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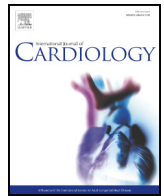
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Letter to the Editor

Systemic determinants as barriers to participation in cardiac prevention and rehabilitation services after Acute Coronary Syndrome[☆]Orna Reges^{a,b,c,*}, Noa Vilchinsky^{d,1}, Morton Leibowitz^{b,e,1}, Abdulrahem Khaskia^{c,1},
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Despite extensive evidence for the efficacy of Cardiac Prevention and Rehabilitation Programs (CPRP) after acute coronary syndrome (ACS) and widespread evidence-based recommendations [1–3], participation in CPRP remains low, particularly among ethnic minorities [4,5].

We recently demonstrated a substantial difference in participation rates between Arabs, Israel's main ethnic minority, and the Jewish majority (17.2% vs. 61.1%, $P < 0.001$) [6]. The finding that cardiac patients from two different ethnic groups, both covered by the same health insurance program and ostensibly exposed to the same intensive recruitment program, have such different participation rates in CPRP raises the question as to underlying barriers. The most common barriers are patient-related barriers (e.g. age) and system-related barriers (e.g. lack of provided information and referral) [7–9]. Therefore, we examined putative patient-related and system-related barriers to participation in CPRP among Jewish and Arabs ACS patients, and here report on systemic barriers.

The sampling method, case definition, inclusion and exclusion criteria, response rates and sample characteristics have been previously reported [6]. In brief, of the 501 ACS patients interviewed

face-to-face at baseline in a regional hospital which implemented a special CPRP recruitment program, 420 (116 Arabs and 304 Jews) were re-interviewed by telephone at the 6-month follow-up (83.8% response). The interview included socio-demographic and clinical characteristics (details in Table 1), participation in CPRP, and possible systemic barriers to participation in CPRP. Informed consent was obtained from each patient and the study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the institutional human research committee.

Systemic barriers to participation in CPRP included access-based obstacles (no driving license, no car, and limited proficiency with Hebrew) and hospital-based obstacles (lack of space at the rehabilitation center upon discharge, no reported knowledge of the existence of the rehabilitation program, absence of a recommendation to participate in CPRP in the discharge letter (LR), and no documentation of a routine visit to the rehabilitation center on discharge from hospital (VC)). Independent associations between potential systemic barriers and participation in CPRP were evaluated by a backward stepwise logistic regression procedure with three blocks of predictor variables and with an exit significance level of $p > 0.2$ within each consecutive block. Block 1 included socio-demographic variables and medical characteristics; block 2, the access-based obstacles; and block 3, the hospital-based barriers. Interactions between ethnicity and the predictors were assessed as deviations from multiplicativity in logistic models as well as from additivity.

The mean age of the study sample was 59.6 ± 10.9 years, 84.5% were male, 72.4% were Jews and 27.6% were Arabs, and 71.1% were hospitalized for acute myocardial infarction and 28.3% for unstable angina.

Unadjusted analyses pointed to significantly larger proportions of patients with each of the hypothesized barriers among Arab than Jewish patients (Table 1).

Among those who did not participate in CPRP ($n = 214$), 6.5% (95%CI: 3.6–10.7%) reported they were willing to join but could not due to full occupancy, and 25.2% (95%CI: 19.6–31.6%) reported being entirely unaware of the rehabilitation program, although written and verbal explanations had been provided in both Arabic and Hebrew. A borderline significant difference between Jews and Arabs was found with regard to unawareness (21.6% vs. 33.7% respectively, $p = 0.056$).

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¹ These authors take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

Table 1
Differences between Jews and Arabs patients in potential systemic barriers.

	Jews (n = 304)	Arabs (n = 116)	Total (n = 420) ¹	P for ethnic difference ²			
Access based barriers							
Possession of driving license (n = 413)	271	89.1%	86	78.9%	357	86.4%	0.007
Possession of a car (n = 411)	258	84.9%	71	66.4%	329	80.0%	<0.001
Good familiarity with the Hebrew language (n = 414)	283	93.1%	85	77.3%	368	88.9%	<0.001
Hospital based barriers¹							
Received recommendation to participate in rehabilitation in discharge letter (LR) (n = 418)	221	73.2%	73	62.9%	294	70.3%	0.04
Having visited the rehabilitation center during hospitalization (VC) (n = 418)	136	45.0%	36	31.0%	172	41.1%	0.009

¹ Data were missing for between 2–9 individuals for the various barriers; 408 patients had complete data.

² Chi square test.

Multivariable logistic modeling (Table 2) pointed to significant independent associations with participation in CPRP: Arab vs. Jewish ethnicity (OR = 0.14, 95%CI: 0.07–0.29), LR (OR = 2.79, 95%CI: 1.51–5.14), VC (OR = 2.00, 95%CI: 1.19–3.37), SEP (OR = 1.17, 95%CI: 1.03–1.33 per unit on a 10-point scale), and having a driving license (OR = 2.42, 95%CI: 1.02–5.73). The multivariable adjustment had no effect on the strong association of ethnicity with CPRP (unadjusted OR = 0.13, 95%CI: 0.08–0.23). Addition of multiplicative interaction terms of ethnicity separately with each of the following—VC, SEP and a driving license—yielded no significant contribution of VC and driving license. However, the interaction between ethnicity and LR was significant (p = .03). LR appeared to be less effective for Arabs (age- and sex-adjusted OR = 2.05, 95%CI: 0.68–6.21, p = 0.20) than for Jews (age- and sex-adjusted OR = 4.61, 95%CI: 2.61–8.17, p < 0.001). The rate differences (RD) differed significantly between Arabs (unadjusted RD = 8.9%, 95%CI: –6.0–24%) and Jews (RD = 39.8%, 95%CI: 27.2–52.5%), pointing to a stronger effect in Jews.

We show that two readily modifiable hospital-based barriers, namely, a letter of recommendation and visiting the rehabilitation clinic, were important independent predictors of CPRP participation in this Israeli sample, for both Arabs and Jews, and were absent for a substantial number of patients. Whereas visiting the rehabilitation facilities was found to be beneficial for all patients regardless of ethnicity, a letter of recommendation from one's physician seemed to be more effective in terms of CPRP participation for Jews than for Arabs. These findings point to a relatively easily remedied change in hospital release practices. Guidance of the medical staff to referral of all eligible patients, with special attention to vulnerable populations and with culturally sensitive modes of tailoring the recommendation, can improve participation in CPRP among the two ethnic groups. In our context, groups in need of special attention include Arab patients, older patients, those with unstable angina, those not in a coronary care unit, and those with a history of CVD, all of whom had significantly less LR and VC (data not shown).

Table 2
Association of socio-demographic characteristics, illness characteristics, and potential systemic barriers with CPRP participation assessed by backward stepwise logistic regression.*

Variable	Unadjusted Odds Ratio* (95% CI)	P value	Adjusted Odds Ratio (95% CI)	P value
<i>Socio-demographic and clinical data</i>				
Ethnic group	0.13 (0.08–0.23)	<0.001	0.14 (0.07–0.29)	<0.001
Age	1.00 (0.98–1.02)	0.92	0.99 (0.97–1.02)	0.53
Gender	1.45 (0.85–2.48)	0.17	2.17 (1.00–4.71)	0.052
Marital status	0.91 (0.55–1.53)	0.73	0.53 (0.27–1.02)	0.057
Level of education	1.57 (1.33–1.87)	<0.001	1.16 (0.92–1.46)	0.21
Employment status	0.64 (0.43–0.95)	0.03		
Socioeconomic position (SEP)	1.26 (1.14–1.39)	<0.001	1.17 (1.03–1.33)	0.016
Economic situation	0.70 (0.58–0.85)	<0.001		
Religiosity: Traditional	0.66 (0.43–1.01)	0.06	1.42 (0.80–2.53)	0.23
Religious	0.28 (0.15–0.53)	<0.001	0.91 (0.40–2.04)	0.82
HMO: Meuhedet/Leumit/Maccabi vs Clalit	1.08 (0.70–1.67)	0.73	0.60 (0.34–1.05)	0.075
Hospital unit	0.47 (0.31–0.72)	<0.001		
Discharge diagnosis	0.35 (0.22–0.55)	<0.001	0.57 (0.31–1.05)	0.07
History of CHD	0.47 (0.32–0.71)	<0.001	0.74 (0.43–1.28)	0.28
<i>Access based barriers</i>				
Possession of driving license	2.84 (1.54–5.27)	<0.001	2.42 (1.02–5.73)	0.045
Possession of a car	2.99 (1.77–5.05)	<0.001		
Proficiency with Hebrew	3.16 (1.59–6.29)	<0.001		
<i>Hospital-based barriers</i>				
Visit to rehabilitation center at discharge (VC)	3.65 (2.42–5.51)	<0.001	2.00 (1.19–3.37)	0.009
Recommendation for CPRP in discharge letter (LR)	4.35 (2.72–6.95)	<0.001	2.79 (1.51–5.14)	0.001

* p to exit > 0.20, within each block, so that variables in block 1 were retained in the final model even if their p-values with the introduction of subsequent blocks increased to >0.2.

* **Values:** Participation in CPRP (dependent variable): 0 = no, 1 = yes; **Variables included in block 1:** Ethnic group: 0 = Jews, 1 = Arabs; Age introduced as continuous variable (years); Gender: 0 = Male, 1 = Female; Birth place: 0 = Israel, 1 = other; Marital status: 0 = married, 1 = other; level of education introduced as an ordinal variable (5 point scale from 1 = no formal education to 5 = Academic Education); Employment status: 0 = working for pay, 1 = not working for pay; SEP introduced as an ordinal variable (10 point scale from 1 = the least well off to 10 = the best off); Economic situation introduced as an ordinal variable (6 point scale from 1 = excellent to 6 = very bad); Religiosity introduced as dummy variable: 1 = Secular (reference group) 2 = Traditional 3 = Religious; HMO: 1 = Clalit (the largest HMO), 2 = Other; Hospital unit: 0 = ICU, 1 = Internal Medicine; Discharge diagnosis: 0 = Myocardial infarction, 1 = Unstable Angina; History of IHD: 0 = no, 1 = yes; **Variables included in block 2:** Possession of driving license: 0 = no, 1 = yes; Possession of a car: 0 = no, 1 = yes; Hebrew language proficiency: 0 = no, 1 = yes; **Variables included in block 3:** Recommendation to participate in CPRP in discharge letter: 0 = no, 1 = yes; Visit to the rehabilitation center on discharge from hospital: 0 = no, 1 = yes.

120 The fact that one fifth of the Jews and one third of the Arabs re-
 121 ported not being aware of the program, despite the explanation
 122 given during hospitalization, suggests the need for enhancing care
 123 provider-patient communication. Systemic solutions to the personal
 124 barrier of not having a driving license, such as a home-based rehabil-
 125 itation program or subsidized travel, might be explored to overcome
 126 the absence of driving license.



127 A potential limitation of our study is the possibility of selection
 128 bias: although response was high overall, it was lower for those
 129 admitted to the internal medicine wards, for those with unstable
 130 angina, and for Arab women.

131 Important Arab-Jewish differences in participation in CPRP persisted
 132 even after multivariable adjustment for systemic barriers. An under-
 133 standing of the personal and cultural determinants of these ethnic dif-
 134 ferences is crucial to develop culturally sensitive programs to increase
 135 participation in CPRP that are appropriate for the two ethnic groups.

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