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ORIGINAL ARTICLE

Quality of life assessment in the first episode of acute coronary syndrome

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Abstract

Background: Assessment of health-related quality of life (HRQoL) is an important measure of a patient's recovery after an illness. However, HRQoL among acute coronary syndrome (ACS) survivors has not been extensively studied following cardiac management.
Aim: The purpose of this study was to assess the quality of life (QoL) among ACS patients who have undergone percutaneous coronary intervention (PCI).
Methods: This cohort study included 145 consecutive male ACS patients between March 2021 and May 2022. Of these patients, 138 (mean age 54.3 ± 10.7 years) completed the QoL assessment using the short form-12 (SF-12) health survey questionnaire. Seventy (51%) of them presented with ST-segment elevation myocardial infarction (STEMI), 18 (13%) had non-STEMI, 39 (28%) had evolved MI, and 11 (8%) had unstable angina. Recruited patients' QoL data were assessed at various time points post-PCI.
Results: At the end of the 12 months of follow-up, major clinical events (MCE) defined as death, sudden death, or re-acute myocardial infarction occurred in 54.9% of patients. Out of 7 MCE, four deaths and three re-AMIs had occurred. SF-12 physical component score was found to be significantly improved when compared to the mental component score, which seems to improve without reaching statistical significance over time. Among event-free ACS patients, we found a significant positive correlation between left ventricular ejection fraction and HRQoL.
Conclusion: Improvement in HRQoL (physical component) was seen among ACS patients post-PCI.
Relevance for Patients: QoL assessment outcomes should be considered in clinical settings, practice guidelines, and treatment modality post-PCI to improve QoL in post-ACS survivors.

1. Introduction

Acute coronary syndrome (ACS) is a term used to describe one of two conditions: A heart attack (myocardial infarction) or when a person suffering from severe chest pain (unstable angina). Myocardial infarction is further classified as ST-segment elevation myocardial infarction (STEMI) and non-STEMI (NSTEMI). India has the world's highest ACS burden as shown by a prospective registry study (CREATE) which generated data from ten regions and 50 cities in 89 centers [1]. Even though the advent of therapies has increased survival in ACS, the rates of event-free survival at 1 year and 2 years were 88 ± 60.3% for males and 83% for females, respectively ($P = 0.58$) [2]. In addition, persons who have ACS report significant physical and mental discomfort related to the condition and subsequent clinical management. Hence, there is a need to understand the effects of

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ACS impact on the physical and mental health status of ACS survivors.

A self-administered generic tool short-form health survey (SF-36) has been used in angina, acute myocardial infarction (AMI), and heart failure. The SF-36 has been demonstrated to be a sensitive measure for identifying improvements in HRQoL following active intervention in individuals with recent AMI. The SF-12 and SF-8 are condensed forms of the questionnaire which are accessible for use and are quicker to complete [3].

Multiple studies have shown that QoL is better after PCI than it was before. Complete angina resolution was better with PCI, according to a meta-analysis of 14 randomized controlled trials comparing PCI to medical therapy in 7818 patients enrolled from 1987 to 2005. Furthermore, it has been observed that the SF-12, or condensed version of the SF-36, correlates favorably with the SF-36 summary scores in a variety of illnesses, including angina [4].

The reason for using the SF-12 health survey questionnaire was with only 12 items, health status could be assessed aptly when compared to the 36-item SF-36 [5]. The SF-12 questionnaire has been proven to be accurate in a variety of medical conditions as well as in the general population [6,7].

Further, not many studies have looked into the effect of comorbidities on the quality of life (QoL) measured post-PCI. Therefore, this study aimed to evaluate the QoL among ACS patients post-PCI using the SF-12 health survey questionnaire and to explore the effect of comorbidities on QoL.

2. Materials and Methods

2.1. Study setting

This cohort study was conducted at the Cardiology outpatient department, R.L. Jalappa Hospital, in association with the Department of Physiology, attached to Sri Devaraj Urs Medical College, Kolar, Karnataka, India.

2.2. Ethical consideration

Central Ethics Committee clearance was obtained (CEC No. SDUAHER/KLR/R & I/91/2021-22). Each participant provided written informed consent to participate in the study.

The sample size was calculated [8] using nMaster 2.0 software and was estimated with 0.9 as the statistical power and <0.05 as the significant *P*-value (Figure 1).

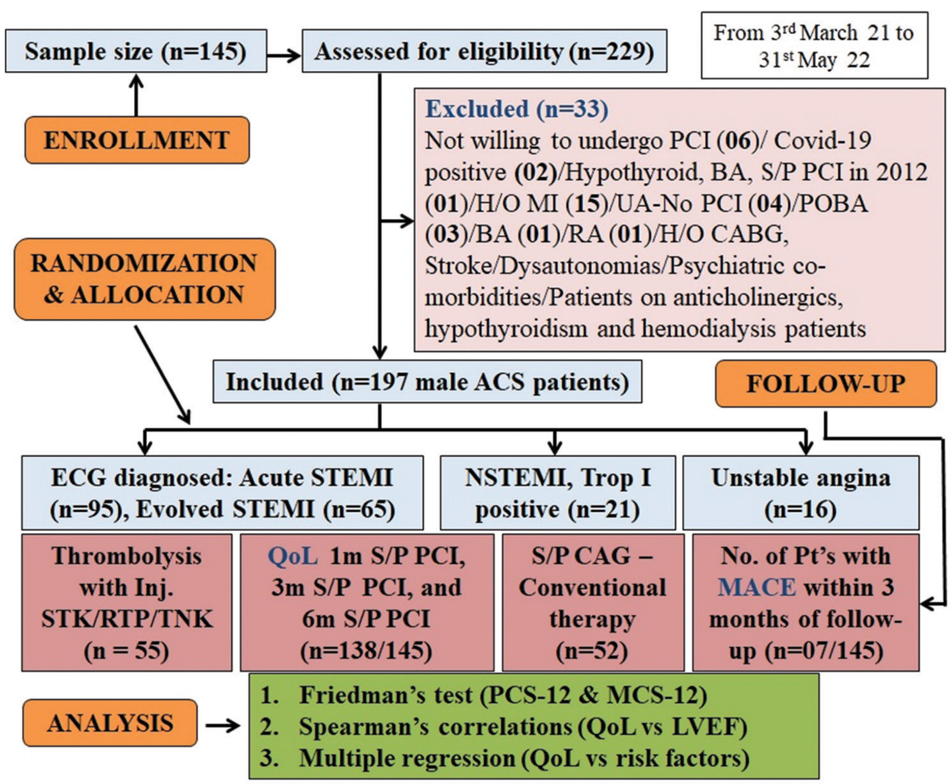

Figure 1. Study flow before and after PCI.

Abbreviations: PCI: Percutaneous coronary intervention; BA: Bronchial asthma; S/P PCI: Status post-PCI; MI: Myocardial infarction; UA: Unstable angina; POBA: Percutaneous old balloon angioplasty; RA: Rheumatoid arthritis; CABG: Coronary artery bypass graft; IHD: Ischemic heart disease; STEMI: ST elevation myocardial infarction; NSTEMI: Non-ST elevation MI; STK: Streptokinase; RTP: Reteplase; TNK: Tenecteplase; CAG: Coronary angiogram; MACE: Major adverse cardiac event; PCS: Physical component score; MCS: Mental component score; QoL: Quality of life; LVEF: Left ventricular ejection fraction.

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2.3. Study population

2.3.1. Study design

The study participants were chosen using a systematic random sampling technique.

2.3.2. Inclusion and exclusion criteria

One forty-five ACS (AHA/ACC/ESC classification) [9,10] male patients who have undergone PCI between March 2021 and May 2022 were included in the study. Among the enrolled, 62 patients had a first AMI (STEMI), 18 patients had NSTEMI, 44 had evolved MI, and 11 patients exhibited unstable angina. Of the 145 participants, seven had major clinical events (termed as death or re-AMI), providing a final sample of 138 individuals (95%) for the health survey. Smokers (cigarette/beedi) [11,12], tobacco chewers, and alcoholics [13] were also included in this study. Among the recruited, 26% of them were diabetics and 37% of them were hypertensive. Individuals were excluded if they were critically ill/mentally challenged. All the subjects went through reperfusion therapy using percutaneous coronary intervention (Primary/Elective PCI). Included participants were COVID-19 negative. Heart failure patients with preserved/mid-range EF (HFpEF or HFmrEF) [14] were considered.

2.4. Study design

We prospectively studied consecutive patients admitted to our intensive coronary care unit with the first episode of ACS, who underwent primary PCI of the culprit coronary vessel within 3–24 h of symptom onset in acute STEMI patients. Non-STEMI patients went through elective PCI within 24 h of symptom onset. Patients were also included if they had earlier failed thrombolysis (rescue PCI), as pointed out by the persistent ST-segment elevation. In case of evolved MI/unstable angina patients, symptom-to-door timings were 2 h to a month duration.

Patients with typical chest pain lasting ≥30 min who also had ST-segment elevation of ≥0.1 mV in ≥2 adjacent leads on the admission electrocardiogram (ECG) were diagnosed to have acute STEMI. Non-STEMI was associated with ST-segment depression of ≥0.1 mV in ≥2 contiguous leads on admission ECG, T wave inversion, with the troponin-I positive, and a typical chest pain lasting ≥30 min. Evolved MI was detected with the on and off symptoms from a few hours to a week, from hyperacute T waves to ST-segment elevation, and T wave inversion in ≥2 neighboring leads on the admission ECG. Unstable angina was identified with the on and off symptoms from a few hours to a month duration.

The demographic, anthropometric, clinical, and laboratory parameters obtained for each patient were: age, height, weight, several cardiovascular risk factors, infarction location, symptom-to-door timings, culprit coronary vessels (defined as the presence of diameter stenosis more than 50%), thrombolytic therapy, thrombolysis in myocardial infarction coronary flow grade, peak values of cardiac biomarkers (creatine kinase-myocardial band or troponin-I), and drug therapy.

Left ventricular ejection fraction was measured on admission, 1-month post-PCI/post-phase 2 cardiac rehabilitation, 3-month post-PCI, and 6-month post-PCI by 2-D echocardiography based on biplane Simpson's method.

2.5. Health-related QoL assessment

The patient's QoL was investigated using the SF-12 health survey questionnaire [6,8,15,16]. The SF-12 consists of eight health concepts representing physical functioning; role-limitations due to physical health problems, bodily pain, general health, energy/fatigue, social functioning, role-limitations due to emotional problems, and mental health (psychological distress or psychological well-being). The 12 questions in this instrument assessed health-related QoL (HRQoL) in the past 4 weeks, producing two different 0-100 scores, namely, physical component (PCS-12) and mental component (MCS-12) scores. The results of the SF-12 with a higher score indicated a better QoL. Thus, face-to-face interviews were conducted at cardiology OPD at various time points. Consequently, PCS-12 and MCS-12 scores were measured 1-month, 3-month, and 6-month post-PCI.

2.6. Data analysis

Descriptive statistics were calculated and expressed as percentages, mean, and standard deviation. Data were tested for normal distribution using the Kolmogorov–Smirnov test. Non-parametric tests were performed because the data did not show Gaussian distribution. Friedman's test was used to measure all the quantitative variables (PCS-12 and MCS-12) and was stated as the median. Furthermore, Spearman's correlation analysis was performed to ascertain the relationship between QoL scores and LVEF%. Then, multiple regression analysis was performed to explore the effect of confounding variables (such as smoking, tobacco chewing, alcohol consumption, Killip class, comorbidities, and drugs) on QoL. All the data were analyzed using IBM SPSS software for Windows (version 22.0; SPSS, Chicago, IL, USA).

3. Results

The study population consisted of 145 ACS patients (aged 54.3 ± 10.7 years) with LVEF of 44.8 ± 9.6%. Patients were on antiplatelets (100%); 96% of patients received antianginal therapy; 35% were treated with β-blockers; 98% of them were on anticoagulants; 9% were on vasodilators; 99% were on statins; 56% were on diuretics; 27% were on oral hypoglycemic agents/insulin; 7% were on angiotensin receptor blockers; 2% were on ACE inhibitors; and 7% were on calcium-channel blockers. The baseline characteristics of the study population (n = 138) are presented in Table 1.

QoL assessment was done among post-ACS survivors at various time points using Friedman's test. Since P = 0.011, we concluded that there was a significant improvement in the QoL scores during the follow-up (Table 2).

3.1. Correlation analysis

Spearman's correlation analysis was done to identify the likely correlation between QoL and left ventricular ejection fraction (%). All QoL parameters had significant correlations with the LVEF

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Table 1. Baseline characteristics of the study population (n=138)

Characteristics	Mean±SD
Mean age (years)	54.3±10.7
BMI (Kg/m^2)	25.2±4.0
Killip classification	
Class I	118
Class II	01
Class III	05
Class IV	03
Clinical data	
Systolic blood pressure (mmHg)	128±24
Diastolic blood pressure (mmHg)	80±11
Heart rate (bpm)	82±13
Left ventricular ejection fraction (%)	45±10
Cardiovascular risk factors	
Diabetes mellitus, *n* (%)	36 (26)
Hypertension, *n* (%)	50 (37)
Smoking, *n* (%)	42 (31)
Alcohol consumption, *n* (%)	21 (15)
Tobacco chewing, *n* (%)	05 (4)
Coronary angiography and PCI data (*n*)	
Primary PCI	79
Rescue PCI	01
Elective PCI	58
TIMI flow grade III (post-PCI)	138

TIMI: Thrombolysis in myocardial infarction; PCI: Percutaneous coronary intervention

Table 2. Quality of life scores after percutaneous coronary intervention using Friedman's test

QoL scores	1-month post-PCI	3-month post-PCI	6-month post-PCI	Chi-square value	*P*-value
PCS-12	53.07	54.00	54.00	8.97	0.011*
MCS-12	55.96	57.00	56.00	3.43	0.180^{NS}

Values expressed as median; *Significance $P \leq 0.05$; NS: Not significant; QoL: Quality of life; PCS-12: Physical component score; MCS-12: Mental component score.

except the correlation between MCS-12 (3 months) and LVEF (3 months) with P = 0.068 showing suggestive significance, as shown in Table 3.

Spearman's correlation analysis was done to identify the likely correlation between QoL scores and age, and body mass index (BMI). One-month post-PCI PCS-12 and MCS-12 QoL scores had significant negative correlations with age suggesting a decline in QoL on aging. Besides, a positive correlation was observed between MCS-12 (1 month) and BMI with P = 0.022, as shown in Table 4.

3.2. Multivariate tests

Multivariate tests were executed to know the likely role of smoking, tobacco chewing, alcohol consumption, and Killip class on QoL parameters (Table 5). Mentioned predictors had no significant association with the QoL scores.

Multivariate tests were accomplished to know whether diabetes mellitus (DM) and hypertension (HTN) had got any effect on QoL parameters (Table 5). Both DM and HTN had no statistically significant association with any of the QoL scores.

Table 3. Spearman's correlation of QoL scores (PCS-12 and MCS-12) with left ventricular ejection fraction

QoL scores	Spearman's rho	LVEF (%) (1 month)	LVEF (%) (3 months)	LVEF (%) (6 months)
PCS 12 (1 month)	Correlation coefficient	0.57		
	P-value	0.000**		
PCS 12 (3 months)	Correlation coefficient		0.35	
	P-value		0.000**	
PCS 12 (6 months)	Correlation coefficient			0.31
	P-value			0.000**
MCS 12 (1 month)	Correlation coefficient	0.31		
	P-value	0.000**		
MCS 12 (3 months)	Correlation coefficient		0.16	
	P-value		0.068	
MCS 12 (6 months)	Correlation coefficient			0.25
	P-value			0.004**

*Moderately significant $P \leq 0.05$; **Strongly significant $P \leq 0.01$; NS: Not significant; QoL: Quality of life; PCS: Physical component score; MCS: Mental component score

Table 4. Spearman's correlation of QoL scores with age and body mass index

QoL scores	Spearman's rho	Age (years)	BMI (kg/m^2)
PCS 12 (1 month)	Correlation coefficient	−0.19	0.06
	P-value	0.029*	0.502^{NS}
MCS 12 (1 month)	Correlation coefficient	−0.19	0.20
	P-value	0.024*	0.022*

*Significance $P \leq 0.05$; NS: Not significant; BMI: Body mass index; QoL: Quality of life; PCS: Physical component score; MCS: Mental component score.

Table 5. Multivariate tests between smoking, tobacco chewing, alcohol consumption, Killip classification, hypertension, diabetes mellitus, and quality of life scores

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	0.019	2074.35^b	3.00	122.00	0.000
Smoking	0.997	0.13^b	3.00	122.00	0.940^{NS}
Tobacco chewing	0.985	0.62^b	3.00	122.00	0.605^{NS}
Alcohol consumption	0.995	0.23^b	3.00	122.00	0.879^{NS}
Killip classification	0.899	1.10	12.00	323.07	0.357^{NS}
Intercept	0.003	14633.67^b	3.00	132.00	0.000
Diabetes mellitus	0.970	1.350^b	3.00	132.00	0.261^{NS}
Hypertension	0.983	0.742^b	3.00	132.00	0.529^{NS}

*Significance $P \leq 0.05$; ^{NS}Not significant; ^{b}Exact statistic

Multivariate tests were performed to know whether drugs have got any effect on QoL measures (Table 6). Various drugs had no statistically significant effect on any of the QoL scores. While, with the corrected model, β-blockers had a significant effect on the PCS-12 component of QoL scores with P = 0.042.

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Table 6. Multivariate tests between various medications and quality of life scores

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	0.142	374.36[b]	2.00	124.00	0.000
Antianginal drugs	0.997	0.17[b]	2.00	124.00	0.846[NS]
Anticoagulants	0.992	0.49[b]	2.00	124.00	0.614[NS]
Thrombolytics	0.981	1.19[b]	2.00	124.00	0.308[NS]
β-blockers	0.967	2.09[b]	2.00	124.00	0.128[NS]
Vasodilators	0.978	1.40[b]	2.00	124.00	0.249[NS]
CCBs	0.996	0.26[b]	2.00	124.00	0.768[NS]
ACE inhibitors	0.986	0.89[b]	2.00	124.00	0.414[NS]
OHAs	0.992	0.49[b]	2.00	124.00	0.612[NS]
Statins	0.984	1.03[b]	2.00	124.00	0.360[NS]
Diuretics	0.996	0.24[b]	2.00	124.00	0.784[NS]

*Significance $P \leq 0.05$; [NS]Not significant; [b]Exact statistic; CCBs: Calcium channel blockers; ACE: Angiotensin-converting enzyme; OHA: Oral hypoglycemic agent

4. Discussion

The major finding of the present study is the significant increase in the PCS-12 component of QoL scores from 1 to 6 months post-PCI among ACS survivors. Results suggest that patients' QoL might have improved on successful revascularization with PCI in the physical domain when compared to their mental component scores.

A prospective cohort study by Seto *et al.* [17] included 1445 PCI patients. Wherein QoL was measured using SF-36 and the Seattle angina questionnaire (SAQ). QoL improved in 58 – 75% of PCI patients for different domains at 6 months. Another prospective cohort study by Wong *et al.* [18] included 78 PCI patients. QoL was assessed using SF-36 and SAQ. Statistically significant improvements in six out of eight SF-36 and five out of five SAQ domains at 1 and 3 months were observed in PCI patients. Yet, another prospective cohort study by Melberg *et al.* [19] enrolled 609 PCI patients, with significant improvement in QoL (measured using SF-36) in PCI patients at 6 months. The present study findings were in line with the literature, wherein QoL in the physical domain (PCS-12) improved significantly from 1-, 3-, and 6-month post-PCI among ACS patients.

Anchah *et al.* [20] recruited 112 patients with newly diagnosed ACS. The SF-36 questionnaire was used to obtain QoL data. Their physical and mental health summaries showed poorer results at baseline. Yet, these improved gradually and significantly over time. Our study enrolled 1-month post-PCI/post-phase 2 cardiac rehabilitation ACS patients, where we also observed a significant improvement in the physical component of QoL when compared to the non-significant improvement in the mental component of QoL over time.

In addition, in the present study, we found a strong positive correlation between LVEF with QoL scores (both in physical and mental domains) except for the association between MCS-12 at 3 months post-PCI and LVEF 3 months post-PCI. In contrast, in a study by Juenger *et al.* [21], among 205 patients with congestive heart failure and systolic dysfunction LVEF, duration of disease, and age showed no association with QoL.

In the present study, age had a significant negative correlation with the physical and mental components of QoL scores. Our study findings suggest that advanced age could have had a detrimental effect on QoL. Whereas, patients' age was not associated with any of the World Health Organization QoL-BREF domains scores [22]. In addition, advanced age, always drinking alcohol, a high-fat diet, and HTN affected the various domain-specific European QoL Five Dimension (EQ-5D) Five-level scale scores in coronary heart disease patients [23].

QoL in HFpEF was observed to be the poorest in patients who are young, obese, and have diabetes [24]. Our study included 138 heart failure patients with mid-range to preserved ejection fraction wherein QoL was the poorest on admission to hospital set-up which later improved after successful revascularization with PCI. Besides, BMI (Obese: ≥ 30 Kg/m^2; $n = 10/138$ ACS patients) had a significant positive correlation with the mental component of the QoL measure.

According to a review by Goldenberg *et al.* [25], a negative relationship between smoking and QoL exists even with secondhand smoke. Further, a Chinese study found that smoking had a negative correlation with the QoL. Smokers had an 11.65% lower average chance of having a higher QoL than non-smokers [26]. Conversely, predictors such as smoking, tobacco chewing, alcohol consumption, and Killip class had no significant association with the QoL scores in our study.

The present study results showed that both diabetes mellitus (DM) and HTN had no significant effect on any of the QoL scores. While in a study with 364 diabetic patients, the physical domain score was negatively associated with the duration of DM [22]. Besides, higher rates of DM significantly decreased EQ-5D index and visual analog scale scores [23].

Regarding outcomes (serious adverse events and major adverse cardiovascular events), the long-term risk of reinfarction during follow-up, QoL, and angina, additional information is needed to approve or reject the clinical effects of β-blockers on the outcomes in patients with or suspected of acute MI [27]. However, on regression analysis, β-blockers had a significant effect on the physical component of QoL in our study. Denoting the beneficial effect of β-blockers in improving the physical well-being of ACS patients post-PCI in the long run. In a meta-analysis, it was evident that β-blocker therapy does not alter QoL. Accordingly, clinicians could add β-blockers to traditional treatment without apprehensions of harming QoL in patients with congestive heart failure [28].

4.1. Study limitations

The nutritional status [29] of the ACS patients on admission and follow-up was not addressed in the present investigation. Since the nutrition status of the patients might have had a significant effect on QoL in the long run, this issue needs to be considered as the future direction of this study. In addition, the present study was a single-center cohort study with small sample size. Hence, multi-centric large-scale studies will be required for additional validation of the usefulness of QoL measurement post-PCI as one of the prognostic evaluators for QoL among ACS survivors. Further, we analyzed the overall effect of various confounding factors on QoL post-PCI in patients with and without MCE. Since no significant association between confounding factors and QoL was observed, future studies could analyze the effect of risk factors (especially comorbidities such as HTN and diabetes mellitus) on QoL among patients who had MCE. The study population was heterogeneous in terms of clinical presentation, comorbidities, and pathophysiology. In accordance, QoL and ejection fraction would be different between patients with STEMI and unstable angina patients. Besides, if an unstable angina patient undergoes PCI for the culprit lesion, the patient would be relieved of any symptoms, and hence, their ejection fraction would be normal. Hence, future studies should focus further research on QoL post-acute MI/STEMI patients only.

5. Conclusions

The present study results revealed a significant increase in the physical component of QoL from 1 to 6 months post-PCI among ACS survivors. QoL scores correlated well with the echocardiographic measure of LV ejection fraction. Further, age had a significant negative effect on QoL. Therefore, QoL assessment outcomes should be considered in routine clinical practice and treatment modality post-PCI to improve QoL.

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Conflicts of Interest

The authors claim to have no conflicts of interest.

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