

Emotional intelligence and systolic blood pressure are determinants of cognitive deficits in patients with heart failure

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Abstract

The present study was designed to compare emotional intelligence (EI) and cognitive performance between patients with systolic heart failure (SHF), patients with diastolic heart failure (DHF) and healthy individuals (HI). Also to further examine the relationship between EI and cognition in patients with heart failure (HF). From April 2016 until April 2017, 96 patients diagnosed with SHF, 96 with DHF from Bahawal Victoria Hospital and Nishtar Hospital, Bahawalpur and another 96 HI took part in the study in from Pakistan. Participants completed BarOn Emotional Quotient Inventory and Montreal Cognitive Assessment. The results showed that patients with HF had impaired EI and cognition in contrast to HI. In comparison, patients with SHF were more impaired on EI and cognition as compared with DHF patients. Systolic blood pressure (SBP) and EI were significant predictors of cognitive performance in patients with HF. In conclusion, high SBP and low EI are significant markers of cognitive deficits in HF.

Keywords: Heart Failure; Mean arterial pressure; Cognition; Emotional Intelligence; Cardiovascular Disease.

Introduction

Heart failure (HF) is a global epidemic affecting around 26 million people, and showing an increasing worldwide prevalence. It has become a global health burden, debilitating in its effects in the form of expenses, mortality, quality of life, etc. HF is described as abridged capacity of the heart to pump blood. It is characterised by insufficient cardiac output to fulfil metabolic needs or ample cardiac output ancillary for compensatory activation of neural hormones which is observed as amplification of filling pressure in left ventricle. HF is categorised on the basis of disturbances in ejection fraction, diastolic function, heart structure and natriuretic peptide levels.¹ Several pathological features such as reduced cardiac output; decreased cerebral blood flow;

disturbed cerebrovascular reactivity; neuroanatomical damages such as cerebral infarcts, cortical/ventricular atrophy; cerebral metabolic changes causing hypoperfusion and altered volume of grey white matter in cognition-related brain areas such as frontal cortex; disrupted metabolism of β -amyloid; inflammation and apoptosis, increase the risk of cognitive impairment.² Cortical activity and grey matter volume are correlates of emotional intelligence (EI) which is defined as ability to express and regulate emotions to solve problems.^{3,4} The present study was designed to examine: (i) impacts of systolic (SHF) and diastolic heart failure (DHF) on EI and cognition (ii) association between EI and cognition in HF.

Patients/Methods

From April 2016 to April 2017, 96 patients diagnosed with SHF and 96 diagnosed with DHF at Bahawal Victoria Hospital and Nishtar Hospital in Pakistan were included in the scope of this study. Exclusion criterion were: (i) any other clinical diagnosis except HF such as stroke, dementia, Alzheimer's disease etc. (ii) on continuous oxygen (iii) presence of psychiatric disorder and (iv) geriatric depression score $<5/15$.⁵ HF was categorised on the basis of ejection fraction systolic $\leq 40\%$ and diastolic $>40\%$ obtained from echocardiogram. Ninety-six healthy individuals (HI) also took part in the study who were screened with the above mentioned exclusion criterion except diagnosis of HF. Subjects were administered BarOn Emotional Quotient Inventory (BarOn EQ-i)⁶ to assess EI. BarOn EQ-i has 133 statements which are scored on a 5-point scale. EI is categorised as atypical underdeveloped = below 70; extremely underdeveloped = 70-79; underdeveloped = 80-89; adequate = 90-109; well-developed = 110-119; extremely well developed = 120-129; atypical well-developed = 130 and above. Participants further completed Montreal Cognitive Assessment (MoCA).⁷ Score below 26/30 is considered normal.

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Results

Statistical analyses: Multivariate analysis with ANOVA revealed that in contrast with HI, patients with HF showed impaired EI and cognition. Patients with SHF had lesser EI $F(2,285)=62661.71$, $p<.001$, $\eta^2=.99$; Systolic blood pressure (SBP) $F(2,285)=570.42$, $p<.001$, $\eta^2=.80$; Diastolic blood pressure (DBP) $F(2,285)=325.57$, $p<.001$, $\eta^2=.69$; age $F(2,285)=7.45$, $p<.001$, $\eta^2=.05$; and greater cognitive impairment $F(2,285)=4026.72$, $p<.001$, $\eta^2=.96$ than patients with DHF. Whereas there was no difference on gender $F(2,285)=0.00$, $p=1.00$, $\eta^2=.00$. Separate repeated measures of ANOVA was conducted with 7 MoCA factors (executive function v. naming vs. attention vs. language vs. abstraction vs. delayed recall vs. orientation; within subjects) x Group 3 (patients with SHF vs. DHF vs. HI; between subjects) showed significant differences between groups on subscales $F(6,285)=228.70$, $p<.001$, $\eta^2=.61$ and with EQ-i 5 factors (intrapersonal vs. interpersonal vs. adaptability vs. stress management vs. general mood; within subjects) x Group 3 (patients with SHF vs. DHF vs. HI between subjects) showed differential EI between groups $F(8,285)=4.20$, $p<.001$, $\eta^2=.02$ (Table). Regression analysis with scores on MoCA (dependent) and BP, Mean arterial pressure (MAP) and BarOn EQ-i as independent variables showed SBP $\beta=-.07$, $t=-3.93$, $p<.001$ and EI $\beta=.92$, $t=48.78$, $p<.001$ as significant predictors of cognition in patients with HF $R^2=.96$, $F(3, 287)=2373.93$, $p<.001$. MAP $\beta=.01$, $t=1.09$,

$p=.27$ was not significant and DBP was excluded.

This study revealed that patients with SHF had lesser emotional capacity as observed on all five factors of EI than patients with DHF. In contrast, HI had adequate emotional capacity. Several studies in psychological medicine have identified that patients with coronary heart disease reported feelings of distress, anger and emotional instability.¹⁰ These psychological factors are responsible for deteriorated quality of life in patients with systolic heart failure rather than somatic reasons which determine severity of heart failure, for instance N-terminal brain natriuretic peptide and left ventricular ejection fraction.¹¹ In the current study, it was also found that patients with SHF were more cognitively impaired than patients with DHF on several domains such as attention, executive function, etc. On the contrary, HI showed normal cognition. EI and SBP contributed towards cognition. This finding is consistent with previous literature demonstrating that several cardiac variables such as cerebral and functional changes, reduced cerebral blood flow, atrial fibrillation etc., contribute to cognitive deficits and dementia in patients with heart failure.^{2,12,13} Moreover, the current study yielded another important result that lower emotional capacity and higher SBP lead to cognitive deficits in HF. These results can be seen in the context of damaged brain areas involved in cognition and brain structural changes such as white matter hyperintensities, temporal lobe atrophy and cortical infarcts as a result of HF.^{8,9} Previous studies also found that after controlling confounds such as demographics, body mass index, diabetes, higher SBP was independently associated with impaired cognition and dementia.¹⁴ However, results of the present study are initial findings which should be further evaluated with a larger sample size. This would enhance validity of these results.

Conclusion

SHF must be treated along with cognitive and behavioural interventions to prevent social-cognitive deficits.

Disclaimer: None.

Conflicts of interest: None.

Funding Sources: None.

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Table: Characteristics of sample.

	SHF (n=96) M ± SD	DHF (n=96) M ± SD	HI (n=96) M ± SD
Age (years)	59.57±5.26	62.44±5.01	61.58±5.58
Gender (m/f)	48/48	48/48	48/48
Systolic blood pressure	132.22±5.75	143.12±5.45	119.63±2.63
Diastolic blood pressure	69.64±3.72	69.59±3.75	79.76±1.52
Mean arterial pressure	90.50±3.05	94.10±3.07	93.05±1.33
BarOn EQ-i	73.17±0.57	83.26±0.54	102.82±0.64
Intrapersonal EQ	74.05±1.32	84.06±1.24	103.16±1.21
Interpersonal EQ	73.86±1.14	84.12±1.07	103.97±1.02
Adaptability	74.14±0.95	84.12±1.17	103.67±1.02
Stress management	69.96±1.30	80.45±1.34	100.12±1.57
General mood	73.86±1.53	83.53±1.30	103.19±1.15
MoCA	11.66±1.03	16.31±1.34	27.97±1.47
Executive functioning	1.90±0.29	3.52±0.50	4.91±0.27
Naming	1.29±0.45	1.89±0.30	2.87±0.33
Attention	1.20±0.40	2.51±0.52	5.24±0.80
Language	1.54±0.50	1.68±0.46	2.94±0.22
Abstraction	1.87±0.33	0.91±0.27	1.83±0.37
Delayed recall	1.67±0.47	2.37±0.63	4.68±0.46
Orientation	2.16±0.62	3.40±0.65	5.54±0.57

SHF=Systolic Heart Failure; DHF=Diastolic Heart Failure; HI= Healthy Individuals; SBP=Systolic Blood Pressure; DBP=Diastolic Blood Pressure; BarOn EQ-i= BarOn Emotional Quotient Inventory; Intra EQ= Intrapersonal Emotional Quotient; Inter EQ= Interpersonal Emotional Quotient; MoCA=Montreal Cognitive Assessment.

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