



Association between Health Literacy and Quality of Life in Patients with Cardiac Disease: The Mediating Role of Social Support and the Moderating Role of Spiritual Well-Being

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Abstract

Background: Cardiac disease substantially impairs quality of life (QoL). Although psychosocial factors influence health outcomes, the mechanisms through which health literacy (HL) affects QoL in patients with cardiac disease remain unclear. This study examined the association between HL and QoL, with social support (SS) as a mediator and spiritual well-being (SWB) as a moderator.

Materials and Methods: This cross-sectional study enrolled adults aged ≥ 30 years with stable coronary artery disease receiving optimal medical therapy at two tertiary-care hospitals in Islamabad, Pakistan, between April and September 2024. Patients with acute coronary syndromes, severe cognitive or psychiatric impairment, or major comorbidities were excluded. Validated instruments assessed health literacy (BHLS), social support (LSNS-6), subjective well-being (ISWBI), and quality of life (QOLS). Moderated mediation was tested using Hayes' PROCESS Model 14 with 1,000 bias-corrected bootstrap resamples ($p \leq 0.05$).

Results: Of 400 distributed questionnaires, 322 were completed (response rate: 80.5%). Participants reported moderate levels of HL (3.54 ± 1.11), SS (3.32 ± 1.08), SWB (3.46 ± 1.07), and QoL (4.27 ± 1.18). QoL did not differ significantly across demographic groups (all ANOVA $p > 0.05$). All variables were positively correlated ($r = 0.314 - 0.462$, $p < 0.05$). HL was directly associated with QoL ($B = 0.2016$, $SE = 0.0291$, 95% CI: 0.1456–0.2607, $p < 0.001$) and indirectly associated with QoL through SS ($B_{\text{indirect}} = 0.1187$, $SE = 0.0578$, 95% bootstrap CI: 0.0051–0.2324), supporting partial mediation. SWB significantly moderated the association between SS and QoL ($B = 1.6727$, $SE = 0.1308$, $t = 12.7837$, $p < 0.001$).

Conclusion: Health literacy was positively associated with QoL among patients with cardiac disease, both directly and indirectly through social support. Spiritual well-being strengthened the positive association between social support and QoL, supporting integrated cardiac rehabilitation approaches that incorporate health communication, social support, and spiritual care.

Key Words: Cardiac Disease, Health Literacy, Social Support, Spiritual Well-being, Quality of Life.

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1- INTRODUCTION

Cardiovascular diseases (CVDs), particularly coronary artery disease (CAD), remain major causes of morbidity and mortality worldwide in both high- and low- and middle-income countries (1). Their high prevalence, along with the economic burden of hospitalization and long-term care, poses a persistent challenge to public health systems. For patients with cardiac disease living in the community, the consequences extend beyond physical symptoms and may substantially impair daily functioning and overall quality of life (QoL).

Health literacy (HL) has emerged as an important multidimensional determinant of health status and QoL (2, 3). Beyond the ability to read health-related materials, HL encompasses the capacity to access, understand, appraise, and apply health information when making informed health decisions. The concept of a good and meaningful life may be viewed through Maslow's hierarchy of needs, in which the fulfillment of fundamental and psychosocial needs contributes to improved QoL. Within this framework, HL, social support (SS), and spiritual well-being (SWB) may correspond to esteem, belongingness, and self-actualization needs, respectively, and may therefore contribute to better QoL (4). In addition, social ecological theory emphasizes that health is shaped by interactions between individual characteristics and social, environmental, and healthcare-system factors (5).

Health literacy may be particularly important among older adults and people living with chronic conditions. Recent systematic reviews have highlighted HL assessment as an essential component of effective home-based cardiovascular self-care (6). However, older adults may experience limited HL because of age-related cognitive changes and the physical and psychological burden of chronic

disease (7, 8). Although higher HL has been associated with better health behaviors, subjective well-being, and overall health status, further research is needed to clarify its relationship with self-care and QoL among patients with cardiac disease (9).

Social support is another important factor that may influence the association between HL and QoL. It can facilitate chronic disease management, encourage healthy behaviors, and improve adherence to self-care recommendations (10–12). Support from family, friends, and community resources may also help patients obtain, process, and evaluate health information and navigate the healthcare system effectively (13). Previous research indicates that self-management behaviors are strongly influenced by the availability of such social resources (14).

Nevertheless, evidence regarding the association between HL and health outcomes remains inconsistent. Some studies have found no significant relationship between HL and self-reported health behaviors or hospitalization outcomes (15, 16). These inconsistencies suggest that the association between HL and QoL may operate through intervening mechanisms rather than through a direct pathway alone (17). Most prior studies have examined the independent effects of HL or SS, with limited attention to the structural pathways linking these variables to QoL (11, 12, 18, 19). In particular, evidence regarding factors that mediate the association between HL and QoL remains limited and inconclusive (20, 21).

Spiritual well-being may further influence the effect of social resources on QoL. Rooted in meaning, purpose, transcendence, and connectedness, SWB is an important component of mental health and QoL (22). For many individuals, spirituality provides a valuable coping resource for managing the existential and emotional challenges associated with

chronic illness (23). However, limited research has examined whether SWB moderates the association between SS and QoL among patients with cardiac disease.

Accordingly, this study used a moderated mediation model to examine the association between health literacy (HL) and quality of life (QoL) among patients with coronary artery disease (CAD). Specifically, it assessed whether social support (SS) mediates the association between HL and QoL and whether spiritual well-being (SWB) moderates the relationship between SS and QoL.

Objectives

- To examine the association between HL and QoL among patients with CAD.
- To assess the association between HL and SS.
- To examine the association between SS and QoL.
- To determine whether SS mediates the association between HL and QoL.
- To investigate whether SWB moderates the association between SS and QoL.

2- MATERIALS AND METHODS

2-1. Study Design and Setting

This cross-sectional quantitative study examined the relationships among health literacy (HL), social support (SS), spiritual well-being (SWB), and quality of life (QoL) in patients with coronary artery disease (CAD). The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (24).

Data were collected from April to September 2024 in the cardiology departments of two tertiary-care teaching hospitals in Islamabad, Pakistan. These hospitals serve as regional referral centers and provide specialized cardiovascular

care to patients from diverse socioeconomic and clinical backgrounds.

2-2. Participants and Eligibility Criteria

The study population comprised patients with clinically diagnosed stable CAD. Participants were recruited using convenience sampling.

2-2-1. The inclusion criteria were:

- A confirmed clinical diagnosis of stable CAD
- Age ≥ 30 years
- Receipt of optimal medical therapy for at least 6 months
- Ability to provide written informed consent.

2-2-2. The exclusion criteria were:

- Acute coronary syndrome, including acute myocardial infarction
- Severe psychiatric disorders or advanced cognitive impairment
- Major comorbidities, such as end-stage renal disease or malignancy, that could independently affect QoL
- Refusal to participate.

2-3. Measurement Instruments

Data were collected using a structured questionnaire comprising five sections:

- **Sociodemographic characteristics:** age, sex, educational level, marital status, and socioeconomic status
- **Health literacy:** assessed using the Brief Health Literacy Screening (BHLS) tool, which evaluates patients' ability to understand and use health information when making healthcare decisions (25)
- **Social support:** assessed using the Lubben Social Network Scale-6 (LSNS-6), which measures support

from family and friends; higher scores indicate stronger social networks (26)

- **Spiritual well-being:** assessed using the 4-item Index of Spiritual Well-Being (ISWBI), which evaluates existential and religious dimensions of spirituality in health-related contexts (27)
- **Quality of life:** assessed using the 16-item Quality of Life Scale (QOLS), which evaluates material and physical well-being, relationships, social and civic activities, personal development, and independence (28)

All instruments had been previously validated for use in clinical populations.

2-4. Sample Size

The required sample size was estimated using Cochran's formula:

$$n = \frac{Z^2 p(1 - p)}{d^2}$$

where n is the required sample size, Z is the standard normal deviate corresponding to the selected confidence level, p is the estimated population proportion, and d is the acceptable margin of error.

2-5. Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of Riphah International University, Islamabad, Pakistan, before data collection began (Approval No. Riph/IERB-070826). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and its subsequent amendments (29).

Eligible participants received verbal and written information about the study objectives, procedures, potential benefits and risks, and their rights as research participants. Participation was voluntary, and participants were informed of their right to decline participation or withdraw

at any time without affecting their access to care or services. Written informed consent was obtained from all participants before questionnaire administration.

No personally identifiable information was included in the analytical dataset. Completed questionnaires and electronic data were securely stored, kept confidential, and accessed only by the research team. Findings were reported in aggregate form to prevent the identification of individual participants.

2-6. Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 20.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations (SDs), were used to summarize participants' demographic and clinical characteristics. The internal consistency reliability of the BHLS, LSNS-6, ISWBI, and QOLS was evaluated using Cronbach's alpha coefficients.

One-way analysis of variance (ANOVA) was conducted to examine differences in QoL scores across demographic categories, including sex, age, marital status, and income. Pearson correlation coefficients were calculated to evaluate bivariate associations among HL, SS, SWB, and QoL.

The hypothesized moderated mediation model was tested using Hayes' PROCESS macro (Model 14). This regression-based analysis estimated the indirect association between HL and QoL through SS and examined whether SWB moderated the association between SS and QoL. Indirect effects were evaluated using bias-corrected bootstrapping with 1,000 resamples. A 95% confidence interval (CI) that did not include zero was considered statistically significant. All tests were two-tailed, and $p \leq 0.05$ was considered statistically significant.

3- RESULTS

3-1. Participant Characteristics

Of the 400 distributed questionnaires, 322 were returned with complete data, yielding a response rate of 80.5%. As shown in **Table 1**, the sample comprised 171 men (53.1%) and 151 women (46.9%). Most participants were aged 51–70 years (79.5%) and married (77.3%). Regarding educational

attainment, most participants held a bachelor's degree (52.8%) or a master's degree (34.7%).

With respect to work experience, the largest subgroup had more than 20 years of professional experience (32.9%). In addition, most respondents (61.2%; n=197) reported a monthly income of less than 60,000 Pakistani rupees (PKR).

Table-1: Demographic characteristics of participants (n=322).

Characteristic	Category	n (%)
Gender	Female	151 (46.9)
	Male	171 (53.1)
Age group, years	31–40	3 (0.9)
	41–50	31 (9.6)
	51–70	256 (79.5)
	>70	32 (9.9)
Marital status	Single	73 (22.7)
	Married	249 (77.3)
Educational level	Undergraduate	15 (4.7)
	Bachelor's degree	170 (52.8)
	Master's degree	112 (34.7)
	PhD/Fellowship	25 (7.8)
Work experience, years	<10	44 (13.7)
	11–15	88 (27.3)
	16–20	84 (26.1)
	>20	106 (32.9)
Monthly income, local currency	<60,000	197 (61.2)
	60,000–100,000	97 (30.1)
	>100,000	28 (8.7)

Note: Data are presented as frequency and percentage, n (%).

3-2. Descriptive statistics and scale reliability

The descriptive statistics and internal consistency estimates for all study variables are summarized in **Table 2**. The mean scores were 3.54 ± 1.11 for health literacy (HL), 3.32 ± 1.08 for social support (SS), 3.46 ± 1.07 for spiritual well-being (SWB), and 4.27 ± 1.18 for quality of life (QoL). All measurement

instruments demonstrated good to excellent internal consistency, with Cronbach's alpha coefficients ranging from 0.860 for HL to 0.966 for the QoL scale. Specifically, the reliability coefficients for the remaining scales were 0.895 for SS and 0.912 for SWB, indicating that all instruments met the acceptable psychometric thresholds for clinical research.

Table-2: Descriptive statistics and internal consistency reliability of study instruments (n=322).

Variables	Number of items	Mean	SD	Cronbach's α
Health literacy (HL)	4	3.541	1.107	0.860
Social support (SS)	6	3.320	1.076	0.863
Spiritual well-being (SWB)	4	3.455	1.066	0.865
Quality of life (QoL)	16	4.274	1.178	0.966

Note: SD = Standard deviation. Cronbach's α values of ≥ 0.70 indicate acceptable internal consistency.

3-3. Preliminary and Correlation Analyses

One-way analyses of variance showed no statistically significant differences in QoL according to sex ($F=0.007$, $p=0.931$), age group ($F=0.226$, $p=0.924$), marital status ($F=0.018$, $p=0.895$), educational level ($F=0.046$, $p=0.987$), work experience ($F=0.122$, $p=0.975$), or monthly income ($F=0.849$, $p=0.468$). Demographic variables were therefore not included as

covariates in the primary moderated mediation analysis. Pearson correlation analysis demonstrated significant positive associations among all study variables (**Table 3**). HL was positively correlated with SS ($r=0.425$, $p<0.05$), SWB ($r=0.329$, $p<0.05$), and QoL ($r=0.438$, $p<0.05$). SS was positively correlated with SWB ($r=0.314$, $p<0.05$) and QoL ($r=0.401$, $p<0.05$). SWB was also positively correlated with QoL ($r=0.462$, $p<0.05$).

Table-3: Pearson correlation matrix among study variables (n=322).

Variables	1	2	3	4
1. Health literacy	1			
2. Social support	0.425*	1		
3. Spiritual well-being	0.329*	0.314*	1	
4. Quality of life	0.438*	0.401*	0.462*	1

Note: Values are Pearson correlation coefficients. $p<0.05$.*

3-4. Moderated Mediation Analysis

The hypothesized moderated mediation model was tested using Hayes' PROCESS macro (Model 14) with 1,000 bias-corrected bootstrap resamples. Health literacy had a significant direct effect on quality of life ($B=0.2016$, $SE=0.0291$, 95% CI [0.1456, 0.2607], $p<0.001$). Health literacy also had a significant indirect effect on quality of life through social support ($B=0.1187$, $SE=0.0578$, 95%

bootstrap CI [0.0051, 0.2324]). Because the bootstrap confidence interval did not include zero, social support significantly mediated the association between health literacy and quality of life. The continued significance of the direct effect indicates partial mediation.

Spiritual well-being significantly moderated the association between social support and quality of life ($B=1.6727$, $SE=0.1308$, $t=12.784$, $p<0.001$, 95% CI

[1.4163, 1.9291]). The positive interaction coefficient indicates that the association between social support and quality of life strengthened as spiritual well-being

increased. The results of the moderated mediation analysis are presented in **Table 4**.

Table-4: Results of the moderated mediation analysis (PROCESS Model 14, n=322).

Pathway / effect	B	SE	t	P- value	95% CI
Direct effect: HL → QoL	0.2016	0.0291	6.928	<0.001	0.1456 to 0.2607
Indirect effect: HL → SS → QoL	0.1187	0.0578	—	—	0.0051 to 0.2324*
Interaction effect: SS × SWB → QoL	1.6727	0.1308	12.784	<0.001	1.4163 to 1.9291

Note: HL = Health literacy; SS = Social support; SWB = Spiritual well-being; QoL = Quality of life; B = unstandardized regression coefficient; SE = Standard error; CI = confidence interval. The indirect effect was estimated using 1,000 bias-corrected bootstrap resamples. *The indirect effect is statistically significant because its 95% bootstrap CI does not include zero.

4- DISCUSSION

This study examined the associations among health literacy (HL), social support (SS), spiritual well-being (SWB), and quality of life (QoL) among patients with coronary artery disease (CAD). Few studies have evaluated these pathways simultaneously in cardiac populations. The findings indicate that HL and SS were positively associated with QoL and that SS partially mediated the association between HL and QoL.

Individuals with adequate HL may be better able to access, understand, appraise, and apply health information, thereby supporting effective self-care and disease management. In contrast, patients with limited HL may experience difficulties recognizing health concerns, adopting recommended health behaviors, and making informed healthcare decisions (15, 31). These findings suggest that improving HL may be an important target for clinical and educational interventions among patients with CAD (7, 8).

HL was also positively associated with SS. Patients with higher HL may be more likely to seek assistance, communicate their needs, and use available social and

healthcare resources to manage their condition (9, 20, 31). Furthermore, SS partially mediated the association between HL and QoL, indicating that the positive association between HL and QoL may operate, in part, through patients' social environments. For individuals with CAD, who often face complex treatment regimens and long-term self-care requirements, support from family members, friends, and healthcare professionals may facilitate adherence to treatment recommendations, management of comorbidities, and maintenance of self-care behaviors (9, 10, 14, 17, 33).

Social support was also directly and positively associated with QoL. This finding is consistent with evidence that stronger social integration and supportive relationships are associated with better health outcomes among people living with chronic conditions (12, 13). From the perspective of attachment theory, supportive interpersonal relationships may buffer psychological distress during stressful circumstances and promote adaptation to illness (10). Patients with limited HL may be less likely to ask questions, seek clarification, or advocate for their healthcare needs (17). In such

circumstances, family members and other social-network members may help patients interpret medical information, navigate healthcare services, and reduce the cognitive demands of self-care (21, 33).

Importantly, SWB moderated the association between SS and QoL. Specifically, the positive association between SS and QoL was stronger among participants with higher SWB. Spiritual well-being may provide emotional and cognitive resources that help patients cope with stress, anxiety, uncertainty, and the existential challenges of chronic illness (22, 23). Religious or spiritual beliefs and practices may foster meaning, hope, belonging, and a sense of security, potentially reducing emotional distress (23). These findings support a holistic approach to cardiac care that recognizes spiritual needs alongside physical, psychological, and social dimensions of health (22, 34).

4-1. Study Limitations

This study has several limitations. First, its cross-sectional design precludes causal inferences; therefore, the reported mediation and moderation findings should be interpreted as associations rather than causal effects. Second, the study focused on HL, SS, and SWB and did not account for potentially relevant factors, such as objective cognitive function, clinical indicators of disease severity (e.g., ejection fraction), depression, anxiety, or other psychological comorbidities.

Third, SS was measured as a general construct rather than as distinct emotional, instrumental, and informational support domains, which may have different associations with self-care and QoL. Finally, the use of convenience sampling and recruitment from two tertiary-care hospitals may limit the generalizability of the findings to patients in other healthcare settings, geographic regions, and cultural contexts.

4-2. Future Directions

Future research should use longitudinal or prospective cohort designs to clarify the temporal and potentially causal relationships among HL, SS, SWB, and QoL. Studies should also incorporate clinical, cognitive, and psychological variables to develop more comprehensive explanatory models.

Further research should distinguish among different dimensions of SS and evaluate the proposed moderated mediation model in larger, multicenter samples representing diverse cultural and socioeconomic contexts. In addition, culturally tailored interventions designed to improve HL, strengthen social resources, and address spiritual needs should be evaluated to determine their effects on self-care and health-related QoL.

5- CONCLUSION

Health literacy, social support, spiritual well-being, and quality of life were positively associated among patients with coronary artery disease. Health literacy was directly associated with quality of life and indirectly associated with quality of life through social support, indicating partial mediation. In addition, spiritual well-being strengthened the positive association between social support and quality of life.

These findings support integrated cardiac-care approaches that improve health communication, strengthen social-support networks, and address patients' spiritual needs. However, because of the cross-sectional design, the findings should be interpreted as associations rather than causal effects.

6- AUTHOR CONTRIBUTIONS

All authors contributed substantially to the study conception and design. Afrasyab Altaf, Ayman Javaid, and Nazar ul Islam contributed to data acquisition, analysis,

and interpretation. Afrasyab Altaf drafted the manuscript. Ashiq Ali critically revised the manuscript for important intellectual content. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work, including the investigation and resolution of questions related to its accuracy or integrity.

7- CONFLICT OF INTEREST: None.

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