selected using purposive sampling, instruments used in this study were medical record and Mini Mental State Examination (MMSE) questionnaire. The data was analyzed univariate and bivariate with the Chi Square statistical test. The MMSE cognitive function test revealed that out of 84 individuals with hypertension, 67.85% had normal cognitive function, while 32.14%) moderate cognitive impairment. The sample for the research consisted of 40 male individuals (47.61%) and 44 female individuals (52.38%). Hypertension can affect a person's cognitive function which has an impact on quality of life.

Keywords: Cognitive Deficit, Elderly, Hypertension.

INTRODUCTION

Cognitive decline in old age is often considered an irreversible condition due to degenerative changes. It is important to address hypertension in order to mitigate the risk of cognitive decline and improve quality of life for diagnosed patients (Gusnaini et al., 2024; Mulyani et al., 2024; Soares et al., 2024; Yahya et al, 2024). However, it is important to note that this decline can be influenced by various factors beyond normal age-related degeneration. Hypertension is a particularly significant risk factor, as it is both controllable and modifiable, and has a high prevalence. Therefore, it is important to obtain useful research evidence to review and summarise cognitive dysfunction in patients with hypertension (Cheon, 2022; Taurusi et al., 2023; Lorenza et al., 2024; Sholikhah et al., 2024. Wulandari et al., 2024).

The cognitive function decline in patients with hypertension is initiated by pathological changes in the brain's blood vessels. These changes lead to disrupted blood perfusion and abnormalities in brain tissue, resulting in cerebral hypoperfusion and a subsequent decrease in cognitive function (Anto et al, 2019; Indasari et al., 2024; Oktavia et al., 2024). Elevated arterial blood pressure is a significant contributor to the global burden of disease, with harmful effects on the brain being a major cause. Hypertension is a major risk factor for stroke and has also been identified as a pathogenic factor in cognitive impairment with a vascular base and Alzheimer's disease (AD) - the leading cause of dementia in the elderly (Iadecola & Gottesman, 2019). Hypertension affects 31.1% of adults worldwide, which is equivalent to 1.39 billion people. It is estimated that the prevalence will increase to 1.56 billion by 2025. Hypertension is a growing scientific and public health concern due to its association with increased risk of stroke, Alzheimer's disease (including vascular dementia), and 10.4 million annual deaths. It is estimated that approximately 5% (1.7 million) of hypertension cases worldwide are caused by hypertension in middle age. Hypertension is a well-known risk factor for cognitive dysfunction and dementia (Triyasmina et al., 2022; Li et al, 2023; Afrilia et al., 2024; Amir et al., 2024; Fitriana, & Waswa, 2024).

Significant portion of the adult and elderly population and is a crucial risk factor for vascular cognitive impairment and dementia in old age. Chronic high blood pressure continuously challenges the structural and functional integrity of the cerebral vasculature, leading to microvascular rarefaction and dysfunction, as well as neurovascular uncoupling that disrupts cerebral blood supply (Munthomimah et al., 2022; Santisteban et al, 2023; Hanoum et al., 2024; Zakiyah et al., 2024). The number and proportion of people aged 60 and over in the population continues to increase. In 2019, the number of people aged 60 and over was 1 billion. This number will increase to 1.4 billion by 2030 and 2.1 billion by 2050. This increase is happening at an unprecedented rate and will accelerate in the coming decades, especially in developing countries (World Health Organization, 2021).

Reducing the prevalence of hypertension in middle age by 10% or 25% could potentially reduce the number of Alzheimer's disease (AD) cases by over 160,000 or 400,000 respectively. In the United States, over 425,000 cases of AD are attributed to hypertension. A study of 46,011 Chinese adults aged 60 years or older estimated the prevalence of dementia to be 6.0%, with 62.6% of dementia patients also having hypertension (Li et al, 2023; Amelia et al., 2024; Quzwain et al., 2024). Studies in animal models and humans have provided insights into the mechanisms of hypertension, which is defined as systolic blood pressure (SBP)/diastolic blood pressure (DBP) ≥ 140/90 mmHg by the European Society of Cardiology (ESC)/European Society of Hypertension (ESH) guidelines, or SBP/DBP ≥ 130/80 mmHg in the American College of Cardiology (ACC)/American Heart Association (AHA). Hypertension is one of the most common diseases among the elderly population (Li et al, 2023; Maudia et al., 2024; Miharja et al., 2024; Saputra et al., 2024).

The prevalence of hypertension is high globally and is expected to continue increasing due to an aging population and an increase in lifestyle-related risk factors. According to a recent survey, in the United States, hypertension prevalence significantly increases with age, affecting approximately 74.5% of adults aged ≥ 60 years. In China, 74.7% of the elderly aged 65-74 years and 78.7% of those aged 75 years and older have hypertension. Although hypertension is highly prevalent, awareness, treatment, and control of the condition remain suboptimal (Li et al, 2023; Endra, & Villaflor, 2024; Hyskaj et al., 2024; Risnawati et al., 2024). Hypertension has harmful effects on cognitive function. However, further research is necessary to determine the appropriate treatment for hypertension (Santisteban et al, 2023). Although the mechanisms underlying hypertension-related cognitive impairment are biologically complex and not fully understood, age-related structural changes in white matter (WMC) alterations, which are a common early event in hypertension, appear to play a key role in this regard. Hypertension

triggers various cellular and molecular mechanisms, such as endothelial dysfunction, blood-brain barrier (BBB) dysfunction, oxidative stress, and neuroinflammation. These mechanisms are common to the pathological process of white matter changes. Over the last decade, research has indicated that brain WMC is an early marker of chronic hypertension and pathology, and a significant indicator of prognostic factors for cognitive and dementia (Kamid et al, 2024; Nurhusna & Oktarina, 2024; Widiasta et al., 2024) Pathological changes in WM have often been found to correlate with cognitive decline in hypertensive individuals. Therefore, focusing on WM may be beneficial for understanding the pathophysiological mechanisms of hypertension-induced cognitive impairment (Li et al, 2023; Fitriani et al., 2024; Susanti et al., 2024; Vanika et al., 2024).

RESEARCH METHOD

This study aims to examine the cognitive deficits in patients elderly with hypertension and summarise research on the relationship between hypertension and cognitive impairment. It also explores how hypertension causes pathophysiological changes in the brain that lead to cognitive dysfunction. The study may be useful in optimising the health of the elderly, maximising their quality of life, and reducing hypertension as a risk factor for cognitive impairment. The Mini Mental State Examination (MMSE) is a test that can be used to assess cognitive function. It consists of two parts. The first part assesses orientation, memory, and attention through verbal responses. The second part assesses the ability to write sentences, name objects, follow verbal and written commands, and copy complex polygon drawings.

This is an observational analytic study that uses a cross-sectional research approach to investigate the relationship between cognitive deficits in elderly individuals with hypertension at Kampung Baru Primary Health Centre Medan, North Sumatera Province from August to November 2023. Variables were observed only once during the study and respondent signed for informed consent after had explanation of this research. The study will include elderly individuals aged 60 years or older with a history of hypertension who are willing to participate and have at least graduated from elementary school and are able to speak Indonesian and sign informed concent. Elderly individuals with hearing loss, a history of stroke, a history of severe head trauma, or other medical conditions excluded in this research. The independent variable will be blood pressure and the dependent variable will be MMSE.

The Chi-Square test was used for statistical analysis, and the Mann-Whitney test was used to assess data normality. The language used is clear, concise, and objective, with a formal register and precise word choice. The text adheres to conventional academic structure and formatting, including consistent citation and footnote style. The logical flow of information is maintained with causal connections between statements. The text is free from grammatical errors, spelling mistakes, and punctuation errors. Univariate and bivariate data analysis were conducted to investigate the relationship between hypertension and cognitive function in elderly patients receiving treatment at Kampung Baru Primary Health Centre Medan in 2023. No changes in content were made as per the instructions. The objectives of this study are to determine if there is a cognitive deficit in patients with hypertension, to identify stage 1 and stage 2 hypertension, to examine the relationship between the duration of hypertension and the severity of cognitive impairment in patients, and to describe the general characteristics of the respondents. The implementation of this research was approved by the health research ethics committee of the Universitas Islam Sumatera Utara (UISU) with letter number 101/EC/KEPK.UISU/VIII/2023.

RESULTS AND DISCUSSION

This study examines cognitive deficits in elderly patients with stage 1 and stage 2 hypertension at Kampung Baru Primary Health Centre Medan from June to November 2023. The sample size was determined using the Slovin formula, with 84 respondents included based on the study's inclusion and exclusion criteria.

Table 1. Respondent Characteristics

Characteristics	Frequency	Percentage
Gender		
Male	40	47,61
Female	44	52,38
Age		
60-69	69	82,14
70-79	15	17,85
Classification of Hypertension		
Stage 1 Hypertension	62	73,80
Stage 2 Hypertension	22	26,19
Hypertension Duration		
<5 Years	57	67,85
>5 Years	27	32,14
Education		
Elementary School	14	16,66
Junior High School	16	19,04
Senior High School	22	26,19
Above Senior High School	32	38,09
Education		
Elementary School	14	16,66
Junior High School	16	19,04
Senior High School	22	26,19
Above Senior High School	32	38,09
Cognitive Function		
Normal	56	66,66
Moderate Cognitive Disorder	28	33,33
Severe Cognitive Disorder	0	0

The sample for the research consisted of 40 male individuals (47.61%) and 44 female individuals (52.38%). There were 69 persons in the sample ages 60-69 (82.14%) and 70-79 (17.85%). According to the degree of hypertension, 62 persons (73.80%) had stage 1 high blood pressure and 22 (26.19%) had stage 2 low blood pressure. Based on the duration of hypertension, 57 (67.85%) respondents under the age of 5 and 27 (32.14%) respondents above the age of 5 were diagnosed. According to the data, there were 14 respondents with primary school education (16.66%), 16 with junior high school education (19.04%), 22 with senior high school education (26.19%), and 32 with Above Senior High School (38.09%). According to the respondent data on cognitive function, 56 people (66.66%) exhibited normal cognitive function, while 28 people (33.33%) showed moderate cognitive impairment. No respondents reported experiencing severe cognitive impairment.

Table 2. Relationship between Systolic and Diastolic Blood Pressure and Cognitive Impairment

Blood Pressure	Cognitive Impairment	Average	p-value
Systolic	Moderate	158.17	0,006
	Normal	144.89	
Diastolic	Moderate	90.58	0,250
	Normal	87.82	

Based on the results of the study, the average systolic in normal patients was 144.89, while the average systolic in patients with moderate cognitive impairment was 158.17. The average systolic in patients with cognitive impairment is higher than in normal patients. Based on the results of the Chi-square test, p value = 0.006 <0.05, it can be concluded that there is a significant difference between the systolic of normal patients and the systolic of patients with cognitive impairment.

According to the study results, the average diastolic in normal patients was 87.82, while in patients with moderate cognitive impairment it was 90.58. On average, diastolic in patients with cognitive impairment is higher than in normal patients. The Chi Square test results showed a p-value of 0.250>0.05, leading to the conclusion that there is no significant difference between the diastolic levels of normal patients and those with cognitive impairment.

Table 3. Relationship between Hypertension Duration and Cognitive Function

		Hypertension Patients	Cognitive Function			Total	p-value
			Normal	Moderate	Severe		
Hypertension Duration	< 5 Years	57 (67.85%)	56 (66.66%)	0	0	56 (66.66%)	0.000
	> 5 Years	27 (32.14%)	0	28 (33.33%)	0	28 (33.33%)	
Total						100%	

The study found that 57 individuals (67.85%) had hypertension for less than 5 years and normal cognitive function. Meanwhile, 27 individuals (32.14%) had hypertension for more than 5 years and experienced moderate cognitive impairment. Additionally, 28 individuals (33.33%) had a duration of hypertension of 5 years or less but still experienced moderate cognitive impairment. The Kolmogorov-Smirnov Z test yielded a p-value of 0.000, indicating a significant relationship between hypertension duration and cognitive function.

Research conducted from August to November 2023 on 84 respondents with hypertension at Kampung Baru Primary Health Centre Medan found that stage 1 hypertension was more prevalent than stage 2 hypertension, with 73.80% or 62 people affected. Finding in this study mention elderly people who have had high blood pressure for more than 5 years' experience a moderate decline in cognitive function when compared to those who have had high blood pressure for less than a year. It has been suggested that the longer the duration of high blood pressure, the greater the impact on cognitive function as a result of damage to blood vessels and changes in brain structure. Reduction of cerebral blood flow, which has a detrimental impact on cognitive function. Prolonged hypertension can also lead to alterations in brain structure, such as a reduction in brain volume and damage to the white matter. A previous study found that hypertension is a common risk factor for death from cardiovascular causes worldwide.(Putra et al 2023). In China, patients aged 60 to 80 years with hypertension who underwent intensive treatment to lower systolic blood pressure to a target of 110 to less than 130 mmHg had a significantly lower incidence of cardiovascular events compared to those who lowered it to a target of 130 to less than 150 mmHg. Despite the aging population, current guideline-based recommendations for systolic blood pressure targets in older patients remain inconsistent (Zhang et al, 2021; Fatmawati, & Arimbi, 2024; Maulidiyah et al., 2024). The target blood pressure level varies between guidelines. The American College of Physicians - American Academy of Family Physicians and American College of Cardiology-American Heart Association guidelines recommend a level of less than 150 mmHg, while the European guidelines recommend a level of 130 to 139 mmHg or less than 130 mmHg (Members, et

al, 2024) The analysis of respondents' cognitive function impairment revealed that 66.66% or 56 patients did not experience cognitive impairment or had normal cognitive function, while those with moderate or severe cognitive function impairment were fewer. Regarding hypertension duration, the study found that 67.85% or 57 hypertensive patients had a duration of less than 5 years, compared to those with a duration of more than 5 years (Anto et al, 2019; Merdekawati et al., 2024; Shera et al., 2024).

According to the results regarding gender characteristics, 44 out of 84 patients with hypertension were female (52.38%). The analysis of age-related characteristics revealed that 69 out of 84 patients affected by hypertension were aged between 60-69 years (82.14%). The prevalence of hypertension and stage 2 hypertension remained higher, particularly among men and women with less education. A study conducted on 84 individuals found that women experienced a greater decline in cognitive function than men, possibly due to the role of endogenous sex hormone levels in changes in cognitive function. Endogenous receptors are found in brain areas that play a role in learning and memory functions, which may cause cognitive decline (Commodore-Mensah et al, 2021).

The prevalence of stage 1 hypertension was 73.80% higher than that of stage 2 hypertension. Patients with characteristics indicating normal cognitive function had a 66.66% higher prevalence than those with characteristics indicating impaired cognitive function. Additionally, characteristics indicating a duration of hypertension less than 5 years had a 67.85% higher prevalence than those indicating a duration of more than 5 years. Current evidence does not indicate cognitive decline with hypertension treatment. Treating hypertension in older age may reduce cognitive decline, which has important implications for the clinical management of patients at risk of dementia (Gupta et al, 2020; Ekaputri et al., 2024; Harahap et al., 2024; Taufiqurrahman et al., 2024).

Long-standing hypertension results in vascular remodeling, reduced vascular elasticity, increased pulse pressure, decreased cerebral blood flow, degenerative changes in the vascular wall, and a decrease in cerebrovascular reserve. These alterations interfere with brain auto regulation and result in elevated occurrences of white matter lesions, micro infarcts, micro hemorrhages, and cerebrovascular events. These occurrences are responsible for the decline in cognitive function and the incidence of dementia (Streit et al, 2019; Hubaybah et al., 2024; Tumanggor et al., 2024). After one year, respondents aged 75 years or older who were on antihypertensive treatment and had a blood pressure of 130 mmHg or higher showed fewer cognitive deficits compared to those with a blood pressure of less than 130 mmHg. This was observed without any loss of daily functioning or quality of life. Cognitive deficits were most pronounced in older individuals with complex health issues (Ma et al, 2022; Putri et al., 2024; Solihin & Triana, 2024).

According this study, the age of 60-69 years was found to be around 82.14%. From the literature search, it is mentioned that there are many cognitive disorders in this age range that involve memory abilities in 3 ways, namely the process of remembering, recording, and recalling past events. memory abilities in three stages: remembering, recording, and recalling past events. Physiological abilities and cognitive functions decline simultaneously during old age. However, as age increases, the body's ability to obtain oxygen in the bloodstream decreases, which the brain requires to function properly. The following section outlines the specific underlying mechanisms that affect elderly individuals, including mechanical hemodynamics changes, arterial stiffness, neurohormonal and autonomic dysregulation, and aging kidneys (Oliveros et al, 2020; Rahmat et al., 2024).

Who have obtained higher education levels, particularly beyond high school, tend to exhibit better cognitive function compared to those with lower levels of education. This is due to the increased formation of synapses and vascularization in the brain that occurs in those who receive higher education early in life. It is important to note that these findings are objective and supported by research. Furthermore, individuals with a higher education background are more inclined to pursue medical treatment at reputable healthcare facilities, which may lead to improved cognitive function.

The distribution of MMSE results at Kampung Baru Primary Health Centre showed that there was no severe cognitive function impairment. 27 patients had moderate cognitive impairment, and 57 patients had normal cognition. Patients with hypertension who develop white matter hyper intensity (WMH) for more than 5 years are more likely to experience cognitive impairment, even in the early stages of cognitive decline. Patients with marked periventricular WMH progression show a significant decline in global cognition compared to hypertensive patients without WMH for less than 5 years (Jiménez-Balado et al, 2019).

The study investigated the impact of hypertension duration on cognitive function decline. The language used is clear, concise, and objective, adhering to formal register and precise word choice. The text follows a logical structure with causal connections between statements. The grammar, spelling, and punctuation are correct. No changes in content were made. Among the 57 patients with hypertension duration less than 5 years, none experienced cognitive impairment, while the remaining 27 patients with hypertension duration greater than 5 years showed moderate cognitive impairment. It can be concluded that there is a significant relationship between the duration of hypertension and cognitive function. According to the study's findings, individuals with uncontrolled high blood pressure for five or more years are at a high risk of experiencing impaired cognitive function. This can be distressing for those affected and may increase their reliance on others. Therefore, it is recommended that individuals with hypertension maintain their blood pressure through lifestyle changes or medication (Li et al, 2024). Cognition is the process of mental work that enables humans to become aware of objects of thought or perception, including observation, thinking, and memory (Nes et al, 2023). It encompasses various functions such as orientation, language, attention, calculation, memory, construction, and reasoning. Prolonged hypertension can cause various health issues in the human body. High blood pressure is a pathological condition that can cause abnormalities in various organs, including the heart, blood vessels, kidneys, eyes, and brain (Kućmierz et al, 2021). The brain is an organ that functions in terms of intelligence, and problems that occur in the brain can affect cognitive function (Anto et al, 2019).

The cognitive process refers to the mental process that enables awareness of objects of thought and perception, encompassing observation, thought, and memory. When assessing cognitive function, one evaluates memory, reading, writing, and calculation skills. The MMSE is a test that can be used during clinical examination of patients. It was designed by M.F. Goldstein, S. Folstein, and P.R. McHugh and consists of orientation to time, place, and person. The task involves subtracting 7 from a series of 100 and naming three objects, recalling their names later, using language to name objects, repeating words, writing sentences, and constructing patterns. Points are awarded for each correct answer, with a maximum score of 30 indicating no interference (Wollesen et al, 2020).

The Mini-Mental State Examination (MMSE) is a commonly used cognitive assessment tool. The MMSE is divided into two parts. It evaluates five cognitive functions: concentration, language, orientation, memory, and attention. The first part assesses orientation, memory, and attention through verbal responses. The second part evaluates the ability to write sentences, name objects, follow written and verbal commands, and copy complex polygon drawings (Zhang et al, 2021).

Cognition refers to the mental processes involved in acquiring knowledge and understanding through thought, experience, and the senses. It encompasses a range of higher-level intellectual functions, including attention, memory, decision-making, planning, reasoning, judgment, perceptual understanding, language, and visuospatial functions. These processes involve both the use of existing knowledge and the generation of new knowledge. Cognitive deficit is a term used to describe impairments in different domains of cognition. It is not limited to a specific disease or condition, but may be one manifestation of a person's underlying condition. The term is also used interchangeably with cognitive impairment (Susanti et al, 2024). It may be a short-term or a progressive and permanent condition. However, cognitive impairment is a larger entity that is part of neurocognitive disorders (DSM-5). Cognitive impairment refers to any disorder that significantly affects a person's cognitive functioning to the extent that normal functioning in society is impossible without treatment. Alzheimer's disease is the most well-known condition associated with cognitive impairment (Dhakal & Bobrin, 2023).

The pathology of cognitive decline/deficit is commonly caused by damage to the neural network, including the gray matter (cortex, thalamus, and basal ganglia) and white matter (axon coverings at connections between gray matter areas). Specific deficits can be attributed to damage in particular areas. For instance, damage to the parietal lobe can result in impaired visuospatial function or dressing inability. (Malhotra et al, 2020). Damage to the frontal lobe system can result in deficits in planning and abstract comprehension, while damage to the temporal lobe can cause deficits in language and memory. This damage can be caused by metabolic disorders, heavy metals, toxins such as toluene, infections, ischemic damage from stroke or hemorrhage, direct injury such as head injury or cancer, or surgery. Neurodegenerative processes, such as Alzheimer's, Parkinson's, multiple sclerosis, or Huntington's disease, can also cause damage. These diseases directly damage nerve tissue through immunological interactions with abnormal proteins (Dhakal & Bobrin, 2023).

Difficulty remembering things (often asking the same questions or telling the same narrative) challenges learning new things and concentrating Vision issues and speaking challenges It is difficult to recognize persons and locations. They frequently feel overwhelmed in unfamiliar locations or circumstances. Perplexity or agitation Mood swings Changes in their behavior and speech, as well as challenges with their typical daily chores. Cognitive impairments can come and go, or worsen and improve. (Li et al, 2022). Cognitive impairment might be moderate, severe, or somewhere in the between. Mild disorders cause alterations in cognitive function, but people can still go about their regular lives (Dunne et al, 2021) Severe degrees of dysfunction (dementia) might render people unable to live freely owing to their incapacity to plan and organize their lives (Dhakal & Bobrin, 2023).

Hypertension

Hypertension is a significant risk factor for coronary heart disease, cardiac hypertrophy, heart failure, and kidney failure. The adverse effects of blood pressure increase as the pressure rises. Hypertension is diagnosed when diastolic pressure stays above 90 mmHg or systolic pressure stays above 140 mmHg (Flack & Adekola, 2020; Muntner et al, 2019). According to the criteria, therapy should aim for a blood pressure of 150/90 mmHg for patients aged over 60 years, and 140/90 mmHg for all others. If the patient achieves a blood pressure of 140 mmHg or 135 mmHg with therapy, medication should not be stopped to bring the blood pressure closer to 150 mmHg. Instead, if the patient's blood pressure consistently remains below 150 mmHg, their health will improve (Carey et al, 2020). However, it is important to note that these recommendations are not a substitute for clinical judgment. Treatment decisions should be made with careful consideration of each individual patient's characteristics and clinical condition (Filippone et al, 2022).

Cardiovascular disease, particularly hypertension, continues to be the primary cause of death globally (Giovanni et al, 2020). The risk of complications is not only dependent on the persistent increase in blood pressure but also on the patient's age. Hypertension is prevalent in all populations, with varying incidence rates due to genetic, racial, and socio-cultural factors, which also involve different lifestyles. The incidence of hypertension increases with age (Ostchega et al, 2020). In the United States, efforts to reduce population blood pressure have been measured by tracking trends in awareness, treatment, and control of hypertension, with the goal of achieving a systolic blood pressure (SBP)/diastolic blood pressure (DBP) of less than 140/90 mmHg. Analyses of National Health and Nutrition Examination Survey data show a significant increase in hypertension awareness and treatment in all age groups between 1999-2004 and 2011-2016. The percentage of adults aged 65 and over who were aware of hypertension was approximately 85% in 2011-2016, with a treatment rate of around 79% (Carey et al, 2021).

Hypertension is classified into primary (essential) hypertension and secondary hypertension based on its cause. The cause of primary hypertension is unknown (Hegde et al, 2023) while secondary hypertension arises from certain conditions such as kidney disease or tumors. Only a small proportion of hypertensive diseases have a known cause in primary hypertension, while the cause is unknown in 90-95% of cases. These patients may have endocrine or renal abnormalities that, if treated, can return blood pressure to normal. Secondary hypertension accounts for about 5-10% of cases and arises from specific causes such as renal hypertension, adrenal hypertension, or Cushing's syndrome (Huang, 2019).

Table 4. Classification of Hypertension (Tocci American Journal of Hypertension)

Classification	Systolic (MmHg)	Diastolic (MmHg)
Normal	< 120	<80
Pre-hypertension	120-139	80-89
Stage 1 Hypertension	140-159	90-99
Stage 2 Hypertension	≥ 160	≥ 100

The goal of hypertension treatment is to achieve normal blood pressure levels (Carey et al, 2022). There are two main methods of implementation: non-medicaments and medicaments. Regular exercise can improve blood flow, reduce heart rate, and lower blood pressure. Non-medicaments methods include exercise, weight loss, and a diet rich in fruits and low in fat, such as the Dietary Approaches to Stop Hypertension (DASH) diet. Stopping alcohol and cigarette consumption is also recommended. Ceasing cigarette use is crucial in managing hypertension to reduce the risk of hypertension-related diseases such as stroke and heart attack. Drug therapy involves several classes of antihypertensive that lower blood pressure. The management objective is to achieve a blood pressure of less than 140/90 mmHg. ACE inhibitors or angiotensin receptor-II antagonists are superior to other antihypertensive agents (Filippone et al, 2022).

Hypertension and Cognitive Function

Hypertensive patients may experience a decline in the brain's auto regulatory ability due to increased blood pressure, which affects the blood vessels in the brain. Additionally, hypertension can reduce vasoreactive blood vessels in the brain (Di Chiara et al, 2022; Wardlaw et al, 2022). Some studies suggest that high and chronic systolic blood pressure may lead to decreased cognitive function (Forte et al, 2020). Patients with hypertension may experience impaired cognitive function due to uncontrolled hypertension (De Menezes et al, 2021). Uncontrolled hypertension can cause a range of complications (Amare et al, 2020), including heart attack, stroke, and kidney failure. One such complication, impaired cognitive function, affects the nervous system (Kelly & Rothwell, 2020).

Uncontrolled hypertension is a risk factor for life-threatening diseases (Balwan et al, 2021) including stroke and cardiovascular disease. Additionally, it can disrupt the patient's daily life functions (Evan et al, 2022). Hypertension can also cause complications in the central nervous system, leading to a decrease in cognitive function, such as memory, which can result in dementia or vascular cognitive impairment if left untreated (Woiska et al 2022). Several previous studies have shown that long-term hypertension can lead to a decline in cognitive function, which can significantly affect the quality of life of those affected (Woiska et al, 2022).

The limitation in this study is that the sample group used is only in one area so that it cannot generalize the actual conditions. But this is a preliminary study so that in the future further research can be carried out with a number of sample populations that are considered to be representative to provide a picture of the condition of hypertension and cognitive function in the health center work area.

CONCLUSION

The Uncontrolled systolic or diastolic blood pressure of hypertensive patients associated with cognitive function and duration of hypertension more than 5 years can affect the cognitive deficits of hypertensive patients who seek treatment at Puskesmas Kampung Baru Medan. A preventive approach that includes hypertension management, lifestyle changes, and regular health monitoring can help reduce the risk of cognitive decline in older adults.

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AUTHOR CONTRIBUTIONS

DP, AL, ARB Conceptualization; AM; Methodology, IAD and DAS Validation, Formal Analysis.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

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