# Assessment of cognitive impairment in patients with vascular risk factors at 108 Military Central Hospital

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**Summary**

*Objective:* This study aimed to screen for cognitive impairment using the Mini-Mental State Examination (MMSE) scale in patients with vascular risk factors, such as hypertension, diabetes mellitus, dyslipidemia, and obesity. *Subject and method:* A total of 263 outpatients diagnosed with hypertension, diabetes, dyslipidemia, obesity, and/or a history of smoking were screened using the MMSE scale at 108 Military Central Hospital between March 2023 and October 2023. The study design was a prospective cross-sectional approach, with data analyzed using SPSS software. *Result:* Cognitive impairment was observed in 48% of the patients, predominantly in individuals over 60 years old. The prevalence of cognitive impairment increased with age and was significantly associated with vascular risk factors, including hypertension, diabetes, and dyslipidemia ($p<0.05$). Patients with a higher number of risk factors demonstrated increased cognitive impairment ($p<0.05$). *Conclusion:* There is a significant relationship between cognitive impairment, as assessed by the MMSE scale, and the presence of vascular risk factors. This study highlights the importance of early screening and intervention for cognitive decline in patients with comorbid vascular conditions.

*Keywords:* Cognitive impairment, Mini-Mental State Examination, vascular risk factors, hypertension, diabetes mellitus, dyslipidemia, obesity, aging population, dementia, cognitive decline.

## I. BACKGROUND

Dementia represents a significant clinical syndrome, marked by memory loss and additional cognitive dysfunctions that disrupt daily social and occupational activities[1]. As the global population ages, Vietnam faces rising dementia rates. Current estimates show that 4.5% to 10% of older adults in both Vietnam and worldwide experience dementia, with prevalence increasing with age[2-4].

The number of elderly individuals with dementia is projected to surge from 25 million in 2000 to 63 million by 2030 and 114 million by 2050. This condition not only affects patients but also places immense burdens on caregivers, families, and healthcare systems, leading to an estimated $818 billion in healthcare costs in 2015, equating to 1.09% of global GDP. Projections indicate these costs could reach $2 trillion by 2030[5].

In Vietnam, healthcare professionals extensively employ neuropsychological assessments to evaluate cognitive functions. Early screening for dementia is vital, enabling timely interventions that enhance outcomes for patients and communities. This study focuses on assessing cognitive impairment using the Mini-Mental State Examination (MMSE) among patients with vascular risk factors - such as

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hypertension, diabetes mellitus, dyslipidemia, obesity, and smoking - who seek treatment at 108 Military Central Hospital.

## II. SUBJECT AND METHOD

### *2.1. Subject*

This study included 263 patients diagnosed with vascular risk factors hypertension, diabetes mellitus, dyslipidemia, obesity, and/or smoking. Participants received outpatient care at 108 Military Central Hospital and underwent cognitive screening using the Mini-Mental State Examination (MMSE) from March to October 2023.

### *2.2. Method*

*Study design:* We conducted a prospective, cross-sectional study, with data analyzed using SPSS software, complemented by nationally validated statistical methods to enhance precision and analytical rigor.

*Research procedure:* Clinical assessments were performed by neurologists, incorporating neuropsychological tests and laboratory investigations. We also collected data from caregivers to ensure completeness. A standardized case report form captured all relevant parameters.

*Clinical assessment:* Neurologists conducted detailed evaluations based on the standardized form, confirming diagnoses of hypertension, diabetes mellitus, dyslipidemia, obesity, and/or smoking.

*Neuropsychological testing:* The MMSE consists of 11 questions assessing seven cognitive domains: Spatial orientation, temporal orientation, memory, attention, calculation, language, and visual construction. The assessment takes approximately 7 to 10 minutes.

*Ethical considerations:* Participation was voluntary, and subjects could withdraw at any time. Personal information was anonymized, securely stored, and used exclusively for research purposes.

## III. RESULT

### *3.1. Characteristics of the study*

**Table 1. Distribution of age and gender in the study**

| Age Group | Male (n) | Female (n) | Total (n, %) |
|---|---|---|---|
| <60 years | 72 | 28 | 28.5 |
| 60-79 years | 52.4 | 47.6 | 68.8 |
| >80 years | 85.7 | 14.3 | 2.7 |
| ***Total*** | ***58.9*** | ***41.1*** | ***100*** |

Among the 263 patients participating in the study, 155 were male (58.9%) and 108 were female (41.1%). The age group of 60 to 80 years accounted for the highest proportion at 68.8%.

**Table 2. Relationship between education level and cognitive impairment (MMSE scores)**

| Education level | With cognitive impairment (n, %) | No cognitive impairment (n, %) |
|---|---|---|
| Secondary school | 25 | 7 |
| High school | 18 | 9 |
| Vocational/College | 57 | 53 |
| University | 19 | 50 |
| Postgraduate | 7 | 18 |
| ***Total*** | ***126*** | ***137*** |

The majority of elerly participants (61.3%) had an education level of secondary school or higher.

**Table 3. Cognitive impairment by age group (MMSE scores)**

| Age group | With cognitive impairment | | | No impairment |
|---|---|---|---|---|
| Level | Mild impairment (MMSE 18-25) | Moderate impairment (MMSE 10-17) | Severe impairment (MMSE < 10) | |
| < 60 years | 18 | 0 | 0 | 57 |
| 60-80 years | 85 | 16 | 1 | 79 |

| Age group | With cognitive impairment | | | No impairment |
|---|---|---|---|---|
| Level | Mild impairment (MMSE 18-25) | Moderate impairment (MMSE 10-17) | Severe impairment (MMSE < 10) | |
| > 80 years | 5 | 1 | 0 | 1 |
| Total (n) | 108 | 17 | 1 | 137 |
| Total (%) | 41.1 | 6.5 | 0.3 | 52.1 |

Cognitive impairment was observed in 48% of patients, with mild impairment being the most prevalent at 41.1%.

**Table 4. Relationship between vascular risk factors and cognitive Impairment**

| Cognitive Impairment | Risk factor | | | |
|---|---|---|---|---|
| | Smoking | Hypertension | Diabetes | Dyslipidemia |
| | n (%) | n (%) | n (%) | n (%) |
| No cognitive impairment | 12 (41.4) | 78 (45.1) | 43 (42.6) | 101 (57.7) |
| With cognitive impairment | 17 (58.6) | 95 (54.9) | 58 (57.4) | 74 (42.3) |
| Total | 29 (100) | 173 (100) | 101 (100) | (100) |
| p | >0.05 | <0.05 | <0.05 | <0.05 |

The results indicated a statistically significant increase in cognitive impairment among patients with vascular risk factors. However, smoking did not show statistical significance, likely due to an insufficient sample size.

**Table 5. Association between risk factors and cognitive impairment**

| Cognitive impairment | Number of patients with risk factors | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| | n (%) | n (%) | n (%) | n (%) |
| No cognitive impairment | 58 (58.6) | 54 (48.6) | 21 (42.0) | 1 (33.3) |
| With cognitive impairment | 41 (41.4) | 57 (51.4) | 29 (58.0) | 2 (66.7) |
| Total | 99 (100) | 111 (100) | 50 (100) | 3 (100) |
| p | >0.05 | | | |

The results show that as the number of risk factors increases, cognitive impairment becomes more severe. However, this difference did not reach statistical significance, likely due to the small sample size.

## IV. DISCUSSION

In our study, the majority of patients were aged between 60 and 80, with a male-to-female ratio of 58.9% to 41.1%. Cognitive impairment was observed in 48% of patients, with mild impairment being the most common (41.1%) based on MMSE scores. Cognitive decline increased significantly with age ($p<0.05$). These findings align with both domestic and international studies. For example, research on vascular dementia patients at Thanh Nhan Hospital showed a mean onset age of 67.8 years, with a

higher prevalence in men, potentially due to the higher number of vascular risk factors in males[6].

Epidemiological studies show that the highest prevalence of dementia occurs in individuals aged 70 years and older, particularly in the United States, where the rate of dementia increases rapidly after age 65[7]. A study in northern Sweden found that 37.2% of individuals aged 60 and above suffered from dementia, significantly higher than the 2% prevalence in individuals younger than 60[8]. In our study, conducted in a population with multiple risk factors, the rate of dementia was as high as 48%. This increase in dementia prevalence with age can be attributed to the accumulation of pathological brain damage over time.

Hypertension has been identified as a critical factor in cognitive decline among the elderly. Our findings revealed a higher prevalence of dementia in hypertensive patients. Studies by Galstein FC et al. demonstrated that prolonged hypertension impairs cognitive functions such as language, visuospatial ability, and memory, and these deficits worsen when accompanied by hypercholesterolemia[9]. A community-based study on 3,824 individuals aged 65 and older, followed over 3.2 years, revealed that patients on regular antihypertensive medication had a reduced risk of developing Alzheimer's disease[10]. This was possibly due to a lower density of neurofibrillary tangles and senile plaques in the hippocampus, a key area affected in Alzheimer's disease.

Dyslipidemia, particularly elevated total cholesterol, also poses a significant risk for dementia. A study involving 9,294 elderly individuals across three French cities showed that hyperlipidemia increased the risk of dementia. Patients taking lipid-lowering medications were found to have a 40% lower risk of dementia[11]. The accumulation of beta-amyloid plaques, a hallmark of Alzheimer's disease, is accelerated by hypercholesterolemia, contributing to cognitive decline[12]. In our analysis, patients with dyslipidemia exhibited significantly higher levels of cognitive impairment compared to those without, with a statistically significant difference ($p<0.001$).

Type II diabetes is a well-established risk factor for Alzheimer's disease and mixed dementia (a combination of Alzheimer's and vascular dementia), particularly in individuals with the ApoE E4 allele[13]. When diabetes develops in middle age, it significantly increases the risk of Alzheimer's and vascular dementia. Both genetic and environmental factors contribute to this heightened risk. A study by Nooyens ACJ et al., which followed 2,613 individuals aged 40 to 70 over five years, found that those with diabetes experienced a decline in cognitive function that was 2.6 times greater than those without the disease. Among individuals over 60, cognitive decline progressed nearly four times faster in those with diabetes[14].

Patients with multiple vascular risk factors demonstrated more severe cognitive decline compared to those with fewer risk factors. Several studies on Alzheimer's disease have found that vascular comorbidities increase the risk of developing Alzheimer's. Furthermore, the presence of vascular risk factors intensifies the pathological damage seen in Alzheimer's, worsening cognitive symptoms[15]. Vascular risk factors for dementia include hypertension, hypercholesterolemia, diabetes, cardiovascular disease, elevated homocysteine levels, and inflammatory markers. In our study, patients with a higher number of risk factors showed an increase in cognitive impairment, although this did not reach statistical significance, likely due to the small sample size.

## V. CONCLUSION

Our study focused on patients aged over 60 years, predominantly those engaged in intellectual activities. We found that 48% of participants experienced cognitive impairment, with mild impairment being the most common at 41.1% based on the MMSE scores. Additionally, cognitive decline significantly increased with age ($p<0.05$). Patients with vascular risk factors, including hypertension, diabetes mellitus, and dyslipidemia, showed higher levels of cognitive impairment ($p<0.05$). Furthermore, cognitive decline tended to increase with the number of risk factors present,

although this trend did not reach statistical significance (p>0.05).

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