

Association between Heart Failure and Dementia among Elderly Patients in Hospital Kuala Lumpur

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ABSTRACT

Heart failure (HF) is a major noncommunicable disease that has been associated with significant morbidity and mortality. It has also been reported to be a risk factor for dementia, termed cardiogenic dementia, leading to further increase in functional disability and death in the elderly. Local studies are still lacking to prove this relationship. This research aimed to identify the association between HF and dementia. This cross-sectional retrospective analysis was conducted on elderly patients diagnosed with HF who were undergoing follow-up at the Geriatric Clinic, Hospital Kuala Lumpur (HKL), from January 2020 to January 2023. Convenience sampling method was used in patient selection. This study found that, among the 42 patients diagnosed with HF, 76.2% (N = 32) of them also had a diagnosis of dementia. A total of 7 comorbidities were found to be significantly associated with dementia ($p < 0.01$). In addition, major depressive disorder (MDD) and benign prostatic hyperplasia (BPH) were found to be significant predictors of dementia among elderly patients with HF. The study found a significant prevalence of dementia in specific subgroups. Early detection of risk factors may help prevent dementia in elderly HF patients, highlighting the need for further research on modifiable risk factors.

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INTRODUCTION

Background

Heart failure (HF) remains a significant public health issue on a global scale, with

indications suggesting a potential rise in prevalence in the near future. A recent study showed that there are approximately 56.19 million individuals affected by HF worldwide, with numerous countries and regions exhibiting an increasing trend from 1990 to 2019, particularly in low-income nations (Yan et al., 2023). Malaysia had one of the highest incidence rates of HF in Southeast Asia, with 721 cases per 100,000 people in 2017, a growing 7.7% from 669 cases per 100,000 people in 1990 (Bragazzi et al., 2021).

Previous studies have shown that HF could increase the risk of recurrent cardiovascular events (Govender et al., 2022) and stroke (Adelborg et al., 2017). Recent literature has also identified dementia as a condition that can arise from HF, with reported overall prevalence of 19.79% (Yap et al., 2022). Specifically, HF has been identified as a significant contributor to cardiogenic dementia which is a form of dementia resulting from cardiac dysfunction (Roger, 2021). Dementia in HF patients could affect patient's ability to self-care (Lovell et al., 2019), further reduce medication adherence (Muñoz-Contreras et al., 2022) and can reduce patients' overall quality of life (Liu et al., 2024).

Problem Statement

The prevalence of HF is rising in Malaysia, particularly among the elderly population. Effective management of HF relies heavily on medication adherence and the patient's ability to self-care. However, emerging evidence suggests a potential link between HF and dementia, which could further compromise self-care abilities and treatment adherence. Understanding this relationship, especially the associated risk factors, is crucial for improving patient outcomes. Despite the frequent co-occurrence of these conditions, there remains a significant gap in knowledge regarding their interplay, particularly within the Malaysian context. Addressing this gap is essential for developing targeted interventions to support elderly patients with both HF and dementia.

Research Questions

1. What is the prevalence of dementia among elderly HF patients in HKL?
2. What are the associated factors of dementia in elderly HF patients in HKL?

Hypotheses

- H₁ : The prevalence of dementia among elderly HF patients at HKL is significantly high.
- H₂ : Certain demographic factors, such as age and smoking status, as well as clinical factors such as comorbidities, are significantly associated with the presence of dementia in elderly HF patients at HKL.

Study Objectives

1. The main aim of this study was to determine the association between HF and dementia among elderly patients. Specific objectives of this study include:
2. To determine the prevalence of dementia among elderly HF patients in HKL
3. To identify associated factors of dementia in elderly HF patients in HKL

METHODOLOGY

Study Design

This cross-sectional study was conducted via retrospective medical record review.

Study Site

The study was conducted at Geriatric Clinic, HKL. HKL was chosen as the study site because it is one of the largest Malaysia's public tertiary hospitals, managing a high volume of elderly patients with various conditions. Its role as a major referral centre with comprehensive geriatric care makes it an ideal setting to study the prevalence and associated factors of dementia in elderly HF patients. Additionally, HKL's extensive medical records and multidisciplinary care support robust data collection and analysis.

Sample Size

The sample size was calculated using the following formula adopted and adapted from Yap et al., (2022):

$$\text{Sample size, } n = \frac{Z^2 \times P(1 - P)}{e^2}$$

where;

Z= statistic for level of confidence,

P= prevalence of dementia in HF

e²= margin of error

Based on literature, the prevalence of dementia in HF patients was 19.79%.

$$\text{Sample size, } n = [(1.96)^2 \times 0.1979 \times (1 - 0.1979)] / 0.05^2$$

$$= 243.9$$

$$\approx 244 \text{ patients}$$

Correction to finite population:

$$\text{Adjusted sample size, } n' = n / [1 + [(n-1) / p^*]]$$

where;

n' = adjusted sample size (corrected for a smaller population) n = sample size

p^* = estimation number of dementia geriatric patients with HF visited HKL during the study period

Estimation number of HF patients visiting Geriatric Clinic, HKL between January 2020 to January 2023 is 50.

Adjusted sample size, $n' = 244 / [1 + [(244-1) / 50]]$

= 41.6

= **42 patients** (final target sample size)

Sampling and Patient Selection Criteria

This cross-sectional study was conducted on elderly patients diagnosed with HF who were undergoing follow-up at the Geriatric Clinic, HKL, from January 2020 to January 2023. Convenient sampling method was employed to identify potential patients because it allows efficient selection of eligible patients within a limited timeframe. The study included individuals aged 60 years and older with HF, with or without dementia, while excluding those with significant neurological disorders or incomplete medical records. Retrospective demographics and clinical data were collected from patients' medical records.

Statistical Analysis

Statistical analyses were performed using SPSS version 29. Demographic factors and prevalence of dementia were analysed descriptively using cross-tabulations and percentages. The association between demographic and clinical factors with dementia was analysed using simple binary logistic regression. A p-value of <0.25 was considered statistically significant. Subsequent analysis of significant factors was done using multiple binary logistic regression, where a p-value of < 0.05 was considered statistically significant.

Ethical Approval

This research has been approved by the Medical Research and Ethics Committee (MREC) [NMRR ID-23-02691-NSQ-(IIR)].

RESULTS

Medical records from a total of 60 patients were identified and screened. A total of 18 patients were excluded and 42 patients were included for final analyses. Majority of the patients were between 80-89 years of age, male, Malay, married, had primary education as highest education and non-smokers. Among the 42 patients diagnosed with HF, 32 of them also had a diagnosis of dementia, giving an overall prevalence of 76.2%. The detailed demographic data of all included patients is as shown in Table 1.

Logistic regression analysis found no statistically significant associations between demographic parameters and dementia ($p > 0.25$). However, 7 clinical parameters were significantly linked to dementia namely hypertension, type 2 diabetes mellitus (T2DM), dyslipidemia, stroke, benign prostatic hyperplasia (BPH), major depressive disorder (MDD), and atrial fibrillation (AF) (Table 2). Notably, MDD and BPH were found to be strong predictors of dementia in elderly HF patients, with odds ratios of 4.6 and 3.8, respectively (Table 3).

Table 1
Demographic data of included patients (N = 42)

Demographic Factors	Groups	Frequency (n)	Percentage (%)
Age (in years)	60 – 69	9	21.4
	70 – 79	13	30.9
	80 – 89	17	40.5
	90 - 99	3	7.1
Gender	Male	26	61.9
	Female	16	38.1
Ethnicity	Malay	18	42.9
	Chinese	14	33.3
	Indian	10	23.8
Marital Status	Single	9	21.4
	Married	33	78.6
Highest education level	Primary	18	42.9
	Secondary	15	35.7
	Tertiary	9	21.4
Smoking Status	Ex-smoker	7	16.7
	No	27	64.3
	Yes	8	19.0

Table 2
Demographic and clinical factors associated with HF (N = 42)

Factors	Groups	Crude OR [95% CI] ^a	p-value
Age		-0.988 [0.938,1.040]	0.636
Gender	Male	Ref	
	Female	-0.687 [0.317,1.489]	
Ethnic	Malay	Ref	0.970
	Chinese	1.114 [0.475,2.612]	0.805
	Indian	1.049 [0.387,2.843]	0.925
Marital status	Single	Ref	
	Married	1.206 [0.426,5.333]	0.525
Highest education level	None	Ref	0.595
	Primary	-0.000[0.000, -]	0.998
	Secondary	-0.825[0.301,2.263]	0.709
	Tertiary	1.524[0.535,4.340]	0.430
Smoking status	No	Ref	0.345
	Ex-Smoker	-0.459 [0.131,1.611]	0.224
	Yes	1.486 [0.452,4.887]	0.515
Hypertension	No	Ref	
	Yes	-0.257 [0.041,1.604]	0.146*
Type 2 diabetes mellitus (T2DM)	No	Ref	
	Yes	-0.257 [0.043,1.504]	0.156*
Dyslipidemia	No	Ref	
	Yes	-0.257 [0.041,1.604]	0.146*
Stroke	No	Ref	
	Yes	-0.461[0.168,1.264]	0.132*
Ischemic Heart Disease (IHD)	No	Ref	
	Yes	1.506 [0.426, 5.333]	0.525
Benign Prostatic Hyperplasia (BPH)	No	Ref	
	Yes	3.280 [1.206,8.917]	0.020*
Major Depressive Disorder (MDD)	No	Ref	
	Yes	3.447 [1.083,11.162]	0.036*
Atrial Fibrillation (AF)	No	Ref	
	Yes	2.169 [0.723, 6.512]	0.167*

^aSimple Binary Logistic Regression
*p-value <0.25 was considered statistically significant

Table 3
Factors associated with dementia in HF patients (N = 32)

Factors	Group	Adjusted OR [95% CI] ^b	p- value*
Major Depressive Disorder (MDD)	No	Ref	0.014*
	Yes	4.579 [1.361,15.401]	
Benign Prostatic Hyperplasia (BPH)	No	Ref	0.014*
	Yes	3.759 [1.307, 10.814]	

^bMultiple Binary Logistics Regression
*p-value <0.05 was considered statistically significant

DISCUSSION

This study found a high overall prevalence of dementia in elderly HF patients (76.2%). This finding is supported by the study by Adelborg et al., (2017) that showed higher risk of dementia in HF patients [HR: 1.21, 95% confidence interval (CI), 1.18-1.24]. Although the exact mechanism linking these two conditions is yet to be fully understood, reduced cerebral blood flow is one of the proposed mechanisms for the development of dementia in HF (Goh et al., 2022). The prevalence of dementia in this study was also noted to be higher in male patients, contrasting with a population-based cohort study in China by Ren et al. (2023), which reported higher rates in females. This difference could be attributed to a vast difference in sample sizes (N = 202,12).

With regards to risk factors, this study found no statistically significant demographic factors linked to dementia. However, a higher incidence of dementia was noted among patients aged 80 to 89, consistent with previous studies suggesting HF increases dementia risk in those 65 and older (Arslan et al., 2024; Jensen et al., 2023) and 75 years and older (Ren et al., 2023). MDD and BPH were identified as significant predictors of dementia in elderly HF patients. Previous research has linked depression history to increased dementia risk in HF patients (Adelborg et al., 2016). Additionally, men with BPH are at higher risk for Alzheimer’s and dementia (Nørgaard et al., 2021), and BPH medications may also elevate dementia risk (Tae et al., 2019). The limitations of this study include its retrospective design, which relies on existing medical records and may be subject to incomplete or missing data. Additionally, the small sample size may limit the statistical power to detect significant associations between HF and dementia. Furthermore, as a single-centre study conducted at HKL, the findings may not be fully generalizable to other healthcare settings or the broader Malaysian population. Differences in patient demographics, healthcare access, and clinical management across regions could influence the observed associations.

CONCLUSION

This research found a higher incidence of dementia in elderly HF patients aged 80 to 89 years, males, Malays, married individuals, those with only primary education, and non-

smokers. Significant correlations were identified between dementia and comorbidities such as hypertension, T2DM, stroke, dyslipidemia, BPH, MDD, and AF, with MDD and BPH being notable predictors of dementia. The study highlights the need for integrated care strategies addressing both cardiovascular and cognitive health in Malaysia. By identifying the modifiable risk factors, healthcare professionals can develop tailored preventative and management plans to improve outcomes and quality of life of HF patients. Further research is needed to explore the mechanisms linking HF and dementia and the impact of comorbidities on cognitive health.

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