Comparison of Long-Term Mortality After Acute Myocardial Infarction Treated by Percutaneous Coronary Intervention in Patients Living Alone Versus Not Living Alone at the Time of Hospitalization

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Living alone was reported to be associated with increased risk of cardiovascular disease. There are, however, limited data on the relation between living alone and all-cause mortality in patients with acute myocardial infarction (AMI) undergoing percutaneous coronary intervention (PCI). The Coronary REvascularization Demonstrating Outcome Study in Kyoto (CREDO-Kyoto) AMI registry was a cohort study of patients with AMI enrolled in 26 hospitals in Japan from 2005 through 2007. For the current analysis, we included those patients who underwent PCI within 24 hours of symptom onset, and we assessed their living status to determine if living alone would be an independent prognostic risk factor. Among 4,109 patients eligible for the current analysis of 5,429 patients enrolled in the CREDO-Kyoto AMI registry, 515 patients (12.5%) were living alone at the time of hospital admission. The cumulative 5-year incidence of all-cause death was 18.3% in the living alone group and 20.1% in the not living alone group (log-rank p = 0.77). After adjusting for potential confounders, risk of the living alone group relative to the not living alone group for all-cause death was not significantly different (adjusted hazard ratio 0.82, 95% confidence interval 0.65 to 1.02, p = 0.08). In a subgroup analysis stratified by age, the adjusted risk for all-cause death was also not different between the living alone group and the not living alone group both in the older population (aged ≥75 years) and the younger population (aged <75 years). In conclusion, living alone was not associated with higher long-term mortality in patients with AMI who underwent PCI. **(Am J Cardiol 2014;114:522−527)**

Living alone was reported to be associated with increased risk of cardiovascular disease[1−4] and poorer clinical outcomes after acute myocardial infarction (AMI).[5−10] However, the proportion of patients who had undergone percutaneous coronary intervention (PCI) was small in these studies. Indeed, some of the recent studies reported no significant association between living alone and mortality after AMI.[11,12] Therefore, the association between living alone and long-term mortality in patients with AMI undergoing PCI in the current real-world clinical practice is controversial. Additionally, living alone in older patients is an important welfare issue in rapidly aging societies. However, little is known about the influence of living alone in older patients on clinical outcomes after AMI. The aim of this study was to determine whether living alone is an independent prognostic risk factor for long-term mortality in patients with AMI who underwent PCI within 24 hours of symptom onset in the real-world clinical practice.

Methods

The Coronary REvascularization Demonstrating Outcome Study in Kyoto AMI registry is a physician-initiated non−company-sponsored multicenter registry that enrolled consecutive patients with AMI who underwent coronary revascularization within 7 days of the onset of symptoms from January 2005 to December 2007 at 26 tertiary hospitals in Japan (Supplementary Appendix A). The relevant review boards or ethics committees at all 26 participating hospitals approved the study protocol. Obtaining written informed consent from the patients was waived because of the retrospective nature of the study; however, we excluded those patients who refused participation in the study when contacted at follow-up. This strategy is concordant with the

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See page 526 for disclosure information.

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Table 1
Baseline clinical characteristics according to living arrangements

Variable	Living Alone (n = 515)	Not Living Alone (n = 3594)	p Value
Age (years)	68.5 ± 13.0	67.6 ± 12.1	0.11
Age ≥75 years*	196 (38%)	1097 (31%)	0.001
Men*	322 (63%)	2701 (75%)	<0.001
Body mass index (kg/m^2) <25.0*	390 (76%)	2586 (72%)	0.07
Hypertension*	407 (79%)	2826 (79%)	0.84
Diabetes mellitus	159 (31%)	1157 (32%)	0.55
On insulin therapy*	19 (3.7%)	160 (4.5%)	0.43
Current smoker*	206 (40%)	1430 (40%)	0.93
Heart failure*	188 (37%)	1093 (30%)	0.005
Multivessel coronary disease*	243 (47%)	1884 (52%)	0.03
Mitral regurgitation grade 3/4*	13 (2.5%)	115 (3.2%)	0.41
Prior myocardial infarction*	44 (8.5%)	307 (8.5%)	0.99
Prior percutaneous coronary intervention*	40 (7.8%)	316 (8.8%)	0.44
Prior stroke (symptomatic)*	50 (9.7%)	331 (9.2%)	0.72
Peripheral vascular disease*	17 (3.3%)	119 (3.3%)	0.99
eGFR (ml/min/1.73 m^2) <30, without hemodialysis*	27 (5.2%)	150 (4.2%)	0.26
Hemodialysis*	11 (2.1%)	52 (1.5%)	0.23
Atrial fibrillation*	53 (10%)	333 (9.3%)	0.46
Anemia (hemoglobin <11.0 g/dl)*	62 (12%)	338 (9.4%)	0.06
Thrombocytopenia (platelet count <100,000)*	11 (2.1%)	65 (1.8%)	0.61
Chronic obstructive pulmonary disease*	23 (4.5%)	113 (3.1%)	0.12
Liver cirrhosis*	20 (3.9%)	76 (2.1%)	0.02
Malignancy*	34 (6.6%)	293 (8.2%)	0.22

Categorical variables are expressed as number (%) unless otherwise indicated. Continuous variables are shown as mean ± SD or median (interquartile range).

eGFR = estimated glomerular filtration rate; SD = standard deviation.

* Potential independent variables selected for Cox proportional hazard models.

Table 2
Presentation and angiographic characteristics according to living arrangements

Variable	Living Alone (n = 515)	Not Living Alone (n = 3594)	p Value
ST-segment elevation myocardial infarction	453 (88%)	3162 (88%)	0.99
Hours from onset to presentation	3.1 (1.3−6.4)	2.4 (1.2−5.3)	0.001
≤2 hours	189 (39%)	1541 (45%)	0.01
Minutes from door to balloon	90 (60−138)	96 (66−138)	0.16
Hemodynamics:			
Killip class 1	365 (71%)	2682 (75%)	0.04
Killip class 2	59 (11%)	279 (7.8%)	
Killip class 3	14 (2.7%)	105 (2.9%)	
Killip class 4*	77 (15%)	528 (15%)	
Duration of hospitalization (days)	15 (10−22)	15 (10−23)	0.06
Infarct related coronary artery			
Left anterior descending	249 (48%)	1602 (45%)	0.32
Left circumflex	69 (13%)	471 (13%)	
Right	180 (35%)	1419 (40%)	
Left main	13 (2.5%)	85 (2.4%)	
Number of target coronary narrowings	1 (1−2)	1 (1−2)	0.76
Target of proximal left anterior descending coronary artery*	286 (56%)	1909 (53%)	0.30
Target of unprotected left main coronary artery*	19 (3.7%)	131 (3.6%)	0.96
Target of chronic total occlusion*	17 (3.3%)	122 (3.4%)	0.91
Target of bifurcation*	146 (28%)	956 (27%)	0.40
Side-branch stenting*	14 (2.7%)	122 (3.4%)	0.42
Total number of stents	1 (1−2)	1 (1−2)	0.97
Total stent length >28 mm*	207 (44%)	1422 (43%)	0.79
Minimum stent size <3.0 mm*	175 (37%)	1105 (34%)	0.13
Drug eluting stent use (culprit or other lesions)*	151 (32%)	1092 (33%)	0.60

Categorical variables are expressed as number (%) unless otherwise indicated. Continuous variables are shown as mean ± SD or median (interquartile range).

SD = standard deviation.

* Potential independent variables selected for Cox proportional hazard models.

guidelines of the Japanese Ministry of Health, Labour and Welfare.

The details on the design and patient enrollment of this registry have been described previously.[13] Of 5,429 patients enrolled in this registry, we excluded 9 patients who refused to participate in the study, 195 patients treated by coronary artery bypass grafting, 689 patients who underwent PCI beyond 24 hours after symptom onset, 30 patients whose symptom onset was unknown, 331 patients for whom the data on living arrangements was not available, and 66 patients who had previous coronary artery bypass grafting. Therefore, the study population for the current analysis consisted of 4,109 patients with AMI who underwent PCI within 24 hours of symptom onset and for whom the data on living arrangements were available (ST-segment elevation AMI: n = 3,615, non−ST-segment elevation AMI: n = 494).

Experienced clinical research coordinators from an independent clinical research organization (Research Institute for Production Development, Kyoto, Japan; Supplementary Appendix B) collected baseline clinical, angiographic, and procedural characteristics including living arrangement from hospital charts or hospital databases according to prespecified definitions. Collection of follow-up information was mainly conducted through review of inpatient and outpatient hospital charts by the clinical research coordinators, and additional follow-up information was collected through contact with patients, relatives, and/or referring physicians by sending mail with questions regarding vital status, subsequent hospitalizations, and status of antiplatelet therapy. Death, myocardial infarction (MI), and stroke were adjudicated by the clinical event committee (Supplementary Appendix C). Median follow-up duration for the surviving patients was 1,844 days (interquartile range 1,508 to 2,163). Complete 1- and 3-year follow-up information was obtained in 98.3% and 96.2% of patients, respectively.

We defined the living alone group as comprising patients who did not live with their family or others, at the time of hospital admission. The detailed definitions of baseline clinical characteristics were described previously.[13,14] The primary outcome measure for the current analysis was