

Effectiveness of Diaphragmatic Breathing Technique on Stress Reduction among Patients with Acute Heart Failure: A Quasi-Experimental Study

Effect Of
Diaphragmatic
Breathing
Techniques On
Stress With
Acute Heart
Failure

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ABSTRACT

Objective: To evaluate the effect of diaphragmatic breathing techniques on stress levels in patients with acute heart failure.

Study Design: Quasi-experimental study

Place and Duration of Study: This study was conducted at the Al-Muthanna Governorate-Iraq from 15th January 2026 to 30th June 2026.

Methods: Fifty patients diagnosed with acute heart failure in selected before and during the use of diaphragmatic breathing, Perceived Stress Questionnaire evaluated stress levels.

Results: The high (36%) and moderate (52%) levels of stress were present before intervention, with a mean score of 2.24 ± 0.657 . The diaphragmatic breathing intervention, most individuals were classified as low stress (70%) and high levels of stress were eliminated (0%), leading to a lower mean score of 1.30 ± 0.463 . A statistically significant ($P < 0.05$) correlation between the sociodemographic factors and stress levels after posttest was not found.

Conclusion: The diaphragmatic breathing method was found to have a significant, positive impact on stress levels related to patients with acute heart failure. The intervention was effective regardless of socio-demographic characteristics.

Key Words: Effectiveness, Breathing technique, Stress reduction, Acute heart failure

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INTRODUCTION

Acute heart failure (AHF) is one of the most serious cardiovascular diseases and also constitutes a major global health concern due to its high prevalence, rehospitalisation rates and mortality. Heart failure is a clinical syndrome defined as the inability of the heart to

pump enough blood to meet metabolic needs leading to symptoms of congestive dyspnoea; fatigue; oedema and exercise intolerance.¹ Acute heart failure is often accompanied by psychological distress characterized mainly by worry and anxiety that aggravates the patients' physiological condition thereby impairing recovery outcomes and quality of life.²

Psychological stress is the feeling that environmental or internal demands exceed one's adaptive capacity. Stress can activate both the sympathetic nervous system and hypothalamic-pituitary-adrenal axis of cardiac patients, resulting in increased heart rate and blood pressure as well excessive secretion of hormones including cortisol and catecholamines.³ Untreated stress in patients with heart failure may lead to nonadherence, sleep disorders, sadness and an unstable emotional state negatively impacts the cardiovascular performance.⁴

The significance of non-pharmacological interventions on the physiological and psychosocial outcomes of cardiac patients has been reaffirmed by recent advancements in nursing and alternative therapies. Diaphragmatic breathing techniques have been the focus of widespread interest as effective, simple and inexpensive methods for reducing stress and improving relaxation.⁵ Diaphragmatic or deep abdominal (belly) breathing is a type of controlled respiration that

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involves using the diaphragm to help you take more relaxed and steady breaths, rather than shallow chest breathing. This technique helps in the inhalation of oxygen into our lungs as it decreases respiratory load, induces characteristics that are parasympathetic and elicits a relaxation response.⁶

The diaphragmatic breathing helps with stress relief and emotional regulation, participants with depression considered diaphragmatic breathing successful, and there were significant decreases in negative affect and perceived stress.⁵ Improved deep breathing exercise resulted in a reduced salivary cortisol, as well as changes to autonomic nervous system regulation. In terms of heart health.⁷ The breathing exercises can significantly reduce stress and negative emotions such as anxiety, tension or worry in heart failure patients. The relaxation-oriented respiratory practices improve anxiety, fatigue, sleep quality and health-related quality of life among patients with chronic illness.⁸

The purposes were to assess the effect of deep breathing technique on stress in patients with heart failure and to test the association of socio-demographic characteristics of patients with stress levels after practicing diaphragmatic breathing.

METHODS

Quasi-experimental study was carried out at Al-Muthanna Governorate-Iraq from 15th January 2026 to 30th June 2026 vide letter 3459/Approval/SDFB Date January 7, 2026. Fifty patients diagnosed with acute heart failure in selected before and during the use of diaphragmatic breathing. All patients with an acute heart failure diagnosis, 8 years of age or older, conscious and able to speak and provide consent were included. Individuals with severe psychological or cognitive issues, acute respiratory distress that hinders them from performing breathing exercises and critical instability were excluded. The demographic information related to age, sex, education, place of

living and income per month was noted. The level of stress was assessed with the Perceived Stress Questionnaire (PSQ) designed by Harald Fliege and colleagues. It is a standardized instrument designed to measure perceived psychological stress with various emotional and cognitive stress-related problems in mind. The scale included measures of tension, anxiety, weariness (boredom), stress, and emotional depletion. Before and during the application of the diaphragmatic breathing technique, participants' answers were evaluated.⁹

Training sessions were conducted through organized meetings by the researcher on diaphragmatic breathing technique. Participants were instructed to sit comfortably and perform slow deep input through the nose while expanding their abdomen, retain 1-2s, and then slowly exhale through the mouth. Seven sessions were conducted on a bi-daily basis, with duration of approximately 15 to 20 minutes each. The approach was ensured to be implemented correctly by observing participants in the sessions. Data were collected from the participants directly in a pre-test (before the diaphragmatic breathing) and post-test (after a complete intervention). Data were analyzed using SPSS-26. The Chi-square test was utilized to determine associations between socio-demographics and stress. Statistical significance was defined by $P < 0.05$.

RESULTS

There were mostly males (62%), between 51-62 years of age (42%) who lived in cities (56%), with more than half obtained a primary educational level (64%) and reported a fairly sufficient monthly income (80%) [Table 1]. The stress scale items showed that mean values ranged from 0.82 to 2.08. The dominant frequencies for most questions were between "Often" and "Usually," indicating that individuals had higher self-reported stress levels prior to the intervention.

Table No. 1: Distribution of sociodemographic characteristics (n=50)

Variable	No.	%
Age (years)	≤50	8.0
	51-62	42.0
	63-74	28.0
	≥75	22.0
Sex	Male	62.0
	Female	38.0
Education level	No education	18.0
	Primary	64.0
	Secondary	14.0
	Bachelor degree	4.0
Residence	City	56.0
	Rural	44.0
Monthly income	Sufficient	8.0
	Somewhat sufficient	80.0
	Not sufficient	12.0

Table No. 2: The stress levels before and after practicing diaphragmatic breathing techniques

Symptoms of Stress	Scoring	Before			After		
		F	%	Mean	F	%	Mean
You feel rested	Almost never	10	20	1.94	20	40	1.00
	Some-times	6	12		10	20	
	Often	11	22		20	40	
	Usually	23	46		-	-	
You feel that too many demands are being made on you	Almost never	15	30	1.68	21	42	0.90
	Some-times	2	4		13	26	
	Often	17	34		16	32	
	Usually	16	32		-	-	
You have too many things to do	Almost never	9	18	1.62	14	28	1.02
	Some-times	12	24		21	42	
	Often	18	36		15	30	
	Usually	11	22		-	-	
You feel you're doing things you really like	Almost never	19	38	1.26	21	42	0.92
	Some-times	10	20		13	26	
	Often	10	20		15	30	
	Usually	11	22		1	2	
You fear you may not manage to attain your goals	Almost never	16	32	1.72	28	56	0.70
	Some-times	4	8		9	18	
	Often	8	16		13	26	
	Usually	22	44		-	-	
You feel calm	Almost never	16	32	1.58	21	42	1.14
	Some-times	8	16		5	10	
	Often	7	14		20	40	
	Usually	19	38		4	8	
You feel frustrated	Almost never	12	24	1.70	20	40	0.86
	Some-times	3	6		17	34	
	Often	23	46		13	26	
	Usually	12	24		-	-	
You are full of energy	Almost never	19	38	1.36	28	56	0.86
	Some-times	8	16		4	8	
	Often	9	18		15	30	
	Usually	14	28		3	6	
You feel tense	Almost never	7	14	2.08	16	32	1.10
	Some-times	6	12		13	26	
	Often	13	26		21	42	
	Usually	24	48		-	-	
Your problems seem to be piling up	Almost never	12	24	1.80	24	48	0.88
	Some-times	6	12		9	18	
	Often	12	24		16	32	
	Usually	20	40		1	2	
You feel you're in a hurry	Almost never	21	42	1.32	22	44	0.92
	Some-times	8	16		10	20	
	Often	5	10		18	36	
	Usually	16	32		-	-	
You feel safe and protected	Almost never	8	16	1.92	14	28	1.18
	Some-times	3	6		15	30	
	Often	24	48		19	38	
	Usually	15	30		2	4	
You have many worries	Almost never	19	38	1.16	20	40	1.00
	Some-times	10	20		15	30	
	Often	15	30		10	20	
	Usually	6	12		5	10	
You enjoy yourself	Almost never	14	28	1.58	21	42	1.02
	Some-times	7	14		10	20	
	Often	15	30		16	32	

	Usually	14	28		3	6	
	Almost never	16	32		20	40	
	Some-times	11	22		13	26	
	Often	10	20		16	32	
	Usually	13	26		1	2	
	Almost never	22	44		23	46	
	Some-times	13	26		20	40	
	Often	12	24		6	12	
	Usually	3	6		1	2	
	Almost never	13	26		27	54	
	Some-times	9	18		13	26	
	Often	15	30		10	20	
	Usually	13	26		-	-	
	Almost never	23	46		33	66	
	Some-times	15	30		15	30	
	Often	10	20		2	4	
	Usually	2	4		-	-	
	Almost never	14	28		29	58	
	Some-times	7	14		20	40	
	Often	16	32		1	2	
	Usually	13	26		-	-	
	Almost never	9	18		38	76	
	Some-times	8	16		9	18	
	Often	19	38		2	4	
	Usually	14	28		1	2	

Table No.3: Pre-distribution of total stress levels in the study sample before applying diaphragmatic breathing technique

Variables	Classification	F	%	Mean	Std. Deviation
Stress Level	Low	6	12	2.24	0.657
	Moderate	26	52		
	High	18	36		

Table No. 4: Distribution of total stress levels among the study sample after diaphragmatic breathing technique

Variables	Classification	F	%	Mean	Std. Deviation
Stress Level	Low	35	70	1.30	0.463
	Moderate	15	30		
	High	0	0		

Table No. 5: Bivariate correlation between sample socio-demographic characteristics and stress after executing the diaphragmatic breathing techniques

Sociodemographic Characteristics	Significance
Age	Chi-square=3.659, df=3, P.=0.301 (Non-significant)
Sex	Chi-square=2.138, df=1, P=0.144 (Non-significant)
Residence	Chi-square=.758, df=1, P=0.384 (Non-significant)
Monthly income	Chi-square=1.310, df=4, P=0.520 (Non-Significant)
Education levels	Chi-square=0.935, df=3, P=0.817 (Non-significant)

The post-intervention showed a significant improvement in stress management scores, with mean differences from 0.32 to 1.18. They mostly moved to the 'Almost never', and 'Sometimes' answer categories, indicating that less stress was experienced after diaphragmatic breathing treatment (Table 2).

The pre-intervention stress levels show that more than half of the study group (52%) is classified as moderate stress and 36% are high stress. The sample presents an

overall mean score 2.24 ± 0.657 , suggesting that the vast majority of people endured an exceptional amount of psychological stress (Table 3).

The overall level of stress after the intervention showed an excellent distribution, representing a clear improvement for crude (70%) from the 'low stress' group. Notably, extreme stress was entirely eliminated (0%) and moderate stress decreased to 30%. The overall mean score decreased significantly to

1.30±0.463 which indicates that the intervention proved effective in reducing perceived stress among study participants (Table 4).

Stress is not significantly associated with sociodemographic variables and was performed using univariate analysis. No statistically significant correlation was observed for any of the variables: age ($P=0.301$), gender ($P=0.244$), residence ($P=0.384$), monthly income ($P=0.520$) and educational level ($P=0.817$) and showed that the decrease in stress was consistent across all demographic groups within the study population (Table 5)

DISCUSSION

In the current study, the largest portion of all patients was aged 51-62 years. Coronary artery disease more commonly occurs in elderly patients. The extent and severity of coronary artery calcification are predictive markers for coronary atherosclerosis, which is known to progress with age especially in middle aged and elderly.¹⁰

The metropolitan population seems to be more at risk because of the stress of urbanization and lifestyle changes that add up as sedentary, fast food consumption and all changes in diet due to transition from rural populations to urban living, all predisposing factors for coronary artery diseases. This is similar to the current study in which males comprised 62% of our sample and 63.3% of all participants. The results are in line with study which found a much larger percentage of men with cardiac disease have large coronary arteries.¹¹ This is due to a larger number of CAD in men, resulting from higher exposure rates to the major risk factors (smoking, work-related stress and unhealthy lifestyle). Cardiac hormones might have a protective effect against coronary artery disease in premenopausal women.

In the current study, 64% of respondents had a primary education (6% uneducated, 27% secondary education, and 6% at least bachelor's degree. These results were confirmed by research showing that worse education attainment is associated with poor cardiovascular prognosis and a higher event rate in stable coronary artery disease patients.¹² This effect might be attributed to lower levels of education, resulting in poor health literacy that makes individuals less aware about cardiovascular risk factors, the prevention of disease and adherence with healthy living and treatment guidelines.

In this study, 56% owned urban region and 44% rural area. Another study from the North-Eastern Zone of India supports this result, it clearly shows that prevalence of coronary artery disease with risk factors was much higher (urban: 68.83% and rural: 31.17%). This indicates that urban way of life and environment in mega cities act as a risk promoting drug for elevated CAD risk.¹³ The very high rate among urban dwellers

due to high prevalence associated with stress, less physical activity and increased ultra-processed foods intake in cities causes an upsurge in cardiovascular diseases particularly coronary artery disease.

Most participants earned a decent monthly income (80%) whereas fewer reported having a sufficient or inadequate income. Socioeconomic status, risk of arteriosclerotic cardiovascular disease and cause-specific and all-cause mortality: National Health and Nutrition Examination Survey 2005-2018.¹⁴ This study indicate that economic conditions impact access to preventive measures including both effective health care and healthy eating behaviours, which are associated with risk of developing CVD or also known as cardiovascular disease management.

This study showed that diaphragm breathing application reduced post-stress levels in patients. Before the intervention, most had moderate to high stress scores; after the intervention, more moved to a lower stress level, and the mean stress score was also significantly lower. Diaphragmatic breathing was effective for reducing perceived psychological stress in acute heart failure. The physiological and psychological effect of diaphragmatic breathing through its facilitation of parasympathetic nervous system activity, promotion of relaxation, inhibition of sympathetic arousal and increased oxygenation underlie this improvement. Besides, controlled respiration could minimize adrenal fatigue and emotional pressure which can help patients reach greater psychological balance and also manage anxiety more effectively. In addition, another non-invasive and easy in application method is called diaphragmatic breathing which helps to improve mental health related conditions and coping ability on patients with cardiovascular diseases. The present results are consistent with previous studies, relaxation methods (diaphragmatic breathing exercises) might relieve stress and anxiety in people with cardiac diseases or chronic illnesses.⁵ Diaphragmatic breathing significantly reduced stress and negative emotions in adults.⁷ Moreover, deep diaphragmatic breathing leads to decreased cortisol release and enhanced autonomic modulation, mechanisms multi-faceted functions in stress relief.³

The current research did not show a statistically significant association between patient stress and their age, gender, education or monthly income ($p>0.05$). Close correlation of patient anxiety on the basis of residential area ($p<0.05$) showed that rural persons were more anxious than urban persons. Study documented analogous results. This is one of the main reasons behind the lack of access to health care and nutrition education in rural areas.^{15,16}

This study demonstrated the role of nurses providing non-pharmacological therapies to promote mental well-being among cardiac patients. Diaphragmatic breathing may serve as a simple nursing intervention for possible

incorporation into ADL standard cardiac care to reduce stress and improve comfort in patients. Diaphragmatic breathing may be a simple, safe and inexpensive nursing intervention which is able to be added to routine cardiac care thus far to lower anxiety and improve comfort for patients.

CONCLUSION

The diaphragmatic breathing approach successfully reduced stress in patients with acute heart failure. Before intervention, majority of the participants belonged to moderate or high stress levels while after utilizing this specific method of diaphragmatic breathing most shifted to low categories in stress level and complete suppression of higher categories.

Author's Contribution:

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