

Age, Gender and Risk Factor Disparities in First-Stroke Jewish and Arab Patients in Israel Undergoing Rehabilitation*

Elina Greenberg MD, Ily Tregler MD PhD and Juliana Schwarz MD

Department of Neurological Rehabilitation C, Loewenstein Rehabilitation Center, Raanana, affiliated with Sackler Faculty of Medicine, Tel Aviv University, Ramat Aviv, Israel

ABSTRACT: **Background:** Little is known of the risk factor disparities in first stroke among Jewish and Arab patients undergoing rehabilitation in Israel.

Objectives: To investigate the age, gender and risk factor disparities in first stroke among Jewish (immigrant and non-immigrant) and Arab patients undergoing rehabilitation and to compare the prevalence and odds ratio of stroke risk factors in these patients.

Methods: The database of the Department of Neurological Rehabilitation C at Loewenstein Rehabilitation Center was used to investigate first ischemic and hemorrhagic stroke patients admitted for hospital rehabilitation over a 15 year period, January 1993 to December 2008. Particular attention was paid to age, gender and risk factor disparities.

Results: The 2000 patients with first stroke who were included in the study were grouped as Jewish (immigrant and non-immigrant) or Arab; there were 237 Arabs, 370 non-immigrant Jews and 1393 immigrant Jews. A high percentage of Arab patients were found to have hypertension and diabetes mellitus, while a high percentage of Jewish immigrants had stenosis of the internal carotid artery.

Conclusions: The study demonstrated some differences in the effect of risk factors between the groups. It may be important to address such differences when developing stroke preventative strategies in this population of Jewish and Arab stroke survivors in Israel.

IMAJ 2011; 13: 680–683

KEY WORDS: stroke, gender, ethnicity, risk factors

There are race-ethnic disparities in stroke incidence and mortality, but the reasons are not clear. Potential explanations include variations in risk factor potency, prevalence and treatment, arising from environmental and genetic factors. Although no study has systematically examined the different effects of risk factors in various race-ethnic groups, the literature has consistently shown race-ethnic variations in the prevalence of cardiovascular risk factors. For example, blacks have the highest prevalence of hypertension regardless of geographic location, although Caribbean-born blacks have a lower prevalence of hypertension than those living in the southern or northeastern United States. Other studies have reported that diabetes is more common in blacks, whereas coronary artery disease and atrial fibrillation are more common in whites.

Blacks have a higher prevalence of hospitalizations for stroke than whites in the U.S. [2]. Higher rates of more severe hemorrhagic events are likewise part of the epidemiological picture for other ethnic minorities [3,4]. The Northern Manhattan Study of 430 patients hospitalized with ischemic stroke suggested a higher prevalence of risk factors among black or Hispanic patients than among white patients [5].

Risk factors may differ between Jewish and Arab stroke patients. Some studies have compared health differences between Jewish and Arab populations in Israel [6-16]. Several studies have described stroke incidence and mortality from stroke in Israel [6,17-21]. The decline in stroke mortality has been much greater in the Jewish than in the Arab population. The highest mortality rates belong to the group aged 75 years and it is precisely in this age group that the greatest difference in trends between Jews and Arabs was found: during the period 1973–1997 there was a statistically significant reduction in mortality rates among Jews but not among Arabs [6]. This finding may be explained by differences in risk factor distribution. Little is known about risk factor disparities between Jewish and Arab stroke survivors in Israel. Despite the mounting evidence that stroke risk factors may differ among race-ethnic groups, public health programs and national guidelines for stroke prevention continue to focus on the identification of risk factors in the general population without addressing the specific needs of specific groups. The

Stroke is the third leading cause of death in the United States, in most European countries and in Israel [1]. It is also a leading cause of serious, long-term disability. The excess burden of disease and mortality from stroke is accurately described as one of the major public health problems.

*Dedicated to the late Prof. Haim Ring

ability to provide targeted information to different population groups is dependent on epidemiological studies comparing risk differences in these groups. The aim of the present study was to determine whether the odds ratio prevalence of risk and demographic factors is different for Jewish and Arab stroke patients undergoing rehabilitation.

PATIENTS AND METHODS

Cases of first ischemic and hemorrhagic stroke were obtained from the database of the Department of Neurological Rehabilitation C at the Loewenstein Rehabilitation Center and related to patients admitted for hospital rehabilitation over a 15 year period, January 1993 to December 2008. To examine differences in age, gender and risk factor disparities among these patients, we analyzed the data of 2000 first-stroke Jewish (immigrant and non-immigrant) and Arab patients.

The demographic variables included in the analysis were age 18–50 years, 50–65 years, 65 years, and gender [Tables 1 and 2]. The vascular risk factors for stroke that were included (in all groups) were current smoking, overweight, hypertension, diabetes mellitus, hypercholesterolemia, history of ischemic heart disease, chronic or paroxysmal atrial fibrillation, peripheral artery disease, and evidence of carotid artery stenosis for stroke [Table 3].

Table 1. Demographic characteristics of Arab, non-immigrant Jewish and immigrant Jewish patients

	No (%)	SD	P
Arabs	237 (11.85%)	11.73	< 0.001
Age (yrs, mean SD)	57.5		
Male gender, n (%)	148 (62.44%)		
Non-immigrant Jews	370 (18.5%)	11.4	
Age (yrs, mean SD)	53.5		
Male gender, n (%)	263 (71.08%)		
Immigrant Jews	1393 (69.65%)	10.1	
Age (yrs, mean SD)	63.4		
Male gender, n (%)	867 (62.2%)		

Table 2. Comparison of incidence of stroke in Arab, non-immigrant Jewish and immigrant Jewish patients by age

	Age (yrs)			Total
	< 50	50–65	65	
Arabs				
Count	59	120	58	237
Percent	24.9%	50.6%	24.5%	100%
Non-immigrant Jews				
Count	159	150	61	370
Percent	43%	40.5%	16.5%	100%
Immigrant Jews				
Count	141	646	606	1393
Percent	10.1%	46.4%	43.5%	100%
Total				
Count	359	916	725	2000
Percent	18%	45.8%	36.2%	100%

Table 3. Risk factor rates for all groups

Risk factor	Arabs		Non-immigrant Jews		Immigrant Jews		P
	N	(%)	N	(%)	N	(%)	
Ischemic heart disease	42	19.6%	70	20.8%	335	26.8%	NS
Hypercholesterolemia	87	40.8%	149	44.5%	538	43.4%	NS
Atrial fibrillation	13	6.1%	24	7.1%	142	11.4%	NS
Hypertension	171	80.3%	222	65.9%	1298	72.3%	< 0.001
Diabetes mellitus	110	51.4%	120	35.8%	490	39.3%	< 0.001
Obesity	9	11.5%	8	7.5%	54	14.4%	NS
Smoking	64	30%	112	33.3%	313	25.1%	NS
Peripheral artery disease	10	4.7%	14	4.2%	87	7%	NS
Carotid stenosis	13	7.7%	52	17.3%	207	19.2%	< 0.001

Differences were examined using one-way descriptive statistics and ANOVA analysis. Logistic regression was used to determine the OR for risk factors. The OR and prevalence of risk factors were calculated for each group. Multivariate adjusted OR and 95% confidence interval were calculated using conditional logistic regression. Prevalence rates were estimated from the proportion of individuals identified with the risk factor in each group. Prevalence rates were compared between Arab and Jewish immigrant and non-immigrant groups. Confidence interval values were considered to demonstrate significantly different prevalence rates.

RESULTS

The study included 2000 cases: 237 Arabs (66.5% men, 33.5% women), 370 non-immigrant Jews (70.3% men, 29.7% women) and 1393 immigrant Jews (67.5% men, 32.5% women). The mean age was 57.5 years among Arab patients, 53.5 years among non-immigrant Jews and 63.4 years among immigrant Jews. Non-immigrant Jewish stroke patients were significantly younger than all other groups ($P < 0.001$). Males were prevalent in all groups.

Patients were divided by side of hemiparesis and type of stroke. We found that 79.1% of all strokes were ischemic and 20.9% were hemorrhagic (80.5% and 19.5% among Arab patients, 79.6% and 20.4% among non-immigrant Jews, and 78.7% and 21.3% among immigrant Jews, respectively). Fifty-five percent of all patients had right hemiparesis and 45% left hemiparesis.

The incidence of stroke was high among non-immigrant Jews under the age of 50 (43%) and from age 50 to 65 (40.5%), and among immigrant Jews aged 50 to 65 (46.4%) and over 65 (43.5%). In the Arab population, the incidence of stroke was high from age 50 to 65 (50.6%). In the total population the incidence of stroke was high from age 50 to 65 (45.8%).

OR = odds ratio

Table 4. Odds ratio for risk factors

Risk factor	Non-immigrant Jews		Arabs		Immigrant Jews		P
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI	
Ischemic heart disease	1.03	1.01-1.04	0.78	0.55-1.10	0.89	0.66-1.2	NS
Hypercholesterolemia	1.00	1.00-1.01	0.89	0.66-1.19	1.09	0.85-1.39	NS
Atrial fibrillation	1.05	1.04-1.07	0.65	0.37-1.13	0.85	0.53-1.37	NS
Hypertension	1.04	1.03-1.05	2.02	1.42-2.88	1.17	0.9-1.54	< 0.001
Diabetes mellitus	1.00	1.00-1.01	1.68	1.27-2.23	0.91	0.71-1.18	< 0.001
Obesity	1.01	0.99-1.04	0.85	0.39-1.83	0.58	0.25-1.3	NS
Smoking	0.96	0.95-0.97	1.02	0.74-1.4	1.05	0.8-1.3	NS
Peripheral vascular disease	1.03	1.01-1.05	0.67	0.34-1.3	0.9	0.52-1.54	NS
Carotid stenosis	1.01	0.9-1.02	0.37	0.20-0.67	0.96	0.6-1.3	< 0.001

We found some differences in the risk factors for all groups. Hypertension and diabetes mellitus were most prevalent in Arab patients ($P < 0.001$), and carotid stenosis was most prevalent among immigrant Jews ($P < 0.001$). These statistically significant differences were demonstrated for hypertension: 80.3% for Arabs, 65.9% for non-immigrant Jews and 72.3% for immigrant Jews; for diabetes: 51.4%, 38.5% and 39.1%; and for internal carotid artery stenosis: 7.7%, 17.3% and 19.2% respectively. A high percentage of hypercholesterolemia and smoking was present in all groups: 40.8%, 44.5% and 43.4% for hypercholesterolemia, and 30%, 33.3% and 25.1% for smoking in Arabs, non-immigrant Jews and immigrant Jews respectively. Immigrant Jews showed a higher incidence of ischemic heart disease, atrial fibrillation, obesity and peripheral vascular (artery) disease.

We found variation in the odds ratio for key stroke risk factors in these groups of patients. The usefulness of the odds ratio lies in the ability to use the calculation to measure the effect of the risk factor and to estimate the benefit of risk elimination.

DISCUSSION

We found that the frequencies of the common risk factors for stroke in the examined population were similar to those of other developed countries, with a significantly higher prevalence of hypertension, hypercholesterolemia, diabetes and smoking.

This study provided an unusual opportunity to evaluate all the risk factors of the Israeli population undergoing inpatient rehabilitation. Analysis of risk factors for stroke showed a significant trend toward a high frequency of hypertension and diabetes mellitus among Arabs, and a high frequency of ischemic heart disease, atrial fibrillation, obesity, carotid artery stenosis and peripheral vascular (artery) disease among immigrant Jews. It may be important to address such differences when developing stroke preventive strategies in these populations, such as initiating programs for the control of high blood pressure, diabetes and hyperlipidemia, for cessation of smoking, and for reduction of stroke mortality.

Improvement in treatment of risk factors, especially control of hypertension and diabetes mellitus at satisfactory levels, has been reported to reduce the risk of stroke.

Arab patients had a higher prevalence of hypertension and diabetes than did Jews. Possible explanations include genetic, environmental and treatment factors. Sociocultural, economic and environmental determinants may influence the potency of certain risk factors such as hypertension and diabetes. It has been demonstrated that certain populations are less aware of their hypertension status or prediabetes than others, perhaps as a result of poorer education on health issues or differences in access to primary medical care.

In some populations, especially Israeli Arab women, hypertension and type 2 diabetes tend to occur together as part of a syndrome of metabolic abnormalities that includes insulin resistance, high plasma triglyceride levels and low high density lipoprotein-cholesterol levels [22]. Understanding the determinants of susceptibility to diabetes in Arabs, both genetic and lifestyle, remains a challenge that warrants further investigation.

Cigarette smoking was relatively frequent in all groups. However, the rate of smoking was higher among non-immigrant Jews. The prevalence of dyslipidemia was higher in Jewish than Arab patients, but in our case series there was no significant difference between all groups. According to a Ministry of Health survey in Israel, obesity is a major problem among Israeli Arab women compared with non-Arab Israeli women [9]. The prevalence of obesity in our study was higher in Arabs and among immigrant Jews compared with non-immigrants, but there was no significant difference between all groups. The prevalence of ischemic heart disease, peripheral artery disease and atrial fibrillation in our study was higher among Jews, especially immigrant Jews, than among Arabs, but the difference was not statistically significant. Our results support those of Rennert et al. [23] who investigated the prevalence of chronic diseases in Israel; they showed that Arabs had higher rates of diabetes mellitus and lower rates of ischemic heart disease and hyperlipidemia than Jews.

Various explanations for the difference in carotid stenosis incidence in the examined population have been suggested. The higher incidence of carotid stenosis among Jewish patients may be explained, in part, by different referral patterns of Arab and Jewish patients for carotid artery imaging – an essential first step in detecting carotid disease – and most probably by ethnic and genetic factors.

A series of articles published worldwide strongly suggest that the incidence of age-adjusted stroke is increasing. We found the high incidence of stroke in the 50–65 year age group among all patients to be similar to that of other developed countries. The high incidence in the non-immigrant Jewish population under 50 may be explained, in part, by a higher prevalence of smoking and hypercholesterolemia, lower awareness of their hypertension or prediabetes status, as well as sociocultural, economic and environmental determinants.

This study was limited by the fact that we were not able to analyze the patients by socioeconomic status, birthplace, and ethnic differences among immigrant and non-immigrant Jewish patients. The strength of the study is the relatively large number of stroke patients undergoing rehabilitation.

CONCLUSIONS

Our results support the concept of stroke as a polyetiologic disease with differences between age, gender distribution and risk factors among various population groups. They also support existing findings regarding the common risk factors for stroke in other developed countries. Differences in risk factors are crucial for the etiology of stroke, as well as for the design and implementation of stroke prevention programs. Ethnic differences in genetic, physiological and behavioral risk factors for stroke require further elucidation before effective strategies for stroke prevention in multi-ethnic communities can be developed.

Corresponding author:

Dr. E. Greenberg

Department of Neurological Rehabilitation C, Loewenstein Rehabilitation Center, P.O. Box 3, Raanana 43100, Israel

Phone: (972-9) 770-9193

Fax: (972-9) 770-9712

email: elinag@clalit.org.il

References

1. Central Bureau of Statistics. Causes of death 1996-1997. Jerusalem: Central Bureau of Statistics, 2000.
2. Centers for Disease Control and Prevention. Public health and aging: hospitalizations for stroke among adults aged 65 years – United States, 2000. *MMWR Morb Mortal Wkly Rep* 2003; 52: 586-9.
3. Bruno A, Carter S, Qualls C, Nolte KB. Incidence of spontaneous intracerebral hemorrhage among Hispanics and non-Hispanic whites in New Mexico. *Neurology* 1996; 47: 405-8.
4. Ayala C, Greenlund KJ, Croft JB, et al. Racial/ethnic disparities in mortality by stroke subtype in the United States, 1995–1998. *Am J Epidemiol* 2001; 154: 1057-63.
5. Sacco RL, Kargmann DE, Zamanillo MC. Race-ethnic differences in stroke risk factors among hospitalized patients with cerebral infarction: the Northern Manhattan Study. *Neurology* 1995; 45: 659-63.
6. Koton S, Bornstein NM, Green MS. Population group differences in trends in stroke mortality in Israel. *Stroke* 2001; 32: 1984-8.
7. Neumark YD, Rahav G, Teichman M, Hasin D. Alcohol drinking patterns among Jewish and Arab men and women in Israel. *J Stud Alcohol* 2001; 62 (4): 443-7.
8. Kaluski DN, Berry EM. Prevalence of obesity in Israel. *Obes Rev* 2005; 6 (2): 115-16.
9. Keinan-Boker L, Noyman N, Chinich A, Green MS, Nitzan-Kaluski D. Overweight and obesity prevalence in Israel: findings of the first national health and nutrition survey (MABAT). *IMAJ Isr Med Assoc J* 2005; 7 (4): 219-23.
10. Kalter-Leibovici O, Atamna A, Lubin F, et al. Obesity among Arabs and Jews in Israel: a population-based study. *IMAJ Isr Med Assoc J* 2007; 9 (7): 525-30.
11. Baron-Epel O, Haviv-Messika A, Tamir D, Nitzan-Kaluski D, Green M. Multiethnic differences in smoking in Israel: pooled analysis from three national surveys. *Eur J Public Health* 2004; 14 (4): 384-9.
12. Ismail S, Rosen B. Smoking among the Arab Population in Israel. Jerusalem: Myers-JDC-Brookdale Institute, June 2006.
13. Jabara R, Namouz S, Kark JD, Lotan C. Risk characteristics of Arab and Jewish women with coronary heart disease in Jerusalem. *IMAJ Isr Med Assoc J* 2007; 9 (4): 316-20.
14. Tirosh A, Calderon-Margalit R, Mazar M, Stern Z. Differences in quality of diabetes care between Jews and Arabs in Jerusalem. *Am J Med Qual* 2008; 23 (1): 60-5.
15. Green MS. Differences between Israeli Jews and Arabs in morbidity and mortality rates for diseases potentially associated with dietary risk factors. *Public Health Rev* 1998; 26 (1): 31-40.
16. Abdul-Ghani MA, Sabbah M, Muati B, et al, for the Israeli Diabetes Research Group (IDRG). High frequency of pre-diabetes, undiagnosed diabetes and metabolic syndrome among overweight Arabs in Israel. *IMAJ Isr Med Assoc J* 2005; 7 (3): 143-7.
17. Melamed E, Canane E, Carmon A, Lavy S. Stroke in Jerusalem district 1960 through 1967: an epidemiological study. *Stroke* 1973; 4: 465-71.
18. Epstein L, Rishpon S, Bental E, et al. Incidence, mortality, and case-fatality rate of stroke in northern Israel. *Stroke* 1989; 20: 725-9.
19. Bornstein NM, Aronovich BD, Kagerov VG, et al. The Tel Aviv Stroke Registry. 3600 consecutive patients. *Stroke* 1996; 27: 1770-3.
20. Rozenhul-Sorokin N, Ronen R, Tamir A, Geva H, Eldar R. Stroke in the young in Israel. Incidence and outcomes. *Stroke* 1996; 27: 838-41.
21. Tanne D, Goldbourt U, Grossman E, Koren-Morag N, Green MS, Bornstein NM, on behalf of the National Acute Stroke Israeli Survey Group. A National Survey of acute cerebrovascular disease in Israel: burden, management, outcome and adherence to guidelines. *IMAJ Isr Med Assoc J* 2006; 8: 3-7.
22. Abdul-Ghani MA, Sabbah M, Muati B, et al. High frequency of pre-diabetes, undiagnosed diabetes and metabolic syndrome among overweight Arabs in Israel. *IMAJ Isr Med Assoc J* 2005; 7: 143-7.
23. Rennert G, Peterburg Y. Prevalence of selected chronic diseases in Israel. *IMAJ Isr Med Assoc J* 2001; 3 (6): 404-8.

“If you want to make peace with your enemy, you have to work with your enemy. Then he becomes your partner”

Nelson Mandela (born 1918), first black president of South Africa, and Nobel Peace Prize laureate. An anti-apartheid activist, Mandela served 27 years in prison. Following his release he led his party in the negotiations that led to multiracial democracy in 1994. As president he frequently gave priority to reconciliation