

Food Insecurity Is Associated with Increased Risk of Ischemic Stroke

Miri Lutski^{1,2,3}; Carmit Libruder²; Binyamin Binyaminy²; Rita Dichtiar²;
Lital Keinan-Boker^{2,4}; Efrat Monsonego-Ornan¹; Tali Sinai^{1,2}

¹ School of Nutritional Sciences, the Hebrew University of Jerusalem; ² Israel Center for Disease Control, Israel Ministry of Health;
³ School of Public Health, Tel Aviv University; ⁴ School of Public Health, University of Haifa

Introduction

Food insecurity, defined as limited access to adequate and nutritious food due to financial constraints, affects approximately 23% of adults aged ≥65 years in Israel and is associated with adverse cardiometabolic and cardiovascular outcomes. Stroke is a leading cause of mortality and neurological disability, and its incidence is expected to rise, emphasizing the importance of identifying modifiable risk factors. However, longitudinal evidence on the association between food insecurity and incident ischemic stroke among older adults remains limited, particularly in Israel. To address this gap, this study investigated the association between food insecurity and the incidence of ischemic stroke among community-dwelling adults aged 65 years and older in Israel.

Methods

This cohort study used data from the 2005–2006 National Health and Nutrition Survey of Israeli community-dwelling older adults (Mabat Zahav), linked to the Israeli National Stroke Registry. Food insecurity was assessed using the 6-item United States Department of Agriculture household food security scale. Participants were classified by the number of affirmative responses to the six items reflecting experiences of inadequate food access or economic barriers to obtaining nutritious food, as high food secure (0 affirmative responses), marginal (1), low (2–4), or very low food secure (5–6). Consistent with prior epidemiological studies, these categories were dichotomized into food secure (0–1) and food insecure (2–6) groups. First-recorded ischemic stroke events during follow-up, whether first-ever or recurrent, were included. Participants were followed from January 1, 2014, until the first occurrence of ischemic stroke, death, or December 31, 2022, whichever came first. Multivariable Fine and Gray proportional hazard models, accounting for death as a competing risk, estimated subdistribution hazard ratios (HRs) and 95% confidence intervals (CIs) for ischemic stroke by food security status.

Results

The study included 1,337 participants (median age: 73 years; 57.4% women). During a mean follow-up of 6.6±3.0 years, 534 participants (39.9%) died, and 82 first-recorded ischemic stroke events were documented. Stroke occurred in 5.5% of food-secure participants and 8.9% of food-insecure participants. Participant demographics and health-related characteristics by food security status are presented in **Table 1**. Kaplan–Meier analysis demonstrated a significantly higher cumulative incidence of first-recorded ischemic stroke among food-insecure participants, as well as a higher incidence of first-ever ischemic stroke (**Figure A+B**). In multivariable models, food insecurity was associated with an approximately twofold increased risk of ischemic stroke (**Table 2**). Sensitivity analyses, including dose-response analyses, demonstrated an increased stroke risk with greater food insecurity severity.

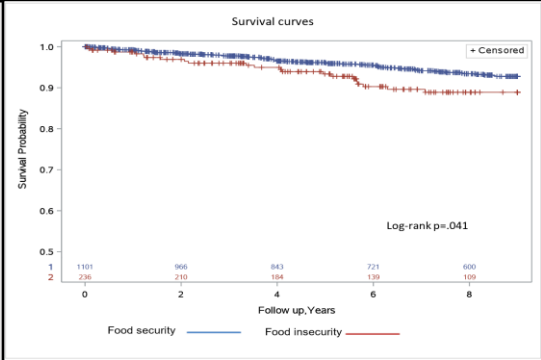
Table 1: Demographic and health characteristics of study participants, overall and by food security status at the time of the original survey* (2005-2006)

Selected characteristics	Food security status		P-value
	Food security N=1,101 (86.5%)	Food insecurity N=236 (13.6%)	
Age, years (median [IQR])	73 [69;80]	71 [68;76]	<.0001
Sex, female, n (%)	612 (56.7)	142 (61.3)	.244
Education, 0-11 years, n (%)	452 (38.7)	166 (61.8)	<.0001
SES, below poverty line, n (%)	147 (12.3)	135 (53.2)	<.0001
Population group, Arabs, n (%)	120 (4.0)	105 (22.5)	<.0001
BMI, (kg/m ²) (median [IQR])	28.3 [25.9;31.4]	30.3 [26.6;33.8]	<.0001
Ever smoked, n (%)	464 (41.9)	94 (39.2)	.493
Physical activity as recommended, n (%)	525 (49.1)	55 (27.5)	<.0001
Comorbidity (≤2 diseases), n (%)	329 (33.2)	84 (46.2)	.002

Notes: Calculated with the application of sample weights of the 2005–6 Mabat Zahav, incorporating age, sex, and population group. IQR, interquartile range. SES, socioeconomic status; Population group was categorized as Jewish or Arab. Comorbidity included type 2 diabetes, coronary heart disease, respiratory diseases (asthma and COPD), osteoporosis, malignancy, kidney and Parkinson's diseases.

Figure: Kaplan-Meier survival curves for ischemic stroke events during follow-up by food security status

A. First-recorded (first-ever or recurrent) ischemic stroke (n=82, 6.1%)



B. First-ever ischemic stroke (n=61, 5.0%)

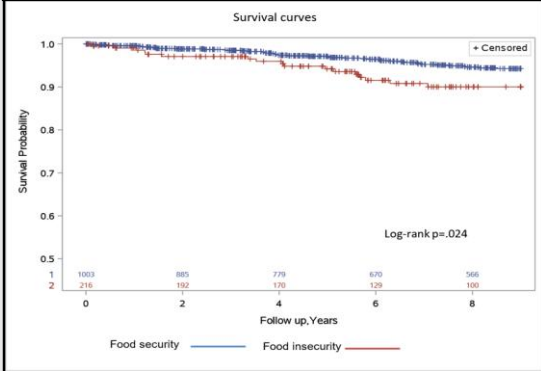


Table 2: Hazard ratios and 95% confidence intervals for ischemic stroke events by food security status

	Food insecurity	First-recorded (first-ever or recurrent) ischemic stroke (n=82)		First-ever ischemic stroke (n=61)	
		HR (95%CI)	P-value	HR (95%CI)	P-value
Model 1	Yes	1.91 (1.12-3.26)	.018	2.18 (1.20-3.95)	.010
	No	Ref.		Ref.	
Model 2	Yes	1.84 (1.05-3.24)	.032	2.14 (1.17-3.90)	.012
	No	Ref.		Ref.	
Model 3	Yes	2.02 (1.12-3.65)	.019	2.65 (1.33-5.29)	.006
	No	Ref.		Ref.	

Model 1: Adjusted for age, sex, BMI, and the age-by-time interaction term.
Model 2: Model 1 + socioeconomic status, education, and population group.
Model 3: Model 1 + total daily food energy, physical activity, and comorbidity.

Conclusions

In this nationally representative cohort of older adults in Israel, food insecurity was associated with a higher risk of ischemic stroke, independent of sociodemographic, lifestyle, and health-related factors. These findings highlight food insecurity as an important social determinant of cerebrovascular risk and support integrating nutritional and socioeconomic interventions into stroke prevention strategies. Improving access to healthy food and strengthening community support programs may help reduce stroke risk among older adults.