Article

Health Literacy, Disease Knowledge and Challenges Experienced After Cardiac Surgery: A Mixed Method Study*

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Theme: Care Processes and Practices

Contributions to the Discipline of Nursing: This study contributes with scientific evidence that can assist in new research on HL and knowledge of cardiovascular disease, directed at changing behavior and improving quality of life after cardiac surgery. It highlights the importance of using these tools to assist and minimize the difficulties of home care after cardiac surgery. Nursing must, therefore, recognize the levels of HL and knowledge of the disease as to establish guidelines and build intervention plans to help reduce the risk of complications and hospital readmissions.

Abstract

Introduction: This study aimed to identify the challenges faced after cardiac surgery and the factors that influence therapeutic adherence through the use of mixed methods associated with health literacy (HL) and coronary artery disease (CAD) knowledge. **Objective**: To assess the disease knowledge and HL in patients who underwent coronary artery bypass grafting (CABG) post-myocardial infarction, and identify the challenges experienced during cardiac rehabilitation. **Method:** A convergent parallel mixed-methods study was conducted in southern Brazil with 24 patients aged ≥18 years. Quantitative data were collected using the Coronary Artery Disease Education Questionnaire Short Version (CADE-Q SV) and the Eight-Item Health Literacy Assessment Tool (HLAT-8). Data were analyzed with descriptive and inferential statistics. The qualitative data was obtained through semi-structured interviews and analyzed using the IRAMUTEQ® software. **Results:** Most participants demonstrated unsatisfactory HL (58.3%) and acceptable disease knowledge (54.1%). The qualitative analysis identified three categories: Feelings experienced during the surgical process and rehabilitation; (mis)guidance and (mis)information related to care; and daily life transformed by the surgical procedure. Data integration revealed divergences and convergences when regarding knowledge, lifestyle changes, and risk factors. **Conclusion:** HL and disease knowledge were insufficient. The main challenge in rehabilitation is the lack of understanding of healthcare guidelines to support lifestyle changes.

Keywords (Source: DeCS)
Health literacy; adult health; cardiovascular disease; nursing; myocardial ischemia; myocardium revascularization.

Alfabetización en salud, conocimiento de la enfermedad y desafíos después de una cirugía cardiaca: un estudio de método mixto*

* El artículo se deriva de la tesis doctoral: El/la enfermero/a y la alfabetización en salud y la alfabetización en salud y la autogestión del cuidado para personas después de una cirugía cardiaca [recurso electrónico]: un estudio de métodos mixtos. Tesis (doctoral) – Programa de postgrado en enfermería. Sector de las Ciencias de la Salud, Universidad Federal de Paraná, Curitiba, 2023. Informamos que está tesis no está disponible para consulta. El acceso de consulta será otorgado el 31 de diembre de 2024.

Resumen

Introducción: el objetivo de este estudio fue identificar los desafíos que se surgen después de una cirugía cardiaca y los factores que influyen en la adherencia al tratamiento terapéutico, haciendo uso de métodos mixtos asociados con alfabetización en salud y el conocimiento sobre la enfermedad de las arterias coronarias (EAC). **Objetivo:** evaluar el conocimiento y la alfabetización en salud de los pacientes sometidos a una cirugía de revascularización miocárdica o bypass coronario luego de un infarto al miocardio, e identificar los desafíos durante la rehabilitación cardiaca. **Método:** se realizó un estudio de diseño paralelo convergente al sur de Brasil con 24 pacientes de ≥18 años. La información cuantitativa se recolectó usando el Cuestionario de Educación de la Enfermedad de Arterías Coronarias – versión corta (CAE-Q SV, por sus siglas en inglés) y la Herramienta de ocho Ítems para Evaluar la Alfabetización en Salud (HLAT-8, por sus siglas en inglés). Los datos fueron analizados, a través de estadísticas descriptivas e inferenciales. La información cualitativa se obtuvo por medio de una entrevista semiestructurada y analizada usando el software IRAMUTEQ®. **Resultados:** La mayoría de los participantes demostraron una alfabetización en salud insatisfactoria (58,3%) y un conocimiento de la enfermedad aceptable (54,1%). El análisis cualitativo identificó tres categorías: sentimientos durante el procedimiento quirúrgico y la rehabilitación; (mal) acompañamiento y (des)información en relación con el cuidado, y transformación de la vida diaria por el procedimiento quirúrgico. La integración de los datos reveló divergencias y convergencias frente al conocimiento, los cambios en el estilo de vida y los factores de riesgo. **Conclusiones:** La alfabetización en salud y el conocimiento de la enfermedad fueron insuficientes. El mayor reto en la rehabilitación es la falta de comprensión de los lineamientos en salud para apoyar los cambios en el estilo de vida.

Palabras clave (Fuente: DeCS)
Alfabetización en salud; salud del adulto; enfermedad cardiovascular; Enfermería; isquemia miocárdica; revascularización del miocardio.

Letramento em saúde, conhecimento da doença e desafios após a cirurgia cardíaca: um estudo de método misto*

* Este artigo é derivado da tese de doutorado "O/a enfermeiro/a e o letramento em saúde e o letramento em saúde e a autogestão do cuidado para pessoas após a cirurgia cardíaca [recurso eletrônico]: um estudo de métodos mistos", no âmbito do Programa de Pós-Graduação em Enfermagem da Universidade Federal do Paraná, Curitiba, em 2023. Informamos que esta tese não se encontra disponível para consulta.

Resumo

Introdução: O objetivo deste estudo foi identificar os desafios que surgem após a cirurgia cardíaca e os fatores que influenciam a adesão ao tratamento terapêutico, utilizando métodos mistos associados ao letramento em saúde e ao conhecimento sobre a doença arterial coronariana (DAC). **Objetivo:** avaliar o conhecimento e o letramento em saúde de pacientes submetidos à cirurgia de revascularização do miocárdio ou by-pass coronário após infarto do miocárdio e identificar desafios durante a reabilitação cardíaca. **Materiais e método:** Realizou-se um estudo de método misto, do tipo convergente paralelo, no Sul do Brasil, com 24 pacientes de ≥18 anos. As informações quantitativas foram coletadas por meio do Questionário de Educação em Doença Arterial Coronariana — versão curta (CAE-Q SV, sigla em inglês) e da Ferramenta de oito itens para avaliar o letramento em saúde (HLAT-8, sigla em inglês). Os dados foram analisados mediante estatística descritiva e inferencial. As informações qualitativas foram obtidas por meio de entrevista semiestruturada e analisadas por meio do software IRAMUTEQ®. **Resultados:** A maioria dos participantes demonstrou letramento em saúde insatisfatório (58,3 %) e conhecimento aceitável sobre a doença (54,1 %). A análise qualitativa identificou três categorias: sentimentos durante o procedimento cirúrgico e reabilitação; (des)acompanhamento e (des)informação em relação ao cuidado; e transformação da vida diária devido ao procedimento cirúrgico. A integração dos dados revelou divergências e convergências quanto ao conhecimento, às mudanças no estilo de vida e a fatores de risco. **Conclusões:** O letramento em saúde e o conhecimento da doença foram insuficientes. O maior desafio na reabilitação é a falta de compreensão das diretrizes de saúde para apoiar as mudanças no estilo de vida.

Palavras-chave (Fonte DeCS)
Alfabetização em saúde; saúde do adulto; doença cardiovascular; Enfermagem; isquemia miocárdica; revascularização do miocárdio.

Introduction

Noncommunicable diseases (NCDs) accounted for seven of the ten leading causes of global mortality between 2000 and 2019, with a predominance of cardiovascular diseases, respiratory conditions, and neonatal disorders. Among these, ischemic heart disease was the leading cause, responsible for 16 % of deaths, with an increase of more than two million deaths during the analyzed period (1).

In Brazil, the national epidemiological profile reflects this scenario, where cardiovascular diseases (CVDs) have been the leading cause of death. Between 1990 and 2019, ischemic heart disease (IHD) remained the primary cause of mortality, the most prevalent condition was acute myocardial infarction (AMI) (2).

Early diagnosis is crucial to guide patients toward the most appropriate therapeutic approach, which range from minimally invasive procedures, such as cardiac catheterization and/or angioplasty, to more complex and highly invasive interventions, such as coronary artery bypass grafting (CABG) (3).

CABG is a highly invasive open-heart surgery that entails greater tissue trauma, longer hospitalization, and a more demanding rehabilitation process, requiring structured pre- and postoperative care to optimize outcomes (3). It aims to restore the heart's functional capacity and reduce symptoms by optimizing blood perfusion to the myocardium (4) and is indicated when there is no possibility of clinical treatment or less invasive techniques, such as MICS-CABG, TMR, or PMR (5). This surgical experience triggers intense emotional responses, which are characterized by fear of the disease progressing, uncertainty, and psychological distress, which affect both patients and their families throughout the perioperative period.

In the postoperative phase, individuals undergoing CABG may experience feelings of restlessness, fear, vulnerability, and insecurity, with difficulties to adapt upon returning home (6). Moreover, the system of beliefs and values acquired throughout life can interfere with the recovery process.

Adequate access to health information enhances knowledge and strengthens skills essential for postoperative self-care, thus promoting the adoption of behaviors that facilitate lifestyle modifications. Participation in structured educational interventions, such as cardiac rehabilitation programs, has demonstrated to significantly improve patients' understanding of surgical wound care, management of postoperative complications, and adjustment to the challenges imposed by cardiac surgery (7).

It is necessary to link actions aimed at promoting health and preventing complications in patients undergoing CABG to facilitate their recovery. Therefore, the identification of aspects related to disease knowledge and understanding of behaviors related to their

health and illness, understood as health literacy (HL), are necessary to improve quality of life and help in the elaboration of ways to prevent or early detect complications (8).

HL is defined as a set of skills developed by searching, understanding, and coding health information for incorporation and appropriate daily decision-making, using a three-dimensional approach: Functional literacy (skills to read and write); interactive literacy (understanding of information and meanings of different forms of communication, as well as its applicability in the execution of daily tasks); and critical literacy (ability to critically analyze the information received) (9-10).

Faced with the complexity of analyzing HL, disease knowledge and the challenges of the rehabilitation process for this profile of patients, it was proposed to conduct a mixed-methods study (11). This method allows answering the research problem with a broad approach since its purpose is to obtain different and complementary data on the same topic, in addition to allowing triangulation between quantitative and qualitative methods. Therefore, it possible to directly compare quantitative statistical results with qualitative findings and development a more complete understanding of the subject under analysis.

Thus, the following research questions emerged: Is there a relationship between knowledge of disease and HL in the late postoperative period of cardiac surgery due to infarction? What are the challenges experienced during the cardiac rehabilitation process? This research aimed to analyze disease knowledge and HL in the late postoperative period of cardiac surgery due to infarction, as well as to recognize the challenges experienced in the rehabilitation process.

Method

Study Design

This is a mixed-method and convergent parallel study (11). Both phases received the same weight, being defined as QUAN + QUAL, and theoretical interpretation was implicit (12). This methodology allows the combination of quantitative and qualitative results in a new structure, with the potential of generating unique insights into the phenomena under study (13). Quantitative and qualitative data were collected simultaneously, and then compared to determine convergences or differences (11). Explanations of the phenomenon and recommendations based on accumulated evidence generated by this study, combined with the literature, are presented in the discussion section (14).

Several data integration points were described. First, all the quantitative data from the total sample of participants were pre-

sented. Second, all participants were interviewed aiming at the qualitative objective. Both data sets were analyzed together to answer the comprehensive, mixed-methods research question. The integration of quantitative and qualitative elements can improve the quality of a mixed-methods study and, therefore, generate important evidence for improving services, health, and public systems (15).

The quantitative stage was conducted with the help of the Strengthening the Reporting of Observational Studies in Epidemiology guidelines (16). The qualitative step was analytical-descriptive and was guided by the Consolidated Criteria for Reporting Qualitative Research (17). As for the mixed method, the Mixed Methods Appraisal Tool (18), translated into Brazilian Portuguese, was the instrument that helped in methodological rigor analysis.

Setting and Study Period

The study was conducted in the participants' homes in the Western Paraná mesoregion, Brazil. Data collection occurred between December 2020 and April 2021, during the COVID-19 pandemic.

Population and Selection Criteria

The eligible population consisted of 44 patients who had AMI and underwent CABG in a referral hospital in cardiology in western Paraná, Brazil. They were identified by analyzing the medical records of surgeries performed in the final half of 2019.

Patients affected by AMI and submitted to CABG, aged ≥18 years, and who reached the minimum score in the Mini-Mental State Examination (being 13 points for non-literates and 18 points for low and medium education) were included.

Thus, 20 patients were excluded: the address of 10 of them was not found, five died, three had inability to communicate, reported by a family member, and two refused because of the COVID-19 pandemic. A total of 24 patients composed the study sample.

Data Collection Procedures

Participants were identified through hospital records and invited by telephone. After consent, quantitative data was collected via the Strengthening the Reporting of Observational Studies in Epidemiology guidelines and qualitative data via semi-structured interviews, which lasted approximately 60 minutes. Participants validated their responses, and educational guidance was provided.

Instruments

Data collection used a sociodemographic and clinical questionnaire, the Coronary Artery Disease Education Questionnaire Short Ver-

sion (CADE-Q SV) (19) for disease knowledge, and the Eight-Item Health Literacy Assessment Tool (HLAT-8) (20) for health literacy. Semi-structured interviews addressed perceptions, difficulties, received guidance, and post-surgical follow-up.

Data Treatment and Analysis

Quantitative data were transcribed into Microsoft Excel 365®, verified, and exported to SPSS 20.0® and R for statistical analysis (21). Descriptive analysis included averages, medians, standard deviations, percentiles (25% and 75%) for quantitative variables, and absolute and relative frequencies for qualitative variables.

Then, quantitative data compliance, regarding normal distribution, was verified using the Shapiro-Wilk test to define the statistical approach. Variables with a normal distribution were submitted to the paired t-test, and those that did not present a normal distribution were submitted to the Wilcoxon test.

Comparison of the sociodemographic categories with CADE-Q SV and HLAT-8 scores was performed using the student's t-Test or one-way ANOVA, as appropriate. Tests were considered significant when $p < 0.05$. For variables in which the ANOVA indicated statistical significance (specifically marital status in relation to CADE-Q SV), a post-hoc analysis was performed using Tukey's test. This analysis revealed a statistically significant difference between the "married" and "divorced" groups ($p = 0.016$), while the other comparisons did not reach statistical significance.

Qualitative data were analyzed through content analysis of statements (12): pre-analysis, coding, treatment of results and interpretation. In the first stage, statements were read and transcribed in full, then organized and transformed into text units for the corpus construction and insertion into the Interface de R Pourles Analyzes Multidimensionnelles de Textes et de Questionnaires (IRAMUTEQ_0.6-alpha3®) software.

In the second stage, the material was explored and codified. Statements were detached from the text into smaller categories, allowing us to identify the most relevant properties of the content. The categories identified were named using the software.

In the third stage of the qualitative analysis, the statements inserted in the software were interpreted and analyzed through similitude. The objective was to expand the meanings of the codes and themes found beyond initial representation. Data interpretation and understanding were based on the literature.

Through the elaboration of joint displays quantitative and qualitative data were integrated, aiming at an in-depth interpretation between the data from the two approaches. This strategy made it possible to identify divergences and convergences between quantitative and qualitative data.

Ethical Considerations

The study was approved by the Research Ethics Committee of the State of Paraná (Approval No. 4,884,686). All participants signed the Informed Consent Form, following Resolution No. 466/2012 of the Brazilian National Health Council.

Results

Quantitative phase

From the 24 participants, 75% (n=18) were male. The average age was 59.6±6.6 years and 58.3% (n=14) had studied for <9 years. The self-declared average family income was R$2,996.1 (US$599.2). The chronic disease that prevailed was hypertension (54%; n=13), followed by diabetes mellitus (DM), associated with hypertension (21%; n=5), as shown in Table 1.

Table 1. Sociodemographic and Clinical Characterization of Participants from the Western Paraná Mesoregion, Brazil, 2023 (n=24)

Variable		
Age - M±SD		**59.6±6.6**
Per-Person Income - M±SD		R$2,996.1±2,707.4
Sex- n (%)	Female	6 (25)
	Male	18 (75)
Marital Status - n (%)	Single	2 (8.3)
	Married	18 (75)
	Widowed	1 (4.2)
	Divorced	3 (12.5)
Number of Children- n (%)	1 to 3	14 (58.3)
	More than 3	10 (41.7)
Education - n (%)	<9 years	14 (58.3)
	>12 years	4 (16.7)
	9 to 12 years	6 (25)
Occupation - n (%)	Retired	7 (29.2)
	Paid activity	7 (29.2)
	Sick pay	7 (29.2)
	Unemployed	2 (8.3)
	Housewife	1 (4.1)
Hypertension - n (%)	Yes	18 (75)
	No	6 (25)

Variable		
Age - M±SD		**59.6±6.6**
Diabetes - n (%)	Yes	7 (29.2)
	No	17 (70.8)
Hypertension and Diabetes - n (%)	Hypertension and diabetes	5 (20.8)
	One of two	15 (62.5)
	Neither	4 (16.7)
Smoking - n (%)	Yes	9 (37.5)
	No	15 (62.5)
Physical Activity - n (%)	Yes	12 (50)
	No	12 (50)
Medications - n (%)	Do not use	6 (25)
	1	9 (37.5)
	2 to 3	8 (33.3)
	4 to 5	1 (4.2)

Source: Prepared by the authors.

The total HLAT-8 score was 18±6; 58.33% of participants had unsatisfactory HL. Males had a lower mean HL (17±5) compared to females (21±8); however, there was no statistically significant difference between groups. Statistical significance was found when comparing knowledge of heart diseases and HL, and marital status (p-value 0.032; 0.014, respectively); divorced participants obtained higher averages on the scales. When comparing HL in terms of education, a lower average was observed among participants who had less than 9 years of education, with no statistically significant difference, as can be seen in Table 2.

Table 2. Comparison between the Participants Sociodemographic and Clinical Variables in Relation to HLAT-8 and CADE-Q SV Scores. West Paraná Mesoregion, Brazil, 2023. (n=24)

Variable	HLAT-8 Mean (SD)	p-value*	CADE-Q SV Mean (SD)	p-value*
Total	18 ± 6	—	36.1 ± 8.7	—
Sex				
Female	21 ± 8	0.185	35.5 ± 9.6	0.855
Male	17 ± 5	—	36.3 ± 8.7	—
Marital Status		0.032		0.014
Single	11 ± 6†		28.5 ± 6.4	
Married	17 ± 5		34.8 ± 7.6	
Widowed	19 ± —		51 ± —	

Variable	HLAT-8 Mean (SD)	p-value*	CADE-Q SV Mean (SD)	p-value*
Divorced	26 ± 5		44 ± 9.2	
Number of Children		0.559		0.547
1 to 3 children	17 ± 7		37.1 ± 8.6	
More than 3 children	19 ± 3		34.8 ± 9.2	
Education		0.185		0.522
< 9 years	17 ± 4		34.7 ± 9.3	
9 to 12 years	18 ± 9		36.5 ± 6.7	
> 12 years	23 ± 6		40.5 ± 9.9	
Occupation		0.323		0.769
Retired	15 ± 3		36.9 ± 12	
Paid work	19 ± 8		38.6 ± 7.4	
On medical leave	17 ± 6		34.3 ± 8.3	
Unemployed	19 ± 4		36 ± —	
Housewife	28 ± —‡		27 ± —‡	

Notes:*p-values obtained using Student's t-Test or ANOVA, depending on variable type. ‡ Only one participant in this category. HLAT-8 = Eight-Item Health Literacy Assessment Tool; CADE-Q SV = Coronary Artery Disease Education Questionnaire Short Version.

Source: Prepared by the authors.

The average CADE-Q SV score was 36.13 ±8.7. As for CVD knowledge level, the acceptable classification prevailed (n=13; 54.17%). Nonetheless, no statistically significant results were found when comparing sociodemographic variables with the results of HLAT-8 and CADE-Q SV.

Table 3. Questions and Domains Descriptive Statistics of the HLAT-8 of Participants Living in the Western Paraná Mesoregion, Brazil, 2023. (n=24)

Domain	Mean/SD per Domain	H	Mean/SD per Question
UHI	1.35 ±1.75	H1	1.17 ±1.74
		H2	1.54 ±1.79
SHI	2.60 ±1.36	H3	2.96 ± 1.12
		H4	2.25 ±1.51
HI	3.14 ±1.34	H5	3.33 ±1.37
		H6	2.96 ±1.30
CHL	1.81 ±1.64	H7	3.67 ±1.37
		H8	0.96 ±1.43

Notes: UHI= understanding health information; SHI= searching health information; HI= health interactivity; CHL= critical health literacy.

Source: Prepared by the authors.

Analysis of the HLAT-8 revealed that participants had low HL in the four domains. The highest scores occurred in SHI (2.60 ±1.36) and HI (3.14 ±1.34), related to search for information and communication in health. UHI domains (1.35 ±1.75) and CHL (1.81 ±1.64) had the lowest scores.

The application HLAT-8 highlighted that the questions with the lowest scores were related to the participants' understanding of health information and their ability to identify the quality of online health information (H1 and H8), as shown in Table 3.

Regarding disease knowledge, results from the CADE-Q SV, presented in Table 4, indicate there was a statistically significant difference related to the knowledge about the disease when related to diet, clinical knowledge, and psychosocial risk, with p<0.001.

Table 4. Descriptive Statistics of CADE-Q SV Scores by Area of Knowledge Regarding the Disease of Participants Residing in the Western Paraná Mesoregion, Brazil, 2023. (n=24)

Knowledge Area	Average/SD per Area	P-value/area
Clinical Knowledge	6.38±2.7	<0.001
Risk Factors	4.88±1.73	0.279
Physical Exercise	7.5±2.65	0.624
Diet	11.75±4.33	<0.001
Psychosocial Risk	5.38±2.5	<0.001

Notes: SD - standard deviation.

Source: Prepared by the authors.

Among the five knowledge areas, the participants scored the highest in Diet (average = 11.75, SD = 4.33) and the lowest in Risk Factors (average = 4.88, SD = 1.73), based on the descriptive statistics of the CADE-Q SV. These comparisons refer to the relative means among the five domains.

Qualitative Phase

The qualitative phase included 24 interviews, with 90.23% of the text analyzed using the Descending Hierarchical Classification technique (DHC) in the IRAMUTEQ®. The corpus was grouped into five lexical classes: Class 3 (29.4%) informed the category (Mis)guidance and (mis)information related to care; Classes 5 (21.4%) and 4 (19.3%) supported Daily life transformed by the surgical procedure; and Classes 2 (13.9%) and 1 (16%) related to Feelings experienced during the surgical process and cardiac rehabilitation. The robust distribution of segments among these classes reflected and validated the thematic framework interpretive analysis.

Figure 1. Phylogram Generated from the Descending Hierarchical Classification of Interviews with Participants Residing in the Western Paraná Mesoregion, Brazil, 2023. (n=24)

Class 3: 29.4%	Class 5: 21.4%	Class 4: 19.3%	Class 2: 13.9%	Class 1: 16%
No guidance	Hospital	To take	Think	Surgery
Good	To throw	To feel	Heart	Problem
Right	To order	Pain	Fearfulness	still
To help	Point	Pressure	Alone	Medicate
Careful	To take	Night	Cancer	To speak
Situation	Curative	Chest pain	Worse	To happen
Primer	Surgeon	To cry	Family	Cardiac
Guidance	To have a bath	Front	Strength	Chance

Source: Prepared by the authors.

Figure 2 presents a combined representation of the QUAN + QUAL results, highlighting the areas of convergence and divergence between the CADE-Q SV and HLAT-8 scores and the participants' narratives. This integration allows for a deeper understanding of the health literacy and knowledge profiles of individuals undergoing CABG in the Western Paraná mesoregion.

For example, although the participants demonstrated reasonable clinical knowledge (average = 6.38), their low score in the IUS domain (average = 1.35) and their testimonies suggest that their health knowledge is based primarily on personal experiences rather than a formal understanding. Similarly, despite their recognition of behavioral causes of disease, the low score in Risk Factors (average = 4.88) suggests a limited understanding of disease prevention, which is reflected in ambivalent or contradictory attitudes, expressed in the interviews.

Divergence was also observed in the domains Physical Exercise and Diet: Participants presented high scores in these areas (average= 7.5 and 11.75, respectively), but reported maintaining unhealthy behaviors after surgery. This points to a gap between knowledge and behavioral change. Finally, although knowledge about psychosocial risk was moderately good (average = 5.38), the emotional burden reported in the interviews reveals significant psychological challenges, reinforcing the importance of addressing emotional literacy in cardiac rehabilitation.

This joint presentation corroborates the dialogic nature of mixed methods research, highlighting how qualitative data can explain or contrast quantitative findings, enriching interpretation and providing insights into the complexity of health literacy and behavior.

Figure 2. Joint display articulating QUAN and QUAL results based on participants' statements and CADE-Q SV and HLAT-8 scores. Western Paraná mesoregion, Brazil, 2023. (n=24)

QUAN Results (Mean ± SD)	QUAL Themes	Interpretation / Integration (QUAN + QUAL)
UHI: 1.35 ± 1.75 Clinical knowledge: 6.38 ± 2.7	Information and (mis) guidance	Low scores in UHI and moderate clinical knowledge indicate difficulties in accessing and understanding health information. Participants often relied on personal experiences rather than structured knowledge. Interview excerpts reveal confusion and reliance on anecdotal accounts rather than preventive understanding.
SHI: 2.60 ± 1.36 Risk factors: 4.88 ± 1.73	Recognition and denial of risk	Despite low scores in Risk Factors, some participants identified behaviors contributing to illness, such as smoking and diet. However, many minimized or denied risks, aligning with low HL scores.
HI: 3.14 ± 1.34 Physical exercise: 7.5 ± 2.65	Behavioral inertia despite knowledge	Participants had high knowledge about physical exercise but reported no significant behavior change. This suggests a disconnect between knowledge and action, highlighting a limitation in applying learned content.
CHL: 1.81 ± 1.64 Diet: 11.75 ± 4.33 Psychosocial risk: 5.38 ± 2.5	Emotional impact and dietary patterns	Although participants had high dietary knowledge, interview data suggested unchanged behaviors and emotional distress. The lower psychosocial score and testimonies reflect challenges with mental health and adjustment post-surgery.

Source: Prepared by the authors.

Discussion

This study analyzed CAD knowledge and HL in individuals with infarction and late CABG, in which challenges in the rehabilitation process were identified through a mixed-methods approach. It can be highlighted for (1) using CADE-Q SV to assess disease knowledge in a South American population; (2) applying a mixed-methods design, as in Brawnwe et al. (22); and (3) integrating HLAT-8 and CADE-Q SV in a post-infarction and CABG population.

The results of this study indicated that participants had difficulties understanding health information since they had unsatisfactory levels of HL. These data corroborate the study conducted in Denmark with 15,728 people, with four out of 10 people reporting difficulties in accessing, understanding, and applying health information. From these, 8.18% had inadequate HL and 30.94% showed problematic HL levels (23).

The HL domains that scored the lowest in this study were related to understanding health information and critical literacy. Such results show difficulties in understanding disease care guidelines and health information, as well as interfering with the ability to select safe health information on the internet.

Our findings corroborate the results of a survey conducted with 1,700 Americans regarding information linked to social networks about COVID-19. The American study highlighted that people with limited HL had difficulties identifying the veracity of health information posted on media channels (24). While media platforms can disseminate information and educate people to take public health action, they can also lead to misinformation and misguidance (25).

Our study found no statistically significant difference between HL and CAD knowledge in relation to sociodemographic characteristics. In line with a study conducted with 76 participants, with acute coronary syndrome (ACS), in which 85.5% obtained inadequate HL, regardless of their level of education (26). However, other authors agree that education levels and sociodemographic variables influence all dimensions of HL when associated with a higher prevalence of risks (27-28).

It is important to emphasize the conceptual differences between HL and health education; the first is a multidimensional concept, related to a set of skills and competencies, which can be developed through the second (education) (29). Therefore, social determinants tend to interfere with the development of fundamental skills necessary for HL, as they influence the health information used by patients (30-31).

As for CAD knowledge, in CADE-Q SV, despite participants having unsatisfactory HL, they had good knowledge about the disease. The areas with the most knowledge were Diet, Physical Exercise and Clinical Knowledge, with lesser knowledge regarding areas of Psychosocial Risk and Risk Factors (32).

These findings corroborate the results observed in the Persian validation of the CADE-Q SV from English to Farsi, where the highest and lowest scores of patients' knowledge were attributed to the areas of Nutrition and Psychosocial Risk, respectively (32), which were also evidenced in this study. Similar results were found when validating the CADE-SV for Brazilian Portuguese and French-Canadian. The area with the greatest knowledge was related to Risk Factors and Diet, with less knowledge on Psychosocial Risk (33).

However, this study partially diverges from these previous findings, suggesting that variations in knowledge levels across different domains may be influenced by cultural and lifestyle differences among populations (32).

HL in CAD influences outcomes through behavioral changes shaped by beliefs, perceptions, and sociocultural factors. A Chinese study found that greater disease knowledge was associated with lower adherence to healthy behaviors, while inadequate HL correlated with greater use of health services and acceptance of medical recommendations (34), thus diverging from the findings of this study.

Despite lower scores in the risk factors domain of the CADE-Q SV, participants recognized determinants of their illness but maintained unhealthy behaviors such as smoking, alcohol use, and sedentarism. These findings are consistent with studies showing adherence to pharmacological treatment despite persistent risk factors (35), and with evidence linking HL to physical activity, but not to smoking or alcohol consumption (36).

Proper management of lifestyle-related risk factors, which can be changed, requires people to gain some understanding of their disease. Thus, low HL and low health education are associated with a higher prevalence of risk factors (27). Therefore, a process centered on the person and their needs for cardiac rehabilitation, which considers the barriers and profiles of HL, becomes determinant for effectively targeting and providing services (36).

In a systematic review with meta-analysis, covering 17 studies conducted in 12 countries in five continents, it was observed that inadequate HL was highly prevalent in patients with CAD, while was associated with a higher risk of CVD, thus reinforcing significant changes in relation to the self-care of patients through educational interventions (37).

It should be noted that HL may be a consequence of AMI, which is a recurrent cause of hospital admissions; however, it is sensitive to interventions by primary services (38), which must be an interconnected network to provide comprehensive care.

The absence of communication and formal protocols between primary and specialized care leads to discontinuity after hospital discharge, making patients and families responsible for seeking information and managing care needs (39), results also found in this study.

Integrated data analysis highlighted the challenges experienced by participants in the late cardiac rehabilitation process. Most reported weaknesses in accessing health information and guidance during the recovery phase, in line with HLAT-8 data, in which participants had unsatisfactory HL. However, they were not usually seeking information or health guidelines and had difficulties understanding them. Furthermore, the information and guidance given at discharge had little impact on the rehabilitation process.

Finding health information and critically assessing health are decisive skills for those with multiple chronic illnesses since they need multiple sources of information to understand and cope with each of their illnesses (40). The difficulty in understanding health instructions can lead to a lack of self-confidence in the ability to practice self-care, constituting a detrimental factor for compliance with treatment (41).

Another important finding concerns participants' low knowledge of psychosocial risks, as it is known that CABG is a procedure full of feelings of doubt, fear, and uncertainty, before and after the surgical procedure. Stress was identified in participants' statements and CADE-Q SV as a risk factor for a cardiac event, being considered as important as DM and hypertension.

A recent study with 190 patients followed for three months after cardiac surgery identified that 14.7% presented elevated levels of depression, anxiety, irritability, and dyspnea (42-44), which corroborates this study's findings. Nursing guidelines at discharge can reduce postoperative stress, as interaction with health professionals and family support positively influence care perception, clarify doubts, and promote self-care (45).

Study Limitations

Limitations include the time elapsed between surgery and data collection, potentially affecting the recall of postoperative experiences and the reduced number of CABGs in 2019 due to institutional instability and the COVID-19 pandemic.

Conclusion

This study identified acceptable levels of CAD knowledge and unsatisfactory HL among individuals who underwent post-myocardial infarction and CABG. The primary challenge observed in the rehabilitation process was the difficulty in understanding professional healthcare guidelines necessary for lifestyle changes.

The integration of quantitative and qualitative data revealed important divergences between knowledge acquisition and health behaviors, highlighting barriers to effective self-care. Emotional challenges, limited understanding of risk factors, and discontinuities in care transitions further complicate the rehabilitation process.

These findings underscore the need for nursing interventions that assess HL and disease knowledge to design individualized educational strategies, aimed at promoting behavior change, preventing complications, and supporting long-term recovery. Incorporating HL assessment tools into the routine of nursing care is essential to optimize patient outcomes after cardiac surgery.

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References

1. World Health Organization (WHO). Global Health Estimates 2020: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2019. [Internet]. Geneva: WHO; 2020 [cited 2025 Apr 26]. Available from: https://www.who.int/data/global-health-estimates

2. Oliveira GMM, Brant LCC, Polanczyk CA, Biolo A, Nascimento BR, Malta DC, et al. Estatística Cardiovascular – Brasil 2020. Arq Bras Cardiol [Internet]. 2020 [cited 2025 Apr 26];115(3):308-439. DOI: https://doi.org/10.36660/abc.20200812

3. Lawton JS, Tamis-Holland JE, Bangalore S, Bates ER, Beckie TM, Bischoff JM, et al. 2021 ACC/AHA/SCAI guideline for coronary artery revascularization: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation [Internet]. 2022 [cited 2025 Apr 26];145(3):e18-e114. DOI: https://doi.org/10.1161/CIR.0000000000001060

4. Neumann FJ, Sousa-Uva M, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on Myocardial Revascularization. Eur Heart J [Internet]. 2019 [cited 2025 Apr 26];40(37):87-165. DOI: https://doi.org/10.1093/eurheartj/ehy394

5. Zhang L, Huang Y, Zhao L, Yang Q, Jin X. A Qualitative Study Exploring the Experiences and Needs of Fear of Progression in Patients after Open-Heart Surgery. J Psychosom Res [Internet]. 2024 [cited 2025 Apr 26];188:111392. DOI: https://doi.org/10.1016/j.jpsychores.2024.111980

6. Kazitani BS, Martins LM, Silva VM, Fernandes PA, Maier SRO, Dessotte CAM. Cardiac Anxiety in the Perioperative Period of Patients Undergoing Cardiac Surgical Procedures: An Observational Study. Rev Bras Enferm [Internet]. 2023 [cited 2025 Apr 26];76(1):e20220250. DOI: https://doi.org/10.1590/0034-7167-2022-0250

7. Lunde P, Grimsmo J, Nilsson BB, Bye A, Finbråten HS. Health Literacy in Patients Participating in Cardiac Rehabilitation: A Prospective Cohort Study with Pre-Post-Test Design. Int J Cardiol Cardiovasc Risk Prev [Internet]. 2024 [cited 2025 Apr 26];22:200314. DOI: https://doi.org/10.1016/j.ijcrp.2024.200314

8. Nudelman G, Ivanova E. The Relationship between Frequency of Performance and Perceived Importance of Health Behavior's. J Health Psychol [Internet]. 2020 [cited 2025 Apr 26];25(10-11):1692-706. DOI: https://doi.org/10.1177/1359105318770724

9. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health Literacy and Public Health: A Systematic Review and Integration of Definitions and Models. BMC Public Health [Internet]. 2012 [cited 2025 Apr 26];12(80):1-13. DOI: https://doi.org/10.1186/1471-2458-12-80

10. Walters R, Leslie SJ, Sixsmith J, Gorely T. Health Literacy for Cardiac Rehabilitation: An Examination of Associated Illness Perceptions, Self-Efficacy, Motivation and Physical Activity. Int J Environ Res Public Health [Internet]. 2020 [cited 2025 Apr 26];17(22):8641. DOI: https://doi.org/10.3390/healthcare11202721

11. Creswell JW, Creswell JD. Projeto de pesquisa: métodos qualitativos, quantitativos e mistos. 5th ed. Porto Alegre: Penso; 2021.

12. Creswell JW, Clark VLP. Designing and Conducting Mixed Methods Research. 3rd ed. Los Angeles: SAGE; 2017.

13. Lorenzini E, Oelke ND, Marck PB. Safety Culture in Healthcare: Mixed Method Study. J Health Organ Manag [Internet]. 2021 [cited 2025 Apr 26];35(8):1080-97. DOI: https://doi.org/10.1108/JHOM-04-2020-0110

14. Lorenzini E, Osorio-Galeano SP, Schmidt CR, Cañon-Montañez W. Practical Guide to Achieve Rigor and Data Integration in Mixed Methods Research. Investigación y Educ Enferm [Internet]. 2024 [cited 2025 Apr 26];42(3):e02. DOI: https://doi.org/10.17533/udea.iee.v42n3e02

15. Lorenzini E. Pesquisa de métodos mistos nas ciências da saúde. Rev Cuid [Internet]. 2017 [cited 2025 Apr 26];8(2):1549-60. DOI: https://doi.org/10.15649/cuidarte.v8i2.406

16. Cuschieri S. The STROBE Guidelines. Saudi J Anaesth [Internet]. 2019 [cited 2025 Apr 26];13(Suppl 1):S31-S34. DOI: https://doi.org/10.4103/sja.SJA_543_18

17. Souza VR, Marziele MH, Silva GT, Nascimento PL. Tradução e validação para a língua portuguesa e avaliação do guia COREQ. Acta Paul Enferm [Internet]. 2021 [cited 2025 Apr 26];34:eAPE02631. DOI: https://doi.org/10.37689/acta-ape/2021AO02631

18. Oliveira JLC, Magalhães AMM, Matsuda LM, Santos JLG, Souto RQ, Riboldi CO, et al. Mixed Methods Appraisal Tool: Strengthening the Methodological Rigor of Mixed Methods Research Studies in Nursing. Texto Contexto Enferm [Internet]. 2021 [cited 2025 Apr 26];30:e20200603. DOI: https://doi.org/10.1590/1980-265X-TCE-2020-0603

19. Ghisi GLM, Chaves GSS, Loures JB, Bonfim GM, Britto R. Validação da versão brasileira do questionário curto para avaliar conhecimento de participantes com doenças cardiovasculares (CADE-Q SV). Sociedade Brasileira de Cardiologia. Arq Bras Cardiol [Internet]. 2018 [cited 2025 Apr 26];111(6):841-49. Disponivel em: https://abccardiol.org/article/validacao-da-versao-brasileira-do-questionario-curto-para-avaliarconhecimento-de-pacientes-com-doencas-cardiovasculares-cade-qsv/

20. Quemelo PR, Milani D, Bento VF, Vieria ER, Zaia JE. Literacia em saúde: tradução e validação de instrumento para pesquisa em promoção da saúde no Brasil. Cad. Saúde Pública [Internet]. 2017 [cited 2025 Apr 26];33(2):e00179715. DOI: https://doi.org/10.1590/0102-311X00179715

21. R Core Team. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing [Internet]. Vienna; 2021[cited 2025 Apr 26]. https://www.R-project.org/

22. Brawner BM, Talley LM, Baker JL, Bowleg L, Dominique TB, Robinson DY, et al. Black Men's Health Initiative of the Penn Center for AIDS Research. A Convergent Mixed Methods Study of Cardiovascular Disease Risk Factors among Young Black Men in the United States. Ethn Dis [Internet]. 2022 [cited 2025 Apr 26];32(3):169-84. DOI: https://doi.org/10.18865/ed.32.3.169

23. Svendsen MT, Bak CK, Sørensen K, Pelikan J, Riddersholm SJ, Skals RK, et al. Associations of Health Literacy with Socioeconomic Position, Health risk Behavior, and Health Status: A Large National Population-Based Survey Among Danish Adults. BMC Public Health [Internet]. 2020 [cited 2025 Apr 26];20:1-12. DOI: https://doi.org/10.1186/s12889-020-08498-8

24. Pennycook G, McPhetres J, Zhang Y, Lu JG, Rand DG. Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. Psychol Sci [Internet]. 2020 [cited 2025 Apr 26];31(7):770-80. DOI: https://doi.org/10.1177/0956797620939054

25. Ghisi GLM, Santos RZ, Korbes AS, Souza CA, Karsten M, Oh P, et al. Percepções dos participantes de reabilitação cardíaca sobre seus comportamentos em saúde e necessidades de informação durante a pandemia Covid-19 no Brasil. Arq Bras Cardiol [Internet]. 2022 [cited 2025 Apr 26];118(5):949-60. DOI: https://doi.org/10.36660/abc.20210447

26. Costa FAZ, Pessoa VLMP, Salles DL, Frota KC, Sobral MGV, Souza LC. Letramento funcional em saúde de pacientes portadores de síndrome coronariana aguda. Cogitare Enfermagem [Internet]. 2021 [cited 2025 Apr 26];26:e75415. DOI: https://doi.org/10.5380/ce.v26i0.75415

27. Dinges SMT, Krotz J, Gass F, Treitschke J, Fegers-Wustrow I, Geisberger M, et al. Cardiovascular Risk Factors, Exercise Capacity and Health Literacy in Patient with Chronic Ischaemic Heart Disease and Type 2 Diabetes Mellitus in Germany: Baseline Characteristics of the Lifestyle Intervention in Chronic Ischaemic Heart Disease and Type 2 Diabetes Study. Diab Vasc Dis Res [Internet]. 2022 [cited 2025 Apr 26];19(4):1-16. DOI: https://doi.org/10.1177/14791641221113781

28. Cabellos-García AC, Castro-Sánchez E, Martínez-Sabater A, Díaz-Herrera MÁ, Ocaña-Ortiz A, Juárez-Vela R, et al. Relationship between Determinants of Health, Equity, and Dimensions of Health Literacy in Patients with Cardiovascular Disease. Int J Environ Res Public Health [Internet]. 2020 [cited 2025 Apr 26];17(6):1-13. DOI: https://doi.org/10.3390/ijerph17062082

29. Peres F. Alfabetização, letramento ou literacia em saúde. Traduzindo e aplicando o conceito de health literacy no Brasil. Ciên Saúde [Internet]. 2023 [cited 2025 Apr 26];28(5):1563-73. DOI: https://doi.org/10.1590/1413-81232023285.14562022

30. Saqlain M, Riaz A, Malik MN, Khan S, Ahmed A, Kamran S, et al. Medication Adherence and Its Association with Health Literacy and Performance in Activities of Daily Livings among Elderly Hypertensive Patients in Islamabad, Pakistan. Medicina (Kaunas) [Internet]. 2019 [cited 2025 Apr 26];55(5):1-16. DOI: https://doi.org/10.3390/medicina55050163

31. Stormacq C, Van den Broucke S, Wosinski J. Does health literacy mediate the relationship between socioeconomic status and health disparities? Integrative review. Health Promot Int [Internet]. 2019 [cited 2025 Apr 26];34(5):e1-e17. DOI: https://doi.org/10.1093/heapro/day062

32. Omovvat Z, Elahi N, Sayadi N, Ghanbari S. The Persian Validation of the Coronary Artery Disease Education Questionnaire Short Version for Education of Patients Undergoing Cardiac Rehabilitation. ARYA Atheroscler [Internet]. 2022 [cited 2025 Apr 26];18(2):1-7. DOI: https://doi.org/10.48305/arya.v18i0.2183

33. Ghisi GLM, Oh P. Validation of the French-Canadian Version of a Short Questionnaire to Assess Knowledge in Cardiac Patients (CADE-Q SV). Can J Nurs Res [Internet]. 2022 [cited 2025 Apr 26];54(1):51-8. DOI: https://doi.org/10.1177/0844562120986001

34. Lu M, Xia H, Ma J, Lin Y, Zhang X, Shen Y, et al. Relationship between Adherence to Secondary Prevention and Health Literacy, Self-Efficacy and Disease Knowledge among Patients with Coronary Artery Disease in China. Eur J Cardiovasc Nurs [Internet]. 2020 [cited 2025 Apr 26];19(3):230-7. DOI: https://doi.org/10.1177/1474515119880059

35. Silva ABB, Alves MF, Ferreira KG, Guerra HS, Brugnoli AVM, Silva RCD. Qualidade de vida em pacientes infartados participantes de um programa de reabilitação cardíaca. VITTALLE – Revista de Ciências de Saúde [Internet]. 2022 [cited 2025 Apr 26];34(1)17-25. DOI: https://doi.org/10.14295/vittalle.v34i1.13612

36. Walters R, Leslie SJ, Sixsmith J, Gorely T. Health Literacy for Cardiac Rehabilitation: An Examination of Associated Illness Perceptions, Self-Efficacy, Motivation and Physical Activity. Int J Environ Res Public Health [Internet]. 2020 [cited 2025 Apr 26];17(22):1-15. DOI: https://doi.org/10.3390/ijerph17228641

37. Świątoniowska-Lonc NA, Sławuta A, Dudek K, Jankowska K, Jankowska-Polańska BK. The impact of Health Education on Treatment Outcomes in Heart Failure Patients. Adv Clin Exp Med [Internet]. 2020 [cited 2025 Apr 26];29(4):481-92. DOI: https://doi.org/10.17219/acem/115079

38. Cavalcante ES, Duarte MP, Pennafort VP, Lima RE, Pinto JJM, Cavalcante CA. Internações por condições sensíveis à atenção primária decorrentes das doenças cardiovasculares. Revista Recien [Internet]. 2021 [cited 2025 Apr 26];11(33):222-32. DOI: https://doi.org/10.24276/rrecien2021.11.33.222-232

39. Almeida PF, Vilasbôas ALQ, Ribeiro AMV, Silva AN, Casotti E. Transição entre Atenção Primária e Especializada no acompanhamento da hipertensão arterial sistêmica: acesso restrito e cuidados descontínuos. Saúde Soc [Internet]. 2024 [cited 2025 Apr 26];33(4):e230594pt. DOI: https://doi.org/10.1590/S0104-12902024230594pt

40. Dinh HTT, Nguyen NT, Bonner A. Healthcare Systems and Professionals Are Key to Improving Health Literacy in Chronic Kidney Disease. J Ren Care [Internet]. 2022 [cited 2025 Apr 26];48(1):4-13. DOI: https://doi.org/10.1111/jorc.12395

41. Chehuen JA, Costa LA, Estevanin GM, Bignoto TC, Vieira CIR, Pinto FAR, et al. Letramento funcional em saúde nos portadores de doenças cardiovasculares crônicas. Ciênc Saúde Coletiva [Internet]. 2019 [cited 2025 Apr 26];24(3):1121-32. DOI: https://doi.org/10.1590/1413-81232018243.02212017

42. Jarmoszewicz K, Topolski M, Hajduk A, Banaszkiewicz D, Nowicka-Sauer K. Prevalence and Predictors of Suicidal Ideation in Patients Following Cardiac Surgery. World J Surg [Internet]. 2022 [cited 2025 Apr 26];46(8):1997-2004. DOI: https://doi.org/10.1007/s00268-022-06582-1

43. Younes O, Amer R, Fawzy H, Shama G. Psychiatric Disturbances in Patients Undergoing Open-Heart Surgery. Middle East Current Psychiatry [Internet]. 2019 [cited 2025 Apr 26];26:1-7. DOI: https://doi.org/10.1186/s43045-019-0004-9

44. McCann WD, Hou XY, Stolic S, Ireland MJ. Predictors of Psychological Distress among Post-Operative Cardiac Patients: A Narrative Review. Healthcare (Basel) [Internet]. 2023 [cited 2025 Apr 26];11(20):1-21. DOI: https://doi.org/10.3390/healthcare11202721

45. Taylan S, Çelik GK. Experiences of Patients Undergoing Bypass Surgery with Health Professionals During the Perioperative Care Process: A Hermeneutic Phenomenological Study. J Perianesth Nurs [Internet]. 2022 [cited 2025 Apr 26];37(6):802-6. DOI: https://doi.org/10.1016/j.jopan.2021.11.016