Impact of socioeconomic status on adverse cardiac events after coronary angioplasty: a cohort study

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ABSTRACT

Background Socioeconomic status (SES) has been associated with adverse cardiovascular events in coronary atherosclerotic disease. However, it is unclear how SES impacts adverse cardiac events in patients treated with percutaneous coronary intervention (PCI).

Methods We determined SES based on educational, economic and occupational parameters for 630 consecutive patients who underwent PCI at our centre between 01 June 2015 and 01 June 2016. The patients were divided into low and high SES groups, and they were followed up for 12 months. Patients were matched at baseline for demographic and procedural characteristics; multivariate analysis was used to adjust for baseline and procedural variables. Postprocedure compliance to medications was analysed. At 12 months, the primary composite end point of major adverse cardiac events (MACE) — consisting of death, non-fatal myocardial infarction, target lesion revascularisation, target vessel revascularisation — was compared between the groups.

Results The high SES group had a higher prevalence of diabetes mellitus ($p=0.03$; OR 0.74%, 95% CI 0.53% to 1.03%) and a stronger family history of ischaemic heart disease ($p=0.003$; OR 0.53%, 95% CI 0.33% to 0.84%). Low SES was associated with lower compliance with medication ($p=0.01$; OR 2.22%, 95% CI 1.19% to 4.15%). At 12 months, the primary composite end point of MACE was found to be higher in the low SES group ($p=0.01$); higher MACE was primarily driven by cardiac mortality ($p<0.001$). Low SES was found to be an independent predictor of MACE (HR 1.84%, 95% CI 1.16% to 2.96%).

Conclusion Low SES was associated with a higher incidence of major adverse cardiac events in patients undergoing PCI and was an independent predictor of MACE at 12 months.

INTRODUCTION

The socioeconomic status (SES) of an individual or community is a complex construct determined by several factors. Income, occupation and education are among the major indicators of SES.^{1,2} Marital status, living environment, age, sex and ethnicity are also contributing factors that decide the socioeconomic position of an individual.^{3,4} The association between the SES of an individual and cardiovascular morbidity and mortality has been fairly well studied and documented.^{5–9} This link can possibly be explained by poor access to medical care, a higher prevalence of risk factors, a lower quality of life (QoL) and a lower adherence to prescribed medications among patients belonging to a lower SES.³

Many studies have documented that lower SES can predict adverse cardiac events in patients with established coronary artery disease.^{4,10} However, very few studies have analysed the impact of SES on outcomes after percutaneous coronary intervention (PCI). Denvir *et al*, in a study conducted in the UK, found no significant association between SES and poor cardiac outcomes after PCI. But he observed that there was considerable influence of SES on post-PCI health-related QoL.¹¹ Shimony *et al* in a retrospective study from Israel (they used the Israel socioeconomic index) observed worse cardiac outcomes in post-PCI patients from low SES communities during follow-up.³ Both these studies had shortcomings (the former was underpowered, and the latter was a retrospective study) and were conducted in developed countries with better access to education and medical care. Very few studies have analysed the impact of SES on outcomes in post-PCI patients in developing countries, where, we may safely presume, the impact of socioeconomic factors may be more pronounced. Ours was a prospective study conducted in a developing country that specifically explores the relation between SES and outcomes after PCI.

METHODOLOGY

Between June 2015 and June 2016, 630 consecutive patients who underwent PCI for atherosclerotic coronary artery disease (at the department of cardiology, Kasturba Hospital, Manipal, India) were recruited for this study. Demographic, anthropometric, social, economic and clinical information was collected prior to the procedure (PCI). Patients were classified as belonging to either low or high SES based on a modified version of the updated Kuppuswamy's Socioeconomic Scale.¹² The Kuppuswamy's Scale, first described in 1976, is a validated tool for the assessment of SES in India, which classifies people into five groups of descending socioeconomic affluence by taking into account their educational status, occupation and income. We used the updated 2015 version redefined by Raj GM *et al*.^{12,13} However, we simplified the scale by dividing patients into only two major groups: low SES and high SES. Among low SES patients, only those who were eligible for free treatment (including primary angioplasty with a drug-eluting stent (DES)) under state-sponsored insurance schemes were included in the study so as to avoid any bias that may occur due to a potential difference in quality of care between the two groups. Both groups received the standard treatment, as per the institutional protocol, for patients

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Table 1 Validation of MSCDC with MARS for 200 post-PTCA patients at 1 month, 6 months and 12 months follow-up

MARS				
MSCDC	High drug adherence (N%)	Medium drug adherence (N%)	Low drug adherence (N%)	κ
1 month follow-up				
High drug adherence	144 (99.3)	7 (18.4)	0	0.881
Medium drug adherence	1 (0.7)	30 (78.9)	0	
Low drug adherence	0	1 (2.6)	12 (100)	
6 months follow-up				
High drug adherence	139 (97.9)	0	0	0.934
Medium adherence	3 (2.1)	23 (92)	0	
Low drug adherence	0	2 (8)	20 (100)	
12 months follow-up				
High drug adherence	130 (97.7)	0	0	0.939
Medium adherence	3 (2.3)	24 (100)	2 (7.7)	
Low drug adherence	0	0	24 (92.3)	
MSCDC, Manipal Scale for Cardiac Drug Compliance; MARS, Medication Adherence Rating Scale; PTCA, percutaneous transluminal coronary angioplasty.				

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undergoing PCI. Patients were then observed for in-hospital events. Only patients who underwent successful PCI, which was defined as establishment of Thrombolysis in Myocardial Infarction 3 (TIMI 3) flow in the treated artery with no major procedure-related complications, were included in this study. Both groups received DES. Follow-up was done at 1 month, 6 months and 12 months after the procedure.

The primary end point was a composite of death, non-fatal myocardial infarction (MI), target lesion revascularisation (TLR) and target vessel revascularisation (TVR). Secondary end points included MI, repeat PCI in the same vessel and death.

To assess compliance to recommended drug therapy during follow-up, we used the Manipal Scale for Cardiac Drug Compliance (MSCDC) that we have developed and validated. Content and criterion validation of the scale was done by comparing it with the Medication Adherence Rating Scale (MARS).^{14 15} We compared the scores at 1 month, 6 months and 12 months of follow-up of 200 postpercutaneous transluminal coronary angioplasty (PTCA) patients. There was a good agreement of MSCDC with MARS with values of 0.881, 0.934 and 0.939, respectively, for 1 month, 6 months and 12 months which suggested near-perfect agreement with the MARS scoring system (table 1).

We further applied this validated scale (MSCDC) on our study population and based on the score, post-PCI patients were grouped into low, medium and high compliance with medication. Adherence to lifestyle modification (LSM) advice after angioplasty was assessed by using a questionnaire that we developed and patients were divided into high, medium and low adherence groups.

Continuous variables were expressed as mean $\pm$ SD. Categorical variables were expressed in number (percentage) and compared with the χ^2 test; the OR for each baseline character was calculated. The impact of SES and other variables such as age, smoking, diabetes, hypertension, dyslipidaemia, number of coronary arteries involved and medication adherence on major adverse cardiac events (MACE) (death, MI and revascularisation) was determined using the Cox's proportional hazards regression model. The results were expressed as HRs and 95% CIs where appropriate. A value of $p < 0.05$ was considered statistically significant. Statistical analyses were performed with SPSS software (SPSS, V.20).

RESULTS

Six hundred and thirty patients who underwent PCI for significant coronary artery disease, defined as coronary artery stenosis in one or more major arteries exceeding 70%, were included. There were 352 (55.9%) and 278 (44.1%) patients in the high and low SES groups, respectively. Patients were followed up for 365 days/12 months.

There were no significant differences in attrition rates during follow-up between the groups ($p=0.9$). Three hundred and twenty (91%) of high SES, 253 (91%) of low SES post-PCI patients came for hospital follow-up. Thirty-two (9%) of high SES and 25 (9%) of low SES patients were lost to follow-up (OR 0.9%, 95% CI 0.57% to 1.71%). A comparison of the baseline characteristics between the two groups is shown in table 2. Illiteracy and educational qualifications restricted to primary school and middle school were significantly higher among the low SES group (the corresponding ORs were 3.36 and 2.75, respectively). The low SES group had a significantly higher number of people with occupations requiring only semi-skilled and unskilled labour (OR 4.18, 2.25, respectively). The average income in the low SES group in Indian rupees (INR) was INR 5648/month (income range INR 2301–6850). The average monthly income in the high SES group was INR 11500 (income range INR 6851–11450).

Patients in the low SES group were younger (55.9 ± 7.5 , 56.4 ± 6.8 low and high SES, respectively) and had higher rates of smoking (OR 1.05%, 95% CI 0.73% to 1.5%). Patients in the high SES group had a higher prevalence of type 2 diabetes mellitus (OR 0.74%, 95% CI 0.53% to 1.03%) and a positive family history of ischaemic heart disease (IHD) (OR 0.53%, 95% CI 0.33% to 0.84%). One hundred and seventy (48.2%) patients in the high SES group and 148 (53.2%) in the low SES group had presented with ST elevation myocardial infarction (STEMI). Almost all of these patients were treated with primary PCI: 166 (47.1%) in the high SES and 146 (52.5%) in the low SES (OR 1.23%, 95% CI 0.89% to 1.7%) groups (table 2). Both groups received dual antiplatelet therapy and high dose statin therapy (OR 1.58%, 95% CI 0.08% to 3.7%). There was no significant difference observed in the prescription patterns of medications between the two groups: angiotensin II receptor blockers (ARB's) (OR 0.99%, 95% CI 0.69% to 1.41%), ACE-inhibitors (ACE-I) (OR 0.91%, 95% CI 0.63% to 1.31%), β -blockers (OR 1.29%, 95% CI 0.92% to 1.80%), calcium channel blockers (OR 0.90%, 95% CI 0.57% to 1.40%), diuretics (OR 1.32%, 95% CI 0.90% to 1.93%) and nitrates (OR 0.88%, 95% CI 0.59% to 1.31%). Adherence to therapeutic LSM after angioplasty was significantly poorer in the low SES group when compared with the high SES group (low LSM: 46 (13.1%) vs 67 (23.8%) in high vs low SES, OR=2.7; medium LSM: 124 (35.2%) vs 113 (40.8%) in high and low SES, OR=1.69; high LSM: 182 (51.8%) vs 98 (35.4%) in high vs low SES, $p < 0.001$) (table 2).

Patients with high adherence to medication (as evidenced by a score of < 1 on MSCDC) and medium adherence (a score of 1–3 on MSCDC) were higher in the high SES group. Concomitantly, patients with low adherence (as evidenced by a score of > 3 on MSCDC) were found to be higher in the low SES category (OR 1.049%, 95% CI 0.58% to 1.88% and OR 2.22%, 95% CI 1.19% to 4.15% for medium and low adherence, respectively) (table 3). Patients in the low SES category were more likely to be non-compliant to medication ($p=0.01$) as measured by continuous days of treatment.

At 12 months follow-up, the composite end point of death, non-fatal MI, TLR, TVR was significantly higher in the low

Table 2 Baseline characteristics of percutaneous transluminal coronary angioplasty (PTCA) patients of high and low socioeconomic status (SES)

	High SES n=352(%)	Low SES n=278(%)	OR (95% CI)
Age	56.4±6.8	55.9±7.5	0.3
Male	274 (77.8)	209 (75.1)	0.86 (0.58 to 1.27)
Female	78 (22.1)	69 (24.8)	1
Mixed diet	246 (69.8)	214 (76.9)	1.44 (0.99 to 2.1)
Veg	106 (30.1)	64 (23)	1
Education (p<0.001)			
Profession/honour	53 (15)	15 (5.4)	1
Graduate/postgraduate			
Intermediate/post high school	35 (9.9)	8 (2.9)	0.81 (0.26 to 2.30)
High school certificate	80 (22.8)	31 (11.2)	1.36 (0.64 to 3.0)
Middle school certificate	18 (5.2)	14 (5.0)	2.75 (1.7.44)
Primary school certificate	125 (35.5)	119 (42.8)	3.36 (1.75 to 6.76)
Illiterate	41 (11.6)	91 (32.7)	7.84 (3.79 to 16.62)
Occupation (p<0.001)			
Profession/semiprofession	30 (8.5)	8 (2.8)	0.42 (0.16 to 1.02)
Clerical/shop owner/farmer	126 (35.8)	84 (30.2)	1.05 (0.67 to 1.65)
Skilled worker	48 (13.6)	24 (8.6)	0.79 (0.42 to 1.47)
Semiskilled worker	35 (9.9)	50 (18)	2.25 (1.26 to 4.02)
Unskilled worker	20 (5.7)	53 (19.1)	4.18 (2.19 to 8.11)
Unemployed/housewife	93 (26.5)	59 (21.2)	1
Income (p<0.001) (INR)			
>22 851	69 (19.6)	10 (3.5)	0.17 (0.07 to 0.36)
17 151–22 850	40 (11.3)	11 (3.9)	0.32 (0.07 to 0.36)
11 451–17 150	46 (13.1)	33 (11.8)	0.83 (0.46 to 1.50)
6 851–11 450	73 (20.7)	71 (25.5)	1.32 (0.69 to 1.84)
2 301–6 850	46 (13)	86 (30.9)	2.17 (1.3 to 3.69)
<2 300	78 (22.1)	67 (24.1)	1
F h/o IHD	75 (21.3)	35 (12.5)	0.53 (0.33 to 0.84)
Smoking	103 (29.3)	84 (31)	1.05 (0.73 to 1.50)
Hypertension	204 (57.9)	152 (54.7)	0.88 (0.63 to 1.22)
Diabetes	172 (48.8)	115 (41.4)	0.74 (0.53 to 1.03)
Dyslipidaemia	27 (7.7)	18 (6.5)	0.83 (0.42 to 1.61)
Prediet control	157 (44.6)	80 (28.8)	0.5 (0.35 to 0.71)
Preblood pressure control	169 (48)	107 (38.5)	0.68 (0.48 to 0.94)
Preblood sugar control	154 (43.8)	84 (30)	1.79 (1.27 to 2.73)
Prephysical exercise	99 (28.1)	53 (19)	0.60 (0.4 to 0.89)
Pre-PCI lifestyle (p=0.005)			
Low lifestyle	219 (62.2)	205 (73.8)	1
Medium lifestyle	126 (35.8)	66 (23.7)	0.55 (0.38 to 0.80)
High lifestyle	7 (2)	7 (2.5)	1.06 (0.21 to 3.63)
NYHA class (p=0.005)			
(III-IV)	106 (30.1)	113 (32.1)	0.62 (0.44 to 0.88)
PCI indication (p=0.3)			
STEMI	170 (48.2)	148 (53.2)	1.55 (0.96 to 2.53)
NSTEMI	93 (26.4)	73 (26.2)	1.40 (0.82 to 2.40)
UA	23 (6.5)	20 (7.1)	1.55 (0.70 to 3.39)
SA	66 (18.7)	37 (13.3)	1
Primary PCI	166 (47.1)	146 (52.5)	1.23 (0.89 to 1.7) (p=0.18)
Thrombolysed	4 (1.1)	2 (0.7)	0.63 (0.05 to 4.43) (p=0.5)
LV function (p=0.28)			
Normal LV	282 (80.1)	213 (76.6)	0.81 (0.54 to 1.21)
Mild LV dysfunction	70 (19.9)	65 (23.4)	1.22 (0.82 to 1.83)

F h/o IHD, family history of ischaemic heart disease; LV, left ventricular; NSTEMI, non-STEMI; NYHA, New York Heart Association; PCI, percutaneous coronary intervention; SA, stable angina; STEMI, ST elevation myocardial infarction; UA, unstable angina.

Table 3 Characteristics of post-PTCA patients of high and low SES

	High SES n=352(%)	Low SES n=278(%)	OR (95% CI)
Vessel-involved (p=0.49)			
SVD	156 (44.4)	119 (42.8)	1
DVD	129 (36.7)	112 (40.2)	1.18 (0.79 to 1.63)
MVD	66 (18.8)	47 (17)	0.86 (0.53 to 1.39)
Culprit vessel (p=0.95)			
LAD	198 (56.3)	159 (57.2)	1
RCA	114 (32.4)	87 (31.3)	0.95 (0.66 to 1.36)
LCX	40 (11.3)	32 (11.5)	0.99 (0.57 to 1.70)
Baseline prescription pattern			
Aspirin	352 (100)	278 (100)	
Antiplatelet	352 (100)	278 (100)	
Clopidogrel	167 (47.4)	127 (45.7)	0.93 (0.67 to 1.29)
Ticagrelor	185 (52.6)	151 (54.3)	1.04 (0.75 to 1.45)
Statin	350 (99.4)	277 (99.6)	1.58 (0.08 to 3.7)
ACE-I	105 (29.8)	78 (28.1)	0.91 (0.63 to 1.31)
ARBs	108 (30.7)	85 (30.6)	0.99 (0.69 to 1.41)
β-blockers	204 (58)	178 (64)	1.29 (0.92 to 1.80)
Ca channel blockers	62 (17.6)	45 (16.2)	0.90 (0.57 to 1.40)
Diuretics	79 (22.4)	77 (27.7)	1.32 (0.90 to 1.93)
Nitrates	81 (23)	58 (20.9)	0.88 (0.59 to 1.31)
Follow-up (p=0.96)			
Hospital follow-up	320 (91)	253 (91)	1
Lost of follow-up	32 (9.0)	25 (9.0)	0.9 (0.57 to 1.71)
Post-PCI LSM at 12 months (p<0.001)			
High LSM	182 (51.7)	98 (35.4)	1
Medium LSM	124 (35.2)	113 (40.8)	1.69 (1.18 to 2.41)
Low LSM	40 (13.1)	67 (23.8)	2.7 (1.72 to 4.23)
Medical adherence (p=0.037)			
High-medical adherence	249 (83.8)	174 (77.7)	1
Medium-medical adherence	30 (10.1)	22 (9.8)	1.04 (0.58 to 1.88)
Low-medical adherence	18 (6.1)	28 (12.5)	2.22 (1.19 to 4.15)

ACE-I-Angiotensin converting enzyme - inhibitor; ARB, angiotensin II receptor blockers; DVD-double vessel disease; LAD-left anterior descending; LCX-left circumflex; LSM-lifestyle modification; MVD- Multiple vessel diseases; RCA-right coronary artery; SES-socioeconomic status; SVD-single vessel disease

SES group (45 (16.2%) in the low SES group and 32 (9.1%) in the high SES group; $p=0.01$) and this was predominantly driven by higher mortality in the low SES group (20 (7.2%) vs 6 (1.7%); $p<0.001$). The composite end point (MACE) at 1 month and 6 months was not significantly different in either group (14 (4%) vs 17 (6.1%); $p=0.2$ and 12 (3.4%) vs 18 (6.5%); $p=0.9$ in the high and low SES groups at 1 month and 6 months, respectively) (table 4).

The secondary end point of death was significantly higher in the low SES group at 12 months (20 (7.2%) in the low SES group vs 6 (1.7%) in the high SES group; $p=0.001$). However, repeat

Table 4 Post-PTCA MACE at different follow-ups

	High SES n=352(%)	Low SES n=278(%)	P value
Composite MACE			
Overall MACE at 12 months	32 (9.1)	45 (16.2)	0.01
At 6 months	12 (3.4)	18 (6.5)	0.9
At 1 month	14 (4)	17 (6.1)	0.2

MACE, major adverse cardiac events; PTCA, percutaneous transluminal coronary angioplasty; SES, socioeconomic status.

Table 5 Unadjusted event rates for secondary end points

Event	High SES n=352(%)	Low SES n=278(%)	P value
Death	6 (1.7)	20 (7.2)	0.001
Non-fatal MI	13 (3.7)	14 (5.1)	0.43
TLR	5 (1.4)	7 (2.5)	0.38
TVR	8 (2.3)	5 (1.8)	0.78

MI, myocardial infarction; SES, socioeconomic status; TLR, transient lesion revascularisation; TVR, transient vessel revascularisation.

PCI (TLR 5 (1.4%) vs 7 (2.5%) and TVR 8 (2.3%) vs 5 (1.8%)) and recurrent MI (13 (3.7%) vs 14 (5.1%) in the high and low SES groups, respectively) were not significantly different between the groups (table 5).

After correction for baseline variables (table 6) like age, gender, family history, smoking, diabetes, hypertension, dyslipidaemia, low SES, adherence to medication, STEMI, presence of multivessel disease and LAD as the culprit vessel, we found that the independent predictors of MACE were low SES (HR 1.84%, 95% CI 1.16% to 2.91%) and STEMI (HR 2.20%, 95% CI 0.98% to 4.93%).

DISCUSSION

Cardiovascular disease (CVD) is the leading cause of mortality and morbidity in Western countries; more recently it has made its way into developing countries.¹⁶ Recent data suggest that there is a rise in the occurrence of cardiovascular disease-related morbidity and mortality across the range of SES, as demarcated by income, occupation and low educational level.^{6 17 18} Earlier

studies from the UK and USA showed a positive association between higher SES and cardiovascular disease. More recently, however, a reversal of this trend has been noticed in those countries with similar patterns emerging in countries like New Zealand, Australia and the Scandinavian countries.¹⁹

A study conducted by the Canadian Heart Health Surveys Research Group among 23 129 Canadian residents aged between 18 years and 74 years from 1986 to 1992 concluded that people with low SES, particularly people with less education, had worse cardiac outcomes and they also had less awareness about CVD risk factors.² A large cohort study, involving 303 036 people, conducted among the Asian and Australian populations demonstrated that poor educational status was strongly associated with a higher risk of CVD or premature death in the general population.⁸ A low SES has been shown to be an independent predictor of cardiovascular disease and its risk factors.^{5 9 17 19}

However, few studies have looked specifically at the relationship between SES and MACE following coronary angioplasty.^{3 10 11} Manderbacka *et al* observed in a cohort study in Finnish residents who underwent coronary revascularisation between 1998 and 2010 that the cardiac mortality rate was significantly higher in the lowest income group.¹⁰ Shimony *et al* demonstrated a higher incidence of cardiovascular risk factors, higher prevalence of non-compliance with prescribed medication and a higher incidence of MACE in the low socioeconomic category patients in a study conducted in Israel.³

In our study, significant differences in baseline characteristics, compliance with therapy and clinical outcomes were observed between patients belonging to high and low socioeconomic (SE) groups. High SES patients had a higher incidence of diabetes and family history of IHD. Patients in the low SES group were less compliant to medication and were also less likely to adhere to therapeutic LSM advice after angioplasty. At 12 months follow-up, the primary composite end point of death, repeat revascularisation and recurrent MI was found to be higher in the low SES group. After correction for baseline differences, low SES was found to be an independent predictor of MACE during follow-up.

In another earlier study, Denvir *et al* found no significant difference in adverse cardiac outcomes after PCI between patients of low and high SES in the UK.¹¹ The difference in results between this study and ours might be explained by the difference in social, economic and educational circumstances that prevail in developed and developing countries. Moreover, this study, in contrast to ours, was conducted in the pre-DES era.

Several studies have reported an association between low SES and poor drug compliance.^{20–22} We found significantly lower compliance with medications among patients of low SES. But when progressively adjusted for risk factors using the Cox's model, drug non-adherence was not found to be an independent predictor of MACE in our study. However, low adherence to guideline-recommended medications has repeatedly been shown to be a major risk factor for adverse long-term outcomes^{3 22} and can be considered one of the possible explanations for the adverse outcomes observed. Moreover, we observed that adherence to therapeutic lifestyle modification was significantly poorer in the low SES group. We hypothesise that this too might have contributed to the findings in our study. Woodward *et al* demonstrated that poor educational status (which was considered a surrogate for SES), especially in Asian countries like China and Thailand, correlated strongly with both all-cause mortality and cardiac mortality.²³ However, the exact mechanism for the increased cardiac mortality observed in the low SES group is not clear. Further research is warranted in this direction.

Table 6 Adjusted Cox and unadjusted Cox proportional analyses: MACE among different variables

Variable (Reference range)	Unadjusted HR (95% CI)	Adjusted HR (95% CI)	P value
Low SES (high SES)	1.84 (1.16 to 2.91)	1.74 (1.10 to 2.77)	0.009
Male gender (female gender)	0.72 (0.42 to 1.23)	0.72 (0.14 to 1.23)	0.231
T2DM (No T2DM)	1.02 (0.62 to 1.66)	1.01 (0.59 to 1.7)	0.92
Hypertension (no hypertension)	1.40 (0.84 to 2.35)	1.32 (0.77 to 2.25)	0.19
Smoker (non-smoker)	0.76 (0.44 to 1.31)	0.88 (0.5 to 1.56)	0.33
Dyslipidaemia (no dyslipidaemia)	0.70 (0.25 to 1.92)	0.67 (0.24 to 1.87)	0.49
Veg Diet (mixed diet)	1.61 (0.89 to 2.92)	1.76 (0.96 to 3.22)	0.06
H/o IHD (no H/o IHD)	0.50 (0.24 to 1.05)	0.52 (0.24 to 1.09)	0.07
STEMI (non STEMI)	2.20 (0.98 to 4.93)	2.20 (0.99 to 4.87)	0.04
NSTEMI (non NSTEMI)	1.39 (0.59 to 3.37)	1.61 (0.67 to 3.87)	0.45
UA (non-UA)	1.66 (0.52 to 5.32)	1.73 (0.55 to 5.46)	0.39
SA (non-SA)	1	1	0.07
LAD (non- LAD)	0.93 (0.46 to 1.87)	0.84 (0.42 to 1.68)	0.84
RCA (non-RCA)	1.02 (0.48 to 2.14)	0.87 (0.42 to 1.82)	0.957
LCX (non-LCX)	1	1	0.849
SVD (non-SVD)	0.92 (0.48 to 1.78)	1.02 (0.54 to 1.95)	0.81
DVD (non-DVD)	0.87 (0.45 to 1.70)	1.04 (0.54 to 1.99)	0.699
MVD (non MVD)	1	1	0.831
Medical adherence (non-medical adherence)	0.80 (0.50 to 1.28)	0.81 (0.5 to 1.2)	0.3

DVD, double vessel disease; H/o IHD, history of ischaemic heart disease; LAD, left anterior descending; LCX, left circumflex; MVD, Multiple vessel diseases; NSTEMI, non-STEMI; RCA, right coronary artery; SA, stable angina; SES, socioeconomic status; STEMI, ST elevation myocardial infarction; SVD, single vessel disease; T2DM, Type 2 diabetes mellitus; UA, unstable angina.

Key messages

What is already known about this subject?

- ▶ Several studies have linked poor socioeconomic status (SES) to adverse outcomes in patients with coronary atherosclerotic disease (CAD). Low SES has been identified as a risk factor for poor outcomes in patients with CAD.
- ▶ A few studies (mostly from developed nations) have also looked at the correlation between SES and outcomes after revascularisation (percutaneous coronary intervention (PCI)/coronary artery bypass graft (CABG)) but the data are scant and inconsistent.

What does this study add?

- ▶ Very few, if any, studies have specifically looked at the role of SES in predicting outcomes after PCI in developing countries like India. Earlier studies had been conducted in developed nations like the UK and Israel. Moreover, our study, unlike previous studies on the subject, is a prospective cohort study with a 12-month follow-up with major adverse cardiac events (MACE) after PCI as a primary end point. We also looked at compliance to medication among patients of poor SES.

How might this impact on clinical practice?

- ▶ Our study shows that SES should be considered a risk factor for adverse outcomes after PCI in developing countries like India. One can make a case for incorporating SES into MACE risk calculations. We also found poor compliance to medications and poor adherence to therapeutic lifestyle modification among patients of low SES. Therefore, A more rigid follow-up regimen and strict counselling regarding adherence to medications after PCI as well as addressing their economic concerns may go a long way in improving long-term outcomes in patients of low SES.

SES has been evaluated as a potential risk factor for coronary atherosclerotic disease in addition to the conventional risk factors.^{24,25} Our study shows that SES should be considered a risk factor for adverse outcomes after PCI as well. One can make a case for incorporating SES into MACE risk calculations and thereby helping the physician to improve treatment. A rigid follow-up regimen and strict counselling regarding adherence to medications after PCI as well as addressing their economic concerns may go a long way in improving long-term outcomes in patients of low SES. From a public health perspective, it may be stressed that it remains the duty of the society and the government to address potential inequalities in healthcare provision and utilisation that may exist between people of different socioeconomic strata so that the benefits of modern medical therapy may reach everyone equally.

Conclusion

The association between SES and adverse cardiac events in post-PCI patients appears to be significant and cannot be ignored. Low SES, in our study, was associated with lower adherence to medication and higher mortality after PCI. Further research is required to delineate the mechanisms that would help explicate the link between SES and mortality.

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