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Ethnical disparities in temporal trends of acute myocardial infarction (AMI) throughout a decade in Israel. Soroka acute myocardial infarction (SAMI-II) project

Ygal Plakht [a,*,1,2], Harel Gilutz [a,1,2], Arthur Shiyovich [b,1,2]

[a] Soroka University Medical Center and Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel
[b] Department of Internal Medicine E, Rabin Medical Center, Beilinson Hospital, Petah-Tikva, Israel

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ABSTRACT

Background: Ethnical disparities in presentation and outcomes following AMI were reported. We evaluated the temporal-trends of AMI hospitalizations and mortality of Bedouins (Muslims) and Jews in Israel.
Methods: Retrospective analysis of 15,352 AMI admissions (10,652 patients; 11.3% Bedouins, 88.7% Jews) throughout 2002–2012. The trends in admission rates (AR) were compared using direct age–sex adjustment. The trends of in-hospital mortality (IHM) and 1-year post-discharge mortality (PDM) were adjusted for the patients' characteristics.
Results: Bedouins were younger (61.7 ± 14.3 vs. 68.8 ± 13.7 years, $p < 0.001$), a higher rate of males. Different prevalence of cardiovascular risk factors was found. STEMI presentation, 3-vessel disease and PCI intervention were more frequently in Bedouins than Jews.
Adjusted AR was lower among Jews (4.80/1000 and 3.24/1000 in 2002 and 2012 respectively) than in Bedouins (9.63/1000 and 5.13/1000). A significant decrease of adjusted AR was found in both ethnicities (p-for-trend < 0.001 both), greater in Bedouins (p-for-disparity = 0.017).
The overall rate of IHM was higher for Jews (8.7% vs. 5.6%; $p = 0.001$). The decline of IHM was found in both groups: an increase of one-year resulted in AdjOR = 0.877; (p-for-trend < 0.001) and 0.910 (p-for-trend = 0.052) in Jews and Bedouins respectively (p-for-interaction = 0.793). The rates of PDM were higher for Jews (13.6% vs. 9.9%; $p = 0.001$). The risk for PDM increased in both groups: AdjOR = 1.118; (p-for-trend < 0.001) and 1.093; (p-for-trend = 0.012) for one-year increase, for Jews and Bedouins respectively (p-for-interaction = 0.927).
Conclusions: Throughout 2002–2012 Bedouin AMI patients differed from Jews. Adjusted incidence of AMI declined, greater in Bedouins. IHM declined and PDM increased in both groups. A culturally sensitive prevention program is warranted.

1. Introduction

Throughout the past decades diverse and dramatic improvements in the medical and interventional treatments of acute myocardial infarction (AMI) were introduced [1–3]. Furthermore the paradigm, of "evidence-based cardiovascular care" has been widely adopted, supporting high quality clinical trials followed by the incorporation of their results into international care guidelines [1,4]. Adherence with such guidelines has been shown to improve care of patients with AMI [1].

Several studies have observed differences in clinical presentation, treatment, and outcomes following AMI, depending on the patient's ethnicity around the world and in Israel [5–20] Furthermore high prevalence of cardiovascular risk factors in different Bedouin/Arab populations has been reported [6,12,17–21]. Approximately 220,000 Bedouins live in the southern Negev region of Israel. Approximately half live in eight Bedouin towns and the rest live in small, rural settlements. A small minority still maintains a semi-nomadic lifestyle. Previous studies observed, disparities healthcare accessibility and utilization between Bedouins and Jews presenting with AMI in southern Israel [6,12,17].

The present study explored ethnical disparities in temporal trends of AMI admissions, characteristics of presenting patients, in-hospital and

* Corresponding author at: Nursing Research Unit, Soroka University Medical Center, P.O.B. 151, Beer-Sheva 84101, Israel.
E-mail address: Plakht@exchange.bgu.ac.il (Y. Plakht).
[1] Equal contributions.
[2] These authors take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

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post-discharge 1-year all-cause mortality — in Bedouins versus Jews in southern Israel region throughout 2002–2012.

2. Methods

2.1. Study population

In this retrospective study we reviewed the medical records of consecutive AMI patients (1206) that were admitted to the Soroka University Medical Center (SUMC) with the recorded diagnosis of AMI. SUMC is a tertiary referral center (1200 beds), serving the metropolitan area of Beer-Sheva and the southern Israel region. Throughout the first year of the study period the region comprised a total of 528,200 residents [22]: ~50.3% women, ~70% Jews and ~25% Bedouins. These ethnical groups had different age composition; for Jews, the rates of young (<20 year old) and seniors (≥65 years old) were ~33% and ~10% respectively while for Bedouins about 66% and 1.1% respectively. The estimated age adjusted all-cause mortality rates (per 100,000 residents) in Jews were 440.1 for men and 303.6 for women. All-cause mortality rates for Bedouins were 592.3 and 457.4 for men and women respectively. The estimated age adjusted, ischemic heart disease-related mortality rates (per 100,000 residents) in Jews were 61.8 and 32.3, while in Bedouins 95.1 and 59.3 for men and women respectively. Throughout 2002–2012 the Bedouin population grew by approximately 98% while the Jewish population only by 23% [22].

Exclusion criteria: unknown ethnicity/religion and out-of-region residents. Incidences were calculated based on all AMI admissions throughout the survey period. For mortality analysis, when a given patient was admitted with AMI more than once throughout the follow-up period only the first admission was included.

The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the local ethics committee.

2.2. Data sources and classifications

Data were obtained from the hospital's computerized medical records. Additionally we obtained data regarding the general population of southern Israel region from the Israeli Central Bureau of Statistics Website [22].

The data included demographic and clinical characteristics, cardiovascular risk factors and co-morbidity, interventions administered for the AMI, and clinical workup (e.g. blood tests, echocardiography and coronary angiography). Mortality data were obtained from the Ministry of the Interior Population Registry.

AMI diagnosis was identified based on the international Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes: ST-elevation AMI (STEMI): 410.0*–410.6* and Non-ST-elevation AMI (NSTEMI): 410.7*–410.9*. Grouping of diseases and interventions was based on ICD-9-CM discharge codes. The results of laboratory tests were divided into three categories (below normal level, within the normal range, and above normal level) according to the appraisals of the testing laboratory.

2.3. Outcomes

Two primary outcomes were defined: in-hospital all-cause mortality evaluated in all patients and 1-year all-cause mortality evaluated in those who were discharged alive.

2.4. Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics 22 software. Calculation of the AMI rates was based on the size of the populations throughout every year of the study period. Direct age and gender adjustment were performed, using the data of the southern-Israel region population in 2012 as the standard population. Evaluation of the AMI trends in each group was performed with a linear regression and presented as the measure of a slope (regression coefficient — B) and it's Standard Error (SE). These trends were compared using comparisons of the slopes, as suggested in the literature [23]. Patient characteristics were presented as mean and standard deviation (SD) (for continuous variables) and n and percent for the categorical data. The secular trends of these parameters were assessed with the analysis of variance (ANOVA) for weighted linear trend test and with Chi-square test for linear trend. The multivariate analysis estimated the relationships between the investigated parameters and the outcomes using logistic regressions.

Two predicting multivariate models were built: for in-hospital and one-year mortality for hospital survivors. A priory these models were built for the total cohort (through all study years) in order to ascertain the variables related to the outcomes. Trends were evaluated for each ethnicity separately, by inserting the variable “year” into the model (i.e. univariate analysis) as well as and by inserting the variables “year” and “total risk score” into the model (i.e. multivariate analysis). Furthermore, comparison of mortality trends according to ethnicity group was performed applying the parameter of interaction “Ethnicity × year” as well as “total risk score”. For each test, $p < 0.05$ was considered as statistically significant.

3. Results

3.1. Study population

Overall 11,107 patients and 17,780 AMI admissions (a mean of 1.6 admissions per patient) were reviewed; 455 patients (2428 admissions) were excluded based on exclusion criteria. Hence 10,652 patients (15,352 admissions) qualified for the study: 1206 Bedouins (1795 admissions) and 9446 Jews (13,557 admissions). Bedouin AMI patients were significantly younger than Jews (Mean of 61.7 years, standard deviation [SD] = 14.3 vs. 68.8 [SD = 13.7] years; $p < 0.001$), with a higher rate of male patients (70.2% vs. 65.7%, $p = 0.002$).

3.2. Trends in AMI admissions

The AMI hospitalization rate throughout the investigated period was higher among Jews (5.01/1000 and 3.77/1000 in 2002 and 2012 respectively) compared with Bedouins (3.09/1000 and 2.27/1000 in 2002 and 2012 respectively) (Fig. 1a). However, following adjustment for age and gender, the hospitalization rate was lower among Jews (4.80/1000 and 3.24/1000 in 2002 and 2012 respectively) than in Bedouins (9.63/1000 and 5.13/1000 in 2002 and 2012 respectively). A significant and similar trend of decrease in the number of AMI admissions/1000 persons was observed during the study period in both ethnicities (Jews: Regression coefficient — $B = -0.134$, Standard Error (SE) = 0.032; $p = 0.002$ and Bedouins: $B = -0.191$; $SE = 0.021$; $p = 0.002$). No significant difference was observed between the latter trends ($p = 0.276$). These trends consisted following adjustment for age and gender (Jews: $B = -0.173$; $SE = 0.026$; $p < 0.001$ and Bedouins: $B = -0.4432$; $SE = 0.095$; $p = 0.001$). Yet it was greater in Bedouins compared with Jews ($p = 0.017$) (see Fig. 1b).

3.3. Ethnical disparities in temporal trends of baseline characteristics

During the study period Bedouin AMI patients characterized by increased rate of smokers (55.3% vs. 34.6%, $p < 0.001$) and diabetes mellitus (DM) (42.0% vs. 36.4%; $p < 0.001$) and lower prevalence of dyslipidemia (62.4% vs. 65.1%; $p = 0.07$), hypertension (44.5% vs. 53.2%, $p < 0.001$), peripheral vascular disease (PVD) (8.4% vs. 14.2%; $p < 0.001$) and chronic kidney diseases (CKD) (29.0% vs. 42.5%; $p < 0.001$), compared with Jews. Regarding non-cardiovascular co-morbidity Bedouins had a higher rate of chronic obstructive pulmonary