

From Education to Impact: Nursing-Led Approaches a Transformative Force in Advanced Valvular Heart Diseases

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ABSTRACT

Background: Valvular heart diseases have a substantial impact on healthcare systems, contributing significantly to cardiovascular morbidity and mortality worldwide. Skilled nurses play a crucial role in improving and stabilizing patients' health and functional status through basic management and follow-up. **Objectives:** This study aimed to evaluate the efficacy of a structured nursing-led health education program in improving heart failure-related clinical status, health-related quality of life, and medication adherence as well as reducing mortality among patients with advanced valvular heart disease at the Cardiovascular Medicine Departments, Assiut University Heart Hospital, Egypt. **Methods:** a quasi-experimental research design was used. A purposive sample of 210 patients with advanced valvular heart disease was selected from the cardiovascular medicine departments at Assiut University Heart Hospital, Assiut, Egypt (105 were assigned to the study group and 105 to the control group). **Tools:** Data were collected using three tools: (I) a patient assessment sheet, (II) a heart quality of life questionnaire, and (III) a Modified Six-Item Morisky Medication Adherence Scale. **Results:** reveals that 57.1% for the studied & 53.3% for the control groups were aged $50 \leq 65$ years, 50.5% & 62.9% were males, and also statistically significant differences were observed in heart failure assessment, total category of heart QoL, and medication adherence between the study and control groups at six months, which persisted throughout the one-year follow-up period after implementing the nursing-led health education approaches (p -value < 0.001), with moderate effect size. **Conclusion:** The study's findings demonstrated favorable outcomes, associated with the nursing-led health education approaches. Thus, integrating these approaches into the management of patients with advanced valvular heart disease is strongly recommended to achieve sustained improvements in patient outcomes.

Keywords: Advanced Valvular Heart Diseases; Egypt; Nursing-Led Approaches; Quality of Life

INTRODUCTION

Valvular Heart Diseases (VHDs) are disorders in which cardiac valves fail to function effectively, leading to serious consequences. VHDs encompass different types, such as aortic stenosis and regurgitation, mitral stenosis and regurgitation, and tricuspid stenosis and regurgitation (Debski *et al.*, 2026). VHDs can present as mixed VHD, which includes both stenotic and regurgitant lesions on the same valve, or as Multiple Valvular Heart Disease (MVD), which includes a mixture of stenotic and regurgitant lesions on two or more heart valves (Vesvrotte *et al.*, 2025).

The incidence and prevalence of VHDs are rapidly increasing, making VHDs the next cardiovascular epidemic challenge that will affect millions of people worldwide and pose a significant threat to public health. The Aswan Heart Center in Egypt, led by Professor Magdi H. Yacoub, provides care to over 45,000 outpatients each year. Nearly 25% of these patients present with rheumatic heart diseases (Kotit & Yacoub, 2023). The prevalence rate for rheumatic heart disease is around 684 per 100,000 individuals. RHD continues to be the

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leading cause of VHD in countries with limited resources, resulting in more than 13 million years of healthy life lost (Correra *et al.*, 2026).

Acquired valvular heart disease is common in the 21st century, yet it remains significantly underdiagnosed and undertreated (Kasprzak, 2026). This contributes to the occurrence of multiple complications, one of the most serious of which is acute heart failure, which is caused by a rapid decline in hemodynamic and cardiac function. Without appropriate treatment, the condition can deteriorate rapidly, leading to acute congestion, cardiogenic shock, and death. VHDs account for 25% of heart failure cases among Egyptian adults (Hassanin *et al.*, 2020).

Heart valve teams that include highly qualified nurses can reduce financial costs and time demands, improve medication adherence, and positively influence life expectancy, quality of life, complications, and mortality rates (Wang *et al.*, 2025). Similar to small outpatient units, nurse-led clinics, which are managed by trained specialist nurses who deliver primary care, provide counseling, promote healthy behaviors, and offer psychological, educational, and preventive support to patients and their families, establish nurses as essential contributors to cardiovascular care (Qiu, 2024).

Nurses play a significant role in the thorough care of patients with VHDs by implementing advanced therapeutic protocols, tailoring care to the individual needs of each patient, and promoting health education. These interventions optimize patients' quality of life, support self-care, facilitate lifestyle modifications, and minimize complications (Majrashi *et al.*, 2024).

Personalized nurse-led interventions via interviews that integrate structured care planning, patient education, self-care instruction, and counseling play a significant role in managing patients with VHD. Such interventions are associated with improved self-control, treatment knowledge and adherence, patient comfort and satisfaction, and quality of life. They also decrease complications and mortality rates (Bernal *et al.*, 2023).

Significance of the Study

In Egypt, valvular heart disease is the second leading cause of heart failure after ischemic heart disease. It contributes to approximately one-quarter of heart failure cases in different regions of the country and also limits patients' quality of life. The prevalence of valvular heart disease is predicted to increase by 2040 and triple by 2060 (Pang *et al.*, 2025). Interventional studies specifically addressing advanced valvular heart disease are limited in Egypt. Therefore, this study specifically targets this under-researched group focusing in evaluating the effect of a structured nursing-led health education program on heart failure–related clinical status, health-related quality of life, and medication adherence as well as mortality aiming to contribute to a better understanding of this understudied group and to provide evidence that may assist support both patient care and future researchers in Egypt in this field. Consequently, this study endeavored to optimize the health status for these vulnerable patients by empowering them through nursing-led education.

Aim of the Study

To evaluate the efficacy of a structured nursing-led health education program in improving heart failure–related clinical status, health-related quality of life, and medication adherence as well as reducing mortality among patients with advanced valvular heart disease at the Cardiovascular Medicine Departments, Assiut University Heart Hospital, Egypt.

Research Hypotheses

Patients with advanced valvular heart disease who receive a structured nursing-led health education program will demonstrate significant improvements in heart failure–related clinical status, health-related quality of life, and medication adherence, along with a reduction in mortality, compared to those in the control group.

METHODOLOGY

Research Design

A quasi-experimental research design was utilized with two groups (study and control groups). Patients who met the eligibility criteria (moderate to severe valvular heart disease) were assigned sequentially into the control group first, followed by the study group to avoid contamination between the two groups and to ensure the internal validity of the study.

Setting

The study was implemented in the cardiovascular medicine departments of Assiut University Heart Hospital, Egypt.

Sample

A total of 210 adult patients of both sexes, aged 20–65 years and diagnosed with advanced valvular heart disease (moderate to severe), were purposively enrolled in the study.

Exclusion Criteria

Individuals with mild VHDs.

Sample Size

The sample size was calculated using G*Power software, version 3.1.9.7, based on a medium effect size (Cohen's $d = 0.50$), a significance level of $\alpha = 0.05$, and a statistical power of 95% ($1 - \beta = 0.95$), with equal allocation between the study and control groups. The required sample size was 210 adult patients with advanced valvular heart diseases, with 105 patients allocated to each group (Lakens, 2022).

The study evaluated multiple outcomes; therefore, no single primary outcome was prospectively specified for the original sample-size calculation.

Duration of Study

The study lasted over the period from February 2024 to April 2025.

Data Collection Tools

Tool (I) Patient Assessment Sheet

Part (1): Patient personal data, such as age, sex, and education (Mohebbi *et al.*, 2021).

Part (2): Cardiac assessment: included

Causes such as rheumatic fever, infective endocarditis, congenital valve disease, family history, and myocardial infarction. The etiology was collected as a baseline clinical characteristic to describe the study population. It was not considered a primary predictor or outcome variable (Yakob *et al.* 2025).

Heart failure assessment included the presence of dyspnea, bilateral limb edema, jugular vein distention, and ejection fraction assessment (Fan *et al.*, 2025).

Mortality assessment

Tool (II) Heart QoL Questionnaire

The patient-reported outcomes instrument was used to measure the achievement of health objectives. The questionnaire included 14 items, divided into 10 physical and 4 emotional subscale items (Oldridge *et al.*, 2014).

Scoring System

The Heart QoL questionnaire was scored using a four-point Likert scale ranging from 0 to 3 for each item, with higher scores denoting better health-related QoL. The mean scores were computed by dividing the sum of completed items by the number of responses. The global scores were categorized into low (≤ 2.00), moderate (2.01–2.99), or high ($= 3$).

Tool (III) Modified Six-Item Morisky Medication Adherence Scale (MMAS)

A modified six-item version of the Morisky Medication Adherence Scale was developed by the researchers based on the original Morisky medication adherence. Scale with modifications to suit patients with valvular heart disease (Morisky *et al.*, 1986) assessed patients' adherence to medication using six yes/no questions that explored medication-taking behaviors. The modified instrument was pilot-tested before the main study, and its internal consistency was assessed using Cronbach's alpha, which was 0.70.

Scoring System

Each item was scored as zero for 'Yes response' and one for 'No response,' with a total score ranging from zero to six. Patients who achieved a total score of six were classified as having good adherence, while those with a score less than six were classified as having low adherence.

Content Validity

The validity was established through an evaluation by five experts from medical–surgical nursing and cardiovascular medicine professors. The experts reviewed the study tools to ensure they were clear, accurate, relevant, applicable, comprehensive, and easy to understand.

Reliability

The Cronbach's alpha coefficient test was utilized to assess the stability of the instruments' internal consistency. The results were 0.87 for tool II and 0.70 for tool III.

A pilot study was carried out on twenty-one patients to evaluate the proposed study tools' feasibility and clarity. The pilot study data were analyzed, and no modifications were made to the study instruments. As a result, the patients chosen for the pilot study were included in the study. A statistical comparison of baseline characteristics and outcome measures between the pilot participants and the newly recruited participants showed no significant differences, indicating that their inclusion did not bias the study results.

Procedure

An official approval was obtained from the head of the cardiovascular medicine departments at Assiut University Heart Hospital prior to data collection. The researcher attended the cardiovascular medicine departments during morning and afternoon shifts on most weekdays until the required sample size was achieved.

Eligible patients who met the criteria (moderate to severe valvular heart disease) were consecutively recruited. To avoid contamination between groups, patients were assigned sequentially; the control group was recruited first until the required number ($n = 105$) was completed, followed by recruitment of the study group ($n = 105$).

Baseline comparability between the two groups was assessed, and no significant differences were found in relation to their baseline characteristics.

Initial Hospital Interview

The researcher interviewed each participant individually to collect data using all study tools to obtain information regarding personal data, cardiac assessment, heart QoL, and medication adherence. All study

instruments were used in their original English versions and filled in by the researcher. Control participants were assessed and received only routine hospital care.

Study participants received routine hospital care after they were assessed. In addition, the researcher conducted one face-to-face structured thorough educational session with them and their family members. The session covered the definition, etiology, signs and symptoms of VHD, potential complications, particularly HF, how to reduce incidence, and how to be controlled. For medication adherence, detailed information about medication administration and strategies to help them remember medication times was provided. Additionally, lifestyle modifications were emphasized, including healthy nutrition, physical activity, stress control, and techniques to enhance their QoL. The education was delivered individually to each participant in simple language to enhance understanding and encourage adherence to the recommended self-care practices.

The researcher developed a standardized teaching material in the form of a colored, illustrated educational Arabic booklet containing detailed information based on an extensive review of the relevant literature (Federal Ministry of Health, 2020) and also were reviewed and validated by five experts to ensure content accuracy and applicability. This booklet was given to each participant in the study group. The session and booklet aimed to equip patients with the knowledge and skills to improve medication adherence, relieve heart failure symptoms, enhance their QoL, and lower mortality. The assessment and educational session took approximately 35-40 minutes.

The educational program was fully standardized for all patients in the study group. All participants received the same content and teaching methods for the same duration in a single session, as well as an educational booklet. For fidelity of intervention, the delivery of the session was conducted by the same researcher using a structured teaching plan to ensure consistency and fidelity of the intervention.

Evaluation and Follow-up

Participants in both groups were followed up via phone calls and WhatsApp to facilitate communication with patients who were unable to attend the hospital and to minimize loss to follow-up. The first follow-up was conducted six months after the initial hospital interview, and the second follow-up was conducted one year later.

During the six-month and one-year follow-up periods, the vital status of participants was assessed by telephone contact with the participant or a close family member. When a family member reported that a participant had died, the death was recorded as a mortality event based on the family report.

To ensure consistency and minimize measurement bias, the same validated data collection tools were used for all participants, and all follow-up interviews were conducted by the same researcher.

Follow-up procedures were applied equally to the study and control groups to maintain uniformity of data collection. Patients were reevaluated using the same data collection tools.

Statistical Analysis

The data were entered and analyzed using SPSS version 26.0 (Statistical Package for Social Sciences). Categorical variables were compared using the chi-square and Fisher's exact tests. They were described as numbers and percentages. The effect size phi (ϕ) was calculated for significant associations between categorical variables. The p -value of <0.05 was considered statistically significant. The p -value of less than 0.05 was considered statistically significant. The p -value was deemed not statistically significant if it was greater than 0.05.

Ethical Consideration

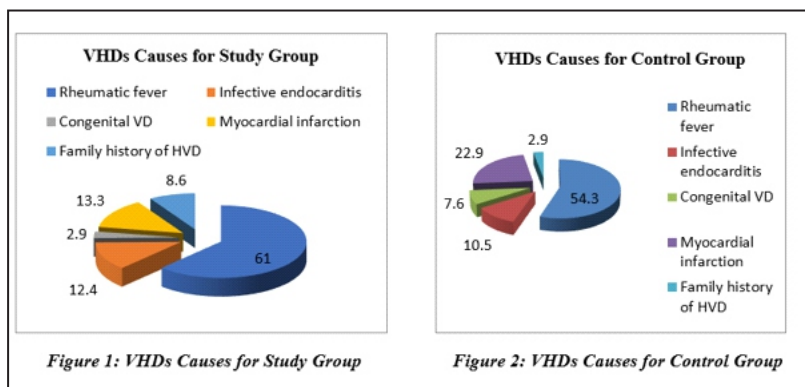
This study received ethical approval from the Faculty of Nursing's Ethical Committee of Assiut University, Egypt with reference number 1120230725 on 26th December, 2023.

RESULTS

Table 1: Comparison between Study and Control Groups Regarding Personal Data (n=210)

Personal Data	Study Patients (105)		Control Patients (105)		P-value	χ^2	Df	95% CI (%)
	N	%	N	%				
Age group						5.457	3	-12.1 to 20.4
20 < 30	4	3.8	7	6.7	0.141			
30 < 40	13	12.4	23	21.9				
40 < 50	28	26.7	19	18.1				
50 ≤ 65	60	57.1	56	53.3				
Sex						3.277	1	-25.7 to 0.9
Male	53	50.5	66	62.9	0.070			
Female	52	49.5	39	37.1				
Education						0.513	1	-17.8 to 8.3
Uneducated	64	61.0	69	65.7	0.474			
Educated	41	39.0	36	34.3				

Table 1 reveals that more than half of the participants (57.1% for the study & 53.3% for the control) were aged 50 ≤ 65 years, were males (50.5% & 62.9% respectively), and were uneducated (61.0% & 65.7% respectively).



Figures 1 & 2 clarify that more than half of the participants (61.0% for the study group & 54.3% for the control group) had rheumatic fever as a dominant cause of VHD

Table 2: Comparison between Study and Control Groups in Relation to Heart Failure Assessment (Initial Assessment)

Heart Failure Assessment	Initial Assessment				
	Study (105)		Control (105)		P-value
	N	%	N	%	
Presence of dyspnea	104	99.0	103	98.1	0.5611
Bilateral limb edema	77	73.3	77	73.3	-
Jugular veins distention	13	12.4	6	5.7	0.092
Abnormal ejection fraction	34	32.4	43	41.0	0.197

Table 2 shows that at initial assessment almost all participants had dyspnea (99.0% study & 98.1% control), and both groups had equal bilateral limb edema (73.3% each). No statistically significant difference was found between the two groups in any heart failure assessment item ($P > 0.05$)

Table 3: Comparison Between Study and Control Groups in Relation to Heart Failure Assessment (Six Months Follow up)

Heart Failure Assessment	Six months follow up									
	Study (92)		Control (86)		p value	Phi (φ)	χ ²	Df	CI 95%	Absolute Difference (%)
	N	%	N	%						
Presence of dyspnea	78	84.8	84	97.7	0.003*	0.225	9.030	1	-20.9 to -4.9	12.9
Bilateral limb edema	16	17.4	61	70.9	0.000*	0.540	51.908	1	-65.9 to -1.2	53.5
Jugular veins distention	0	0.0	10	11.6	0.001*	0.252	11.334	1	-18.4 to -4.9	11.6
Abnormal ejection fraction	16	17.4	44	51.2	0.000*	0.357	22.687	1	-46.9 to -20.7	33.8

Table 4: Comparison Between Study and Control Groups in Relation to Heart Failure Assessment One Year Follow up

Heart Failure Assessment	One year follow up									
	Study (90)		Control (76)		P-value	Phi (φ)	χ ²	Df	CI 95%	Absolute Difference (%)
	N	%	N	%						
Presence of dyspnea	26	28.9	55	72.4	0.000*	0.433	31.177	1	-57.2 to -29.7	43.5
Bilateral limb edema	2	2.2	26	34.2	0.000*	0.426	30.068	1	-43.1 to -20.9	32.0
Jugular veins distention	0	0.0	3	3.9	0.057*	0.148	3.618	1	-8.3 to 0.4	3.9
Abnormal ejection fraction	15	16.7	38	50.0	0.000*	0.356	21.065	1	-47.0 to -19.7	33.3

-Chi square test was used for comparison between the two groups

-Significant at p value < 0.05*

-Effect size was calculated using Phi coefficient (φ): small = 0.10, moderate = 0.30, large ≥ 0.50.

Tables 3 & 4 highlight that there was a statistically significant difference in heart failure assessment between the study and control groups at six months follow up, and this difference persisted throughout the one-year follow-up period, with a moderate effect size.

Table 5: Comparison Between Study and Control Groups in Relation to the Total Category of Heart QoL (Initial Assessment)

Category of Heart QoL	Initial Assessment					
	Study (105)		Control (105)		P- value	
	N	%	N	%		
Low quality of life (≤ 2.00)	45	42.9	60	57.1	0.117	
Moderate quality of life (2.01-2.99)	56	53.3	42	40.0		
High quality of life (=3)	4	3.8	3	2.9		

Table 5 shows that, at the initial assessment, more than half of the study group (53.3%) had a moderate quality of life while more than half of the control group (57.1%) had a low quality of life, with only a small proportion of both groups (3.8% & 2.9% respectively) reporting high quality of life. No statistically significant difference was detected between the two groups regarding the total category of heart QoL at baseline (p = 0.117).

Table 6: Comparison Between Study and Control Groups in Relation to the Total Category of Heart QoL) Six Months Follow Up)

Category of Heart QoL	Six Months Follow Up									
	Study (92)		Control (86)		P- value	Phi (φ)	χ ²	Df	CI 95%	Absolute Difference (%)
	N	%	N	%						
Low quality of life (≤ 2.00)	3	3.3	19	22.1	0.001*	0.342	20.782	2	-28.3 to -9.3	18.8
Moderate quality of life (2.01-2.99)	81	88.8	67	77.9					-0.9 to 21.1	10.9
High quality of life (=3)	8	8.7	0	0.0					2.9 to 14.5	8.7

Table 7: Comparison Between Study and Control Groups in Relation to the Total Category of Heart QoL (One Year Follow up)

Category of Heart QoL	One Follow up									
	Study (90)		Control (76)		P-value	Phi (φ)	χ²	Df	CI 95%	Absolute Difference (%)
	N	%	N	%						
Low quality of life (≤ 2.00)	2	2.2	13	17.1	0.001*	0.387	24.880	2	-23.9 to -5.9	14.9
Moderate quality of life (2.01-2.99)	54	60.0	56	73.7					-27.8 to 0.5	-13.7
High quality of life (=3)	34	37.8	7	9.2					16.6 to 40.5	28.6

-Chi square test was used for comparison between the two groups

-Significant at p value < 0.05 *

-Effect size was calculated using Phi coefficient (φ): small = 0.10, moderate = 0.30, large ≥ 0.50 .

Tables 6 & 7 present that there was a statistically significant difference in the total category of heart QoL between the study and control groups at six months follow up, and this difference persisted throughout the one-year follow-up period, with a moderate effect size.

Table 8: Comparison between Study and Control Groups in Relation to Medication Adherence (Initial Assessment)

Medication Adherence	Initial Assessment				P-value
	Study (105)		Control (105)		
	N	%	N	%	
Low adherence	32	30.5	33	31.4	0.354
Good adherence	73	69.5	70	66.7	

Table 8: Table 8 illustrates that, at the initial assessment, slightly more than two-thirds of both groups (69.5% for the study group & 66.7% for the control group) had good medication adherence, while nearly one-third of each (30.5% & 31.4% respectively) had low adherence. There was no statistically significant difference between the two groups regarding medication adherence at baseline ($p = 0.354$).

Table 9: Comparison between Study and Control Groups in Relation to Medication Adherence (Six Months Follow up)

Medication Adherence	Six Months Follow up									
	Study (92)		Control (86)		P-value	Phi (φ)	χ²	Df	CI 95%	Absolut Difference (%)
	N	%	N	%						
Low adherence	4	4.3	15	17.4	0.000*	0.212	7.993	1	−22.1 to − 4.1	13.1
Good adherence	88	95.7	71	82.6					4.1 to22.1	13.1

Table 10: Comparison between Study and Control Groups in Relation to Medication Adherence (One Year Follow up)

Medication Adherence	One Year Follow up									
	Study (90)		Control (76)		P-value	Phi (φ)	χ²	Df	CI 95%	Absolute Difference (%)
	N	%	N	%						
Low adherence	5	5.6	16	21.1	0.000*	0.232	8.955	1	-25.8 to -5.2	15.5
Good adherence	85	94.4	60	78.9					5.2 to 25.8	15.5

-Chi square test was used for comparison between the two groups

-Significant at p value < 0.05 *

-Effect size was calculated using Phi coefficient (φ): small = 0.10, moderate = 0.30, large ≥ 0.50 .

Table 9 & 10 indicates that there was a statistically significant difference in medication adherence between the study and control groups at six months follow up, and this difference persisted throughout the one-year follow-up period, with a small effect size.

Table 11: Comparison between Study and Control Groups Regarding Mortality

Mortality Assessment	Study Patients (105)		Control Patients (105)		P value	Phi (ϕ)	χ^2	Df	95% CI (%)	Absolute Difference (%)
	N	%	N	%						
Six months follow up	13	12.4	19	18.1	0.249	0.079	1.327	1	−15.4 to 4.0	5.7
One year follow up	15	14.3	29	27.6	0.015*	0.168	5.944	1	−25.7 to −0.9	13.3

Chi square test was used for comparison between the two groups

Significant at p value < 0.05*

Effect size was calculated using Phi coefficient (ϕ): small = 0.10, moderate = 0.30, large ≥ 0.50 .

Table 11 reveals that there was a statistically significant difference in mortality between the study and control groups throughout the one-year follow-up, resulting in a difference in the numbers of cases from baseline, with a small effect size.

DISCUSSION

VHDs represent a significant public health threat with major cardiovascular events such as heart failure, arrhythmia, and death (Zhang *et al.*, 2024). Rheumatic VHD accounts for approximately 250,000 deaths every year worldwide (Sherif *et al.*, 2025). Moreover, maximizing health-related outcomes depends on educating patients and offering clear, structured guidance on their condition management.

Personal Data

In relation to personal data, the present study revealed that more than half of both the study and control groups (57.1% and 53.3%, respectively) were aged 50–65 years and were males. This finding is consistent with Duan *et al.* (2024), who reported a median age of 57 years for rheumatic valvular disease patients, which is within the same range of fifty to sixty-five years. Also, this is consistent with Grave *et al.* (2024), who reported a higher prevalence of VHD in men. From a clinical perspective, the predominance of patients in the 50–65-year age group in the current study may be explained by the progression of valvular pathology and the increasing likelihood of symptom manifestation during this stage, prompting patients to seek medical care. The predominance of males may be explained by the fact that men have greater exposure to cardiovascular risk factors, which predisposes them to VHD. Clinically, this underscores the need to consider gender-specific risk profiles when screening and managing valvular heart disease.

Concerning education, the study demonstrated that more than half of the patients were uneducated. The same result was observed in the research of Salehi *et al.* (2024), which indicated that most patients were illiterate. This finding is consistent with international evidence linking low educational attainment to VHD, particularly of the rheumatic etiology. Clinically, this emphasizes the importance of providing health education and interventions tailored to patients with limited literacy to enhance adherence, self-care, and health outcomes.

Causes of VHDs

Regarding the causes of VHDs, the study found that more than half of the patients had a history of rheumatic fever, making it the dominant etiology. This finding is supported by Yakob *et al.* (2025), who demonstrated that rheumatic heart disease is the primary cause of VHDs. This result aligns with global epidemiological trends, indicating that rheumatic fever and its chronic sequence remain leading contributors to VHDs in low- and middle-income countries. This emphasizes the need for targeted interventions and health education programs to reduce disease progression and associated complications.

Heart Failure Assessment

The study demonstrated a statistically significant improvement in heart failure outcomes in the study group compared to the control group six months after nursing-led education, with improvements persisting through the one-year follow-up. This finding is aligned with those of Wongpiriyayothar *et al.* (2024), who reported reduced perceived HF symptom severity among VHDs patients, and Fan *et al.* (2025), who found

improved ejection fraction and cardiac output among VHDs patients. This improvement may be attributed not only to the initial nursing-led education but also to the continued follow-up provided through telephone calls and WhatsApp, which enabled the researcher to reinforce self-care instructions, clarify patients' concerns, encourage medication adherence, promote regular follow-up and investigations, and facilitate early recognition and management of worsening symptoms. The present findings may therefore suggest that continuous nursing support and reinforcement of self-management behaviors can contribute to better heart failure-related outcomes among patients with advanced VHDs. From a clinical perspective, personalized, patient-centered education could reduce HF severity, hemodynamic stress, and complications, thus supporting its incorporation into routine care for patients with advanced VHDs.

Total Category of Heart QoL & Medication Adherence Assessment

The study demonstrated statistically significant improvements in heart-related quality of life and medication adherence in the study group compared with the control group at six months following the nursing-led health education, and these improvements were maintained throughout the one-year follow-up.

These findings are consistent with Dollaku *et al.* (2025), who reported that educational interventions given to VHD patients were associated with improvements in quality of life, self-care behaviors, and treatment adherence. Similarly, Wang *et al.* (2025) emphasized the beneficial role of effective VHDs patient education in improving quality of life and potentially reducing healthcare-related costs. Furthermore, Li *et al.* (2021) indicated that written health education provided to VHD patients during the rehabilitation process benefits healthy behavior capacity, quality of life, and drug commitment of experimental patients, which were superior to those of the control patients. (Chyead & Haloob, 2025) Also demonstrated that, after implementing instructional education for the VHDs study group, the compliance rate greatly improved, reaching a moderate degree of compliance. This result is also congruent with that of Oktarina *et al.* (2025), who reported that education serves as an external trigger that facilitates adaptive reactions and enables VHD patients to effectively control their physical and psychological health. Collectively, these studies support the current findings emphasizing the possible contribution of structured, patient-centered educational programs, which could significantly enhance both quality of life and adherence to prescribed therapies in patients with advanced valvular heart diseases.

Mortality of VHD

The current research findings established a notable statistically significant difference in the mortality between the study and control groups over the course of a one-year follow-up period, following the study group's exposure to nurse-led education. This outcome is aligned with the conclusion drawn by Zhou *et al.* (2025), who stated that the effect of nurse-led cardiac rehabilitation for VHD patients reduces recurrence and mortality rates.

The improvements observed in the study group may reflect the beneficial contribution of the nursing-led health education program, together with subsequent follow-up and improved self-management behaviors provided to the study patients. This education empowered the patients with knowledge about their condition, the importance of medication adherence, lifestyle modifications, and self-care strategies. This promoted the consistent use of prescribed therapies, which helped control symptoms and reduce deaths. Consequently, patients clinically experienced better functional status and overall well-being, leading to a measurable improvement in health-related quality of life and a lowered death rate.

The observed improvements may not be attributed solely to the initial educational session and the provided booklet alone. Rather, the continuous and intensive follow-up provided to patients throughout the study period may have contributed to the favorable outcomes. Patients received repeated telephone and WhatsApp follow-up contacts, during which their questions and concerns were addressed, appropriate guidance was provided, and they were continuously encouraged to adhere to their prescribed medications and recommended self-care instructions. In addition, patients were reminded and encouraged to undergo the required periodic investigations and diagnostic imaging and to maintain regular follow-up. This ongoing communication and support may have reinforced patients' knowledge, self-management behaviors,

medication adherence, and compliance with recommended monitoring, which may, in turn, have contributed to the improved clinical and quality-of-life outcomes observed in the study group.

Limitations

This study has several limitations. The non-randomized design and reliance on purposive sampling may limit the generalizability of the findings. In addition, the study was conducted in a single hospital, which may not reflect variations in practice patterns or resources across different settings.

Future Scope

Future research should investigate the long-term effectiveness of structured nursing-led health education programs among patients with advanced valvular heart disease using larger, multicenter samples to enhance the generalizability of the findings. Further studies should also examine the effectiveness of continuous telenursing and digital follow-up interventions, including telephone calls, WhatsApp-based communication, and other digital health platforms, in supporting medication adherence, symptom monitoring, lifestyle modification, and early recognition of complications. Randomized controlled trials with longer follow-up periods are recommended to provide stronger evidence regarding the sustained effects of nursing-led education on health-related quality of life, clinical outcomes, healthcare utilization, and survival. Future studies may also evaluate the cost-effectiveness of nurse-led educational and follow-up interventions and explore the perspectives of patients and family caregivers regarding barriers to adherence and self-management. In addition, integrating nurse-led education within multidisciplinary valvular heart disease clinics may be investigated as a model for improving continuity of care and patient outcomes.

CONCLUSION

Based on the study findings, the nursing-led health education program appeared to improve heart failure-related clinical status, health-related quality of life, and medication adherence, along with a reduction in mortality among patients with VHD. These results suggest that integrating structured, nursing-led education into routine care could lead to better long-term outcomes for patients. However, the quasi-experimental design and purposive sampling of the study may affect the generalizability of the findings.

RECOMMENDATION

To facilitate the potential application of these findings, outpatient VHD services may consider incorporating structured nursing-led education and regular follow-up into existing care pathways, where resources permit. Such services could involve trained nurses working in collaboration with cardiologists to provide individualized education, reinforce self-care and medication adherence, monitor patients' symptoms, and support regular follow-up. A workflow diagram outlining patient registration, initial assessment, education, and follow-up procedures could be developed and evaluated in future implementation studies to determine its feasibility and applicability in routine clinical practice. Further research using larger, more representative samples and randomized controlled designs is recommended to confirm the effectiveness of the intervention, determine the contribution of continued follow-up, and evaluate its long-term effects on quality of life, medication adherence, healthcare utilization, complications, and mortality.

CRedit Authorship Contribution Statement

F. E. A. A.: Conceptualization, methodology, data collection and manuscript writing, Review, editing and study supervision, **M. A. A. M.:** Formal analysis, **M. A. M.:** Review, editing and study supervision, **A. A. G. A.:** Review, editing and study supervision.

AI Assistance Declaration

The authors declare that artificial intelligence tools (Grammarly and DeepL Write) were used only for language editing and grammatical correction; the study design, data collection, statistical analysis, interpretation of results, and final conclusions were entirely conducted and verified by the authors, who take full responsibility for the integrity of the work.

Conflict of Interest

The authors have no competing interests.

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