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Population Attributable Risk Fraction for Major Cardiovascular Risk Factors for Coronary Artery Disease and Stroke in Palestinians Living in And Out Camps in the Gaza Strip

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ABSTRACT

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Background: Epidemiological data on cardiovascular diseases in Palestine are scarce. We aimed to estimate the attributable risk of major modifiable cardiovascular risk factors contributing to prevalent coronary artery disease (CAD) and stroke in the Palestinian population in Gaza. More specifically, we compared the population living in and out of camps to assess the potential influence of this specific environmental parameter on cardiovascular epidemiology.

Methods: The prevalence of cardiovascular risk factors and their association with CAD and stroke were studied in a cross-sectional study carried out in the Gazan community among 2240 participants, aged ≥ 25 years. The population attributable risk fractions (PARF) were calculated using an adjusted odds ratio for CAD and stroke.

Results: The PARF of hypertension, diabetes and low physical activity were respectively at 33.8% (95%CI, 24.8-46.1), 22.3% (95% CI,16.3-30.4) and 16.2% (95% CI,11.9-22.0) for CAD. For stroke, hypertension, diabetes and high level of triglycerides had the highest impact, with PARF reaching 54.4% (95% CI, 32.1-95.1), 39.4% (95%CI,23.9-64.9), and 30.7% (95% CI,18.6-50.6), respectively. Hypertension, diabetes, low PA, and obesity were the factors with the strongest impact on CAD and stroke in women. When comparing the PARF in a population living in camps and those living out of camps, hypertension and diabetes remained the risk factors with the highest PARF for CAD or stroke in persons living in both areas with a slight difference.

Conclusion: A majority of CAD and stroke cases are attributable to major cardiovascular risk factors in the Gazan population. Interventions to reduce cardiovascular disease occurrence should primarily focus on the control of hypertension, diabetes, and obesity as preventable risk factors in this setting.

KEYWORDS:

Population attributable risk fraction; cardiovascular risk factors; Coronary artery disease; Stroke; genders, camp; non-camp; Gaza-Palestine

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1. INTRODUCTION

Cardiovascular diseases are the leading cause of death in the Middle East [1] but epidemiology data are scarce in some areas of this global region. Among those, few data have been presented in the Palestinian territories, where a substantial part of the population has the particularity of living in camps. The Gaza strip is the most crowded area in Palestine with a

population of 1.9 million people, including some 1.4 million refugees, representing nearly 70% of the Gazan population. Over half a million refugees in the Gaza Strip live in the eight refugee camps [2]. The refugee camp is defined as a plot of land at the disposal of the United Nations Relief and Works Agency (UNRWA) by the host government to accommodate Palestine refugees and set up facilities to meet their needs [3]. Under poor socio-economic conditions, Palestine has experienced a rapid epidemiological transition [4]. A third of all deaths in Palestine are attributable to cardiovascular diseases (CVD), stroke being the third cause with a mortality rate up to 11.7% [5]. In 2016 the global burden disease for risk profiles in Palestine stranded out major cardiovascular risk factors by order of priority: high blood pressure ranked first, followed by obesity, diabetes, and then smoking and dyslipidemia [1]. Population-attributable risk fraction also known as population-attributable risk is a meaningful indicator that can be used to guide policy and prioritize public health intervention by identifying modifiable risk factors that can have the strongest power to reduce the risk of disease if the causal risk factor could be eliminated [6,7].

In this study, we examined CAD and stroke risks attributable to major modifiable cardiovascular risk factors among Palestinians. Because of the significant difference in the living conditions in camps, we sought to compare this attributable risk in Gazans living in camps versus those residing out of camps and to look at the particularities in both genders, in order to prioritize preventive measures in these different subsets.

2. MATERIALS AND METHODS

The prevalence of cardiovascular risk factors such as smoking, hypertension, diabetes, hypercholesteremia, high triglycerides, obesity, and physical activity (PA) were obtained from a cross-sectional study carried out in 2017 using a multistage stratified cluster sampling method among 2240 individuals aged 25 years and over from five districts of the Gaza strip [8]. All participants gave their written informed consent. The protocol was approved by the Palestinian Ethical Research Committees and was conducted following the principles of the Declaration of Helsinki (PHRC/ HC 212: 25 April 2017).

Trained nurses interviewed each participant and completed a questionnaire that included: socio-demographic variables, lifestyle, medical history of chronic diseases, as well as the international physical activity questionnaire short form [9]. Height and weight were measured without shoes and wearing light clothing, with a wall-mounted stadiometer and an electronic scale (Seca, Hamburg, Germany). Venous blood samples for lipid profiles including total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and triglycerides were taken by the nurse's staff from the antecubital vein and were sent to the laboratory for analysis using standard methods. Low-density lipoprotein cholesterol (LDL-C) was calculated by the Friedewald equation. Whole blood glucose was measured using a glucometer.

Body mass index (BMI kg/m^2) was calculated as weight in kilograms divided by the square of the height in meters. According to WHO definitions, individuals with BMI< 30 kg/m^2 were categorized as non-obese and those with a BMI ≥ 30 kg/m^2 were obese. Diabetes mellitus was defined as a capillary blood sugar level ≥ 126 mg/dl if the participant was fasting or ≥ 200 mg/dl if the participant was non-fasting and or self-reported as currently taking any diabetes medication [10]. We considered subjects with hypertension if their average systolic blood pressure (SBP) in both arms was ≥140 mmHg or their average diastolic blood pressure (DBP) ≥ 90 mmHg, or if they were being treated for hypertension [11] We defined high plasma of total cholesterol ≥ 240 mg/dl, plasma triglycerides ≥150 mg/dl, low-density lipid cholesterol (LDL) ≥ 160 mg/dl, and high-density lipoprotein cholesterol (HDL) ≤ 40 mg/dl in males and ≤ 50 mg/dl in females [12]. Current smoking was self-reported by active smoking within 1 year prior to the exam. Coronary artery disease (CAD) was defined by a self-reported history of hospitalization for angina pectoris, myocardial infarction, and previous cardiac revascularization, after verification of the medical prescription list. Stroke was identified by self-reported and/or documented medical history.

3. STATISTICAL ANALYSIS

Continuous data were expressed as mean± standard deviation and categorical data as a percentage. Before estimating PARF for risk factors, we determined the strength of the association between each risk factor and cardiovascular diseases (CAD and stroke) using a logistic regression model estimating an adjusted odds ratio (OR) with its 95% confidence interval in both genders and camps vs no-camps. Adjusted PARF was calculated for each risk factor associated with CVDs with a p-value < 0.25, using the following formula [P(OR-1)] /[1+P(OR-1)]x100, where P is the prevalence of each risk factor in the Gazan population and OR is either the unadjusted or the age and gender-adjusted odds ratio. The 95% confidence interval (CI) for PARF was calculated by determining the 95% log (P(OR-1)) based on the standard errors for P and OR and transforming back to the 95% CI for PARF. All statistical analyses were performed using SPSS software (version 25.0; SPSS Inc. Chicago, III, USA), and a p-value < 0.05 was considered statistically significant. The prevalence estimates of cardiovascular risk factors used in our PARF estimations have been previously published [8].

4. RESULTS

The total number of participants in this study was 2240, with a mean age of 47.4±14.3 years, 28.4% had hypertension,19.1% had diabetes, 23.2% were smokers, Low physical activity (PA), obesity, and high level of triglycerides

were the three risk factors affecting almost one half of the population (Table1).

Table 2 shows the odds ratio and the PARF for CAD and stroke attributable to different cardiovascular risk factors in the overall population and both genders. For CAD, adjusted PARF associated with hypertension, diabetes, and low PA were respectively 33.8%, 22.3%, and 16.2%. The PARF for stroke ranged from 22.3% to 54.4% with the greatest attributable fraction due to hypertension and then diabetes.

Among women, hypertension, diabetes, and low PA were the factors with the strongest impact on CAD and stroke and obesity particularly impacted the numbers of stroke events. The PARF associated with the high level of triglycerides was more pronounced for stroke cases in males than females 35.9%; 25.1% respectively.

Tables 3 and 4 display the PARF for CAD and stroke according to whether living in or out of camps and in both genders. In both residences, the PARFs for CAD, or stroke associated with hypertension, and diabetes, remained the highest. Low PA accounted for large CAD or stroke events in camp residences.

When looking at the results for males and females in two both residences, we observed that hypertension and low PA accounted were the most attributable risk factors for CAD events in both genders living in camps with the greatest attributable fraction in females (72.2% and 57.3% respectively). For stroke, the PARF for diabetes and hypertension were more pronounced in females (67% and 75.5% respectively). Smoking account for thirty of stroke in males. In out-of camps residency hypertension and diabetes accounted for large CAD cases mainly in females (36.3% and 41.8% respectively). For stroke hypertension was the leading risk factor in both sexes, accounting for 57%. Diabetes explained 26.9% of strokes in males and 44.8% of strokes in females. Elevated high triglycerides accounted for approximately thirty of strokes in both genders.

Table 1:Prevalence of Cardiovascular risk

	Prevalence			Residing in camps			Residing out of camps		
Risk Factors	Total 2240 (100%)	Male 1121 (50)	Female 1119 (50)	Total 642 (28.7)	Male 363(56.5)	Female 279 (43.5)	Total 1589(71.3)	Male 758 (47.7)	Female 840 (52.8)
Hypertension, n (%)	636 (28.4)	292 (26.0)	344 (30.7)	209 (32.6)	104 (28.7)	105 (37.6) ***	427 (26.7)	188 (24.8)	239 (28.5)
Diabetes, n (%)	427 (19.1)	206 (18.4)	221 (19.7)	135 (21.0)	73 (20.1)	62 (22.2)	292 (18.3)	133 (17.5)	159 (18.9)
Smoking, n (%)	520 (23.2)	493 (44.0)	27 (2.4)	171 (26.6)	166 (45.8)	5 (1.8)	349 (21.8)	327 (43.1)	22 (2.6)
Low physical activity, n (%)	1081(48.3)	429 (38.3)	652 (58.3)	303 (47.2)	133 (36.6)	170 (60.9)	778 (48.7)	296 (39.1)	482 (57.4)
Obese ≥30 kg/m^2, n (%)	1070 (47.8)	397 (35.4)	673 (60.1)	309 (48.1)	120 (33.1)	189 (67.7) ***	761 (47.6)	277 (36.5)	484 (57.6)
High total cholesterol †, n (%)	195 (8.8)	68 (6.1)	127 (11.4)	53 (8.3)	23 (6.4)	30 (10.8)	142 (8.9)	45 (6.0)	97 (11.6)
High Triglycerides ††, n (%)	895 (40.2)	480 (43.1)	415 (37.3)	249 (39.1)	156 (43.3)	93 (33.6)	646 (40.7)	324(43)	322 (38.6)

†high total cholesterol: ≥240mg/dl; ††high triglycerides: ≥150mg/dl

The p.value was not significative for all risk factors when comparing males living in camps vs those living in out camps;

The ***p.value was <0.001 for hypertension and obesity when comparing females living in camps vs those living in out camps

Table 2: Odds- ratio and Population Attributable Risk Fraction for coronary artery disease and stroke by gender in general population

	Total		Male		Female	
	Odds ratio (95%CI)	PARF (95%CI)	Odds ratio (95%CI)	PARF (95%CI)	Odds ratio (95%CI)	PARF (95%CI)
CAD						
Hypertension	2.8 (2.0-3.9) ***	33.8 (24.8-46.1)	2.5 (1.6-3.8) ***	28.1 (18-41.8)	3.4 (2.0-5.9) ***	42.4 (25.4-70.9)
Diabetes	2.5 (1.9-3.5) ***	22.3 (16.3-30.4)	1.9 (1.2-3.0) ***	14.2 (9.4-21.5)	3.5 (2.1-5.8) ***	33.0 (20.2-53.8)
Smoking	1.1 (0.7-1.7)	---------	1.1 (0.7-1.7)	------	1.8 (0.4-8.0)	--------
Physical inactivity	1.4 (1.0-1.9)	16.2 (11.9-22.0)	1.2 (0.8-1.9)	-------	1.7 (0.9-2.9)	29.0 (16.8-50.1)
Obese ≥30kg/m^2	1.0 (0.7-1.4)	-------	1.0 (0.7-1.6)	-------	1.0 (0.6-1.7)	--------

High total cholesterol†	1.0 (0.6-1.8)	-------	0.6 (0.3-1.7)	-------	1.4 (0.7-2.7)	--------
High Triglycerides ††	0.9 (0.6-1.2)	-------	1.3 (0.8-1.9)	-------	1.0 (0.6-1.7)	-------
Stroke						
Hypertension	5.2 (2.9-9.3) ***	54.4 (31.1-95.1)	4.9 (2.3-10.2) ***	50.4 (24.7-102.5)	5.8 (2.2-15.3) ***	59.6 (23.9-148.2)
Diabetes	4.4 (2.6-7.3) ***	39.4 (23.9-64.9)	3.4 (1.7-6.6) ***	30.6 (15.0-58.6)	6.3 (2.8-14.6) ***	51.0(22.8-114.6)
Smoking	1.4 (0.8-2.7)	---------	1.4 (0.7-2.8)	--------	2.4 (0.3-18.6)	----------
Physical inactivity	1.6 (0.9-2.7)	22.5 (13.5-37.3)	1.3 (0.7-2.5)	--------	2.5 (0.9-6.8)	46.7 (17.6-123.6)
Obese ≥30kg/m^2	1.6 (0.9-2.6)	22.3 (13.5-36.7)	1.4 (0.7-2.6)	--------	2.1 (0.8-5.7)	39.8 (15.0-105.5)
High total cholesterol†	1.3 (0.6-2.8)	--------	0.8 (0.2-3.5)	---------	1.7 (0.7-4.3)	-------
High Triglycerides ††	2.1 (1.3-3.5) ***	30.7 (18.6-50.6)	2.3 (1.2-4.7) **	35.9 (18.4-70.2)	1.9 (0.9-4.1)	25.1 (11.8-53.7)

Odds ratio was adjusted for age and gender based on separate logistic regression model; * p.value <0.05; **p<0.01; ***p<0.001; Female gender was the reference; †High Total Cholesterol: ≥ 240 mg/dl; †† High Triglycerides ≥150mg/d

Table 3: Odds-ratio and Population Attributable Risk Fraction for coronary artery disease and stroke for Residing in camps by gender

	Total		Male		Female	
	Odds ratio (95%CI)	PARF (95%CI)	Odds ratio (95%CI)	PARF (95%CI)	Odds ratio (95%CI)	PARF (95%CI)
CAD						
Hypertension	2.8 (1.5-5.3) ***	37.0 (21.1-64.7)	2.1 (1.1-4.4) *	24.0 (12.6-45.7)	7.9 (1.6-38.2) **	72.2 (15.9-326.7)
Diabetes	2.3 (1.3-4.1) ***	27.4 (15.8-47.5)	2.9 (1.4-6.0) ***	27.6 (14.3-53.4)	1.2 (0.4-3.7)	------
Smoking	0.7 (0.4-1.4)	------	0.8 (0.4-1.5)	-------	-------	------
Physical inactivity	2.3 (1.3-4.3) ***	38.0 (21.8-66.2)	2.2 (1.1-4.3) *	30.5 (16.2-57.6)	3.2 (0.7-15.0)	57.3 (12.7-258.9)
Obese ≥30kg/m^2	1.0 (0.6-1.8)	----	0.7 (0.4-1.5)	------	0.2)0.1-1.6)	--------
High total cholesterol†	1.0 (0.4-2.7)	----	0.5 (0.1-2.1)	-------	2.4 (0.7-1.4)	--------
High Triglycerides ††	0.9 (0.6-1.7)	------	1.4 (0.7-2.7)	---------	0.2 (0.1-1.4)	--------
Stroke						
Hypertension	3.4 (1.2-9.6) ***	43.9 (16.9-114.0)	2.7 (0.9-8.8)	32.8 (11.1-96.9)	6.4 (0.6-63.9)	67.0 (7.7-581.6)
Diabetes	5.3 (2.0-13.9) ***	47.5 (18.5-119.0)	3.6 (1.2-10.9) ***	34.3 (12.0-97.9)	14.9 (1.6-141.2) **	75.5 (8.7-659.4)
Smoking	1.8 (0.7-4.9)	-------	2.1 (0.7-6.5)	33.5 (12.3-91.3)	----------	
Physical inactivity	1.8 (0.7-4.6)	27.4 (11.3-66.3)	1.6 (0.6-4.7)	------	2.5 (0.3-22.7)	-----
Obese ≥30kg/m^2	1.1 (0.4-2.8)	---------	1.0 (0.3-2.9)	-----	1.7 (0.2-15.6)	-----
High total cholesterol†	1.5 (0.3-5.5)	---------	1.7 (0.3-8.7)	-----	1.2 (0.1-11.4)	-----
High Triglycerides ††	1.4 (0.6-3.4)	--------	1.8 (0.6-5.4)	-------	0.8 (0.2-4.8)	------

Odds ratio was adjusted for age and gender based on separate logistic regression model; * p.value <0.05; **p<0.01; ***p<0.001; Female gender was the reference; †High Total Cholesterol: ≥ 240 mg/dl; †† High Triglycerides ≥150mg

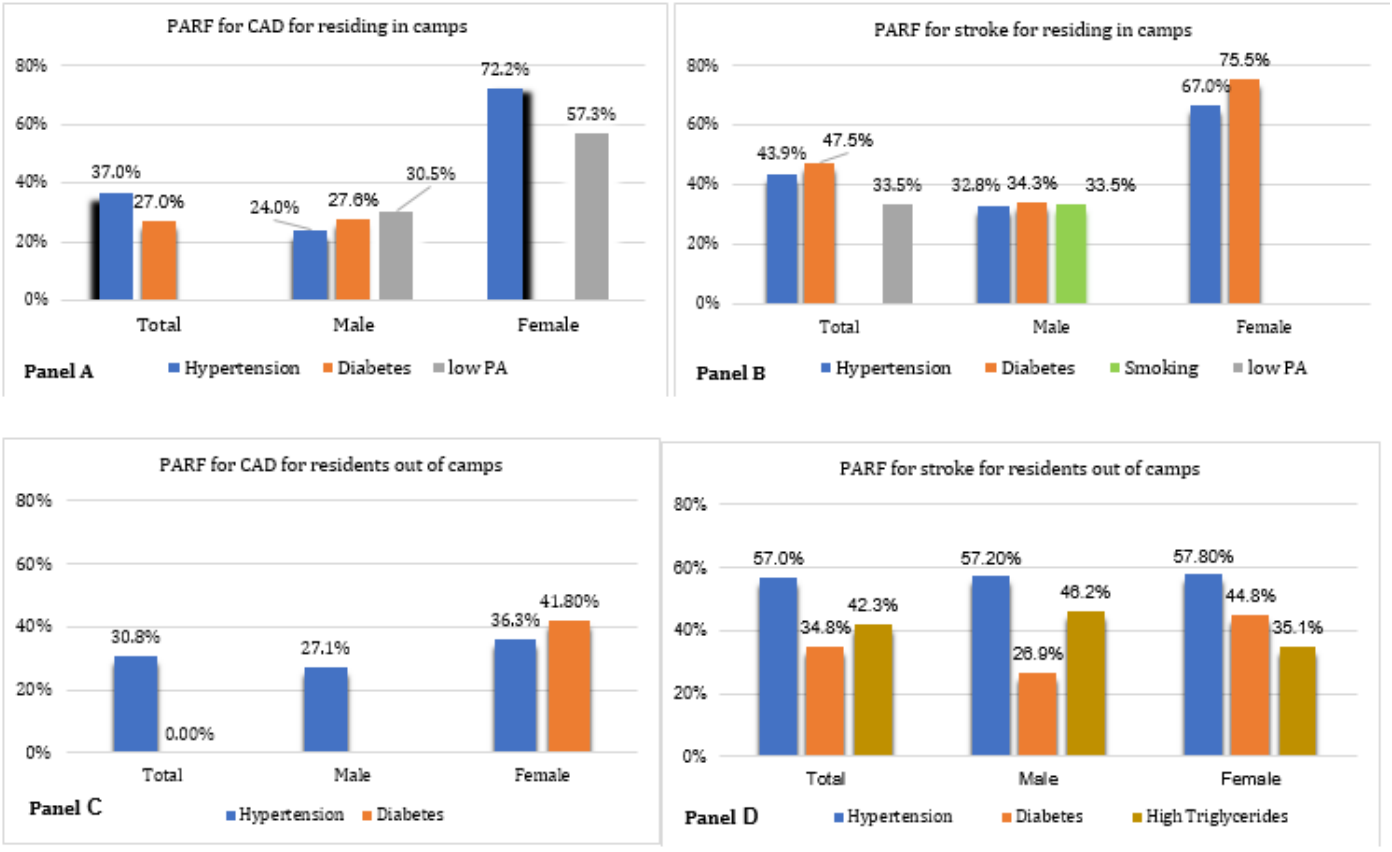
Table 4: Odds-ratio and Population Attributable Risk Fraction for coronary artery disease and stroke for Residing in out of camps by gender

	Total		Male		Female	
	Odds ratio (95%CI)	PARF (95%CI)	Odds ratio (95%CI)	PARF (95%CI)	Odds ratio (95%CI)	PARF (95%CI)
CAD						
Hypertension	2.7 (1.8-4.0) ***	30.7 (21.1-44.6)	2.5 (1.5-4.3) ***	27.1 (16.3-45.1)	3.0 (1.7-5.6) ***	36.3 (20.7-63.6)

Diabetes	2.5 (1.7-3.8) ***	21.6 (14.8-31.6)	1.4 (0.8-2.4)	-----	4.8 (2.7-8.7) ***	41.8 (23.9-73.1)
Smoking	1.4 (0.8-2.3)	15.0 (9.8-22.9)	1.4 (0.8-2.3)	------	2.4 (0.5-11.0)	-----
Low physical activity	1.1 (0.7-1.6)	----	0.9 (0.5-1.5)	-------	1.5 (0.8-2.7)	------
Obese ≥30kg/m^2	1.1 (0.7-1.6)	------	1.3 (0.7-2.2)	-----	0.8 (0.5-1.5)	---------
High total cholesterol†	1.0 (0.5-1.9)	-------	0.7 (0.2-2.5)	--------	1.2 (0.6-2.5)	----------
High Triglycerides ††	1.3 (0.9-1.8)	11.5 (7.9-16.5)	1.3 (0.7-2.1)	---------	1.3 (0.7-2.2)	---------
Stroke						
Hypertension	6.1 (3.0-13.0) ***	57.0 (28.6-113.6)	6.4 (2.4-17.0) ***	57.2 (32.6-100.6)	5.8 (2.0-17.2) ***	57.8 (21.1-158.5)
Diabetes	3.9 (2.1-7.3) ***	34.8 (19.1-113.6	3.1 (1.2-7.1) **	26.9 (11.6-62.3	5.3 (2.1-13.2) ***	44.8 (18.5-108.8)
Smoking	1.3 (0.6-2.9)	----------	1.1 (0.5-2.7)	--------	3.3 (0.4-27.0)	------
Low physical activity	1.5 (0.8-2.9)	16.1 (8.7-29.8)	1.1 (0.5-2.6)	--------	2.5 (0.8-7.7)	-------
Obese ≥30kg/m^2	1.9 (1.0-3.6) *	24.2 (12.9-45.3)	0.6 (0.3-1.4)	-------	2.3 (0.7-6.9)	-------
High total cholesterol†	1.2 (0.4-3.1)	---------	--------	--------	1.9 (0.7-5.3)	--------
High Triglycerides ††	2.7 (1.4-5.0) ***	42.3 (22.6-79.3)	3.0 (1.2-7.5) **	46.2 (18.8-113.8)	2.4 (0.9-5.7)	35.1 (14.6-84.6)

Odds ratio was adjusted for age and gender based on separate logistic regression model; * p.value <0.05; **p<0.01; ***p<0.001; Female gender was the reference; †High Total Cholesterol: ≥ 240 mg/dl; †† High Triglycerides ≥150mg

Figure 1: PARF for CAD and stroke in Palestinian males and females living in- and out of camps.



5. DISCUSSION

CAD and stroke are multifactorial diseases that share similar risk factors. Aggregation of risk factors increases the likelihood of an individual being affected by a disease over a lifetime. This study evaluated the PARFs for two leading cardiovascular diseases (CAD and stroke) associated with cardiovascular risk factors in a specific geographic area in Gaza, with part of the population living in camps.

Hypertension was found to be the strongest cardiovascular risk factor related to the risk of CAD and stroke and the estimation of the attributable risk fraction associated with hypertension did not differ by residence and gender. Our findings show a similar impact reported in the Indonesian population in which it was reported that hypertension

accounts for 33% of CAD and 50% of stroke cases [13]. In the Jackson Heart Study and Reasons for Geographic And Racial Difference in Stroke (REGARDS) study, performed among a US black adult population followed for 14.3 years, the PARF linked with hypertension was 32.5% for CVD, 42.7% for CAD, and 38.9% for stroke [14]. Overall, PARF for stroke deaths associated with hypertension was 60% in the Middle East and North Africa (MENA)[15]. In the Global Burden Disease study, Ezzati et al; showed that in the MENA region PARF for stroke associated with raised blood pressure was 49% in men and 59% in women [16] and this is consistent with our results. Diabetes is the risk factor with the second greatest impact, accounting for 22% of CAD and 39% of stroke events in the general population. In the Monica project in Northern Sweden, the PARF associated with diabetes was responsible for 20% of strokes and 12% for myocardial infarctions [17]. The contribution of risk factors to stroke differs by gender. In our study diabetes carried more than one-third of CAD and one-half of stroke cases in women due to the high prevalence of diabetes in the female population, which is consistent with a meta-analysis of 64 cohorts, showing a higher risk of stroke associated with diabetes in women compared to men [18]. Another meta-analysis of 48 studies settled in Spain showed that a high proportion of incident coronary events was attributable to hypertension (16%) in men and diabetes (25%) in women [19]. In the INTERHEART Middle East study among 2889 participants (1639 cases and 1786 controls) recruited from eight countries, the PARFs associated with hypertension (10.7%) and diabetes (16.4%) had a greater association with acute coronary events and this was more pronounced in women than men [20]. Also, we noted that the PARF resulting from the combination of hypertension and diabetes, was more than thirty percent for CAD cases and over fifty percent for stroke cases, greatest than the PARF among Hispanics (50%), as reported in the Northern Manhattan study [21]. Obesity is a multifactorial disease and has a great contribution to stroke in women; this is an expected result since obesity has a very high prevalence in the female Gazan population. In the Framingham study, obesity was greater in women and led to impressive PARF associated with the development of CVD risk factors and events [22]. Low PA accounted for nearly one-quarter of CAD and stroke, with the greatest impact on women, accounting for nearly one-half of stroke and one-third for CAD. In a meta-analysis, a high level of PA compared to low PA caused a 24% reduction in stroke in women [23] and high levels of PA and moderate PA have a beneficial effect on cardiovascular health by reducing the overall risk of CAD and incident stroke among men and women by 20% to 30% and 10% to 20% respectively [24].

Elevated triglyceride levels have been reported as a risk factor for stroke, [25]. In this study, we found a strong association of high triglycerides with stroke in men. The interpretation of studies evaluating the relationship between lipids profile and the risk of stroke may be confounded by race and region [26]. A cohort study in the Middle Eastern population during 9.3 years of follow-up failed to detect such an association [27]. In addition, our analysis suggested that the PARF for CAD and stroke resulting from hypertension and diabetes did not differ by area of residence whereas a greater population impact of obesity on stroke risk in those living out of camps. Through our study, we hypothesize that the epidemiological transition, the continuing urbanization, the industrialization aspect of globalization new lifestyle, and sociodemographic changes in the region are likely to increase the epidemic of cardiovascular risk factors and cardiovascular diseases.

Our study has some limitations: the cross-sectional nature of the design limits the assessment of causal relationships between risk factors and CAD or stroke. Blood pressure was measured from a single visit, and current guidelines recommended that the classification of blood pressure measurement should be based at least on 2 visits.

6. CONCLUSION

In summary, our results indicate that CAD and stroke are largely attributable to major modifiable and highly preventable cardiovascular risk factors, mainly hypertension and diabetes without difference in place of residence. This pattern is strongest in women as compared to men. In the context of preventive measures, population attributable risk is one of the prominent concepts in public health considerations. If an effective prevention program can control these risk factors for CAD and stroke, a significant reduction in the rate of these cardiovascular diseases will be achieved.

7. ACKNOWLEDGEMENTS

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8. DECLARATION OF COMPETING INTEREST FUNDING

The authors declare any financial interest or any conflict of interest

REFERENCES

1. Benziger CP, Roth GA, Moran AE. The Global Burden of Disease Study and the Preventable Burden of NCD. Global Heart. 2016 Dec; 11(4):393–7.
2. Where We Work | UNRWA [Internet]. [cited 2022 Jul 30]. Available from: https://www.unrwa.org/where-we-work/west-bank
3. Seita A, Khader A, Shahin Y, Hababeeh M, Zeidan W, Turki Y, et al. UNRWA Health Annual Report 2016 (published May 2017). 2017.
4. CIA. CIA-The World Factbook-Gaza Strip. 2018;
5. PHIC. Health Annual Report Palestine 2017. 2018.
6. Northridge ME. Public health methods--attributable risk as a link between causality and public health action. Am J Public Health. 1995 Sep;85(9):1202–4.

7. Rothman KJ, Greenland S. Modern epidemiology [Internet]. 2nd ed. Philadelphia, Pa. : Lippincott, Williams & WIlkins; 1998 [cited 2019 Dec 29]. Available from: https://trove.nla.gov.au/version/45280494
8. Jamee.Shahwan A, Abed Y, Magne J, Victor Aboyans, Preux PM, Desormais I, et al. Epidemiology of cardiovascular disease and associated factors in Gaza-Palestine. PLOS ONE. 2019;
9. International Physical Activity Questionnaire [Internet]. [cited 2018 Oct 1]. Available from: https://sites.google.com/site/theipaq/
10. American Diabetes Association 2016. ADA Diabetes Management Guidelines A1C Diagnosis | NDEI [Internet]. [cited 2018 Jan 22]. Available from: http://www.ndei.org/ADA-diabetes-management-guidelines-diagnosis-A1C-testing.aspx.html
11. Unger Thomas, Borghi Claudio, Charchar Fadi, Khan Nadia A., Poulter Neil R., Prabhakaran Dorairaj, et al. 2020 International Society of Hypertension Global Hypertension Practice Guidelines. Hypertension. 2020 Jun 1;75(6):1334–57.
12. N.C.E.P. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation. 2002 Dec 17;106(25):3143–421.
13. Hussain MA, Al Mamun A, Peters SA, Woodward M, Huxley RR. The Burden of Cardiovascular Disease Attributable to Major Modifiable Risk Factors in Indonesia. J Epidemiol. 2016 Oct 5;26(10):515–21.
14. Raible E. Hypertension Tied to Over One-Third of PAR CVD Risk in U.S. Blacks [Internet]. Docwire News. 2019 [cited 2019 Dec 29]. Available from: https://www.docwirenews.com/docwire-pick/cardiology-picks/hypertension-population-associated-risk-black-adults/
15. Tran J, Mirzaei M. The population attributable fraction of stroke associated with high blood pressure in the Middle East and North Africa. J Neurol Sci. 2011 Sep 15;308(1–2):135–8.
16. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. Lancet. 2006 May 27;367(9524):1747–57.
17. Eliasson M, Lindahl B, Lundberg V, Stegmayr B. Diabetes and obesity in Northern Sweden: occurrence and risk factors for stroke and myocardial infarction. Scand J Public Health Suppl. 2003;61:70–7.
18. Peters SAE, Huxley RR, Woodward M. Diabetes as a risk factor for stroke in women compared with men: a systematic review and meta-analysis of 64 cohorts, including 775,385 individuals and 12,539 strokes. Lancet. 2014 Jun 7;383(9933):1973–80.
19. Medrano MJ, Pastor-Barriuso R, Boix R, del Barrio JL, Damián J, Álvarez R, et al. Coronary Disease Risk Attributable to Cardiovascular Risk Factors in the Spanish Population. Rev Esp Cardiol. 2007 Dec 1;60(12):1250–6.
20. Gehani AA, Al-Hinai AT, Zubaid M, Almahmeed W, Hasani MRM, Yusufali AH, et al. Association of risk factors with acute myocardial infarction in Middle Eastern countries: the INTERHEART Middle East study. Eur J Prev Cardiol. 2014 Apr;21(4):400–10.
21. Willey JZ, Moon YP, Kahn E, Rodriguez CJ, Rundek T, Cheung K, et al. Population Attributable Risks of Hypertension and Diabetes for Cardiovascular Disease and Stroke in the Northern Manhattan Study. J Am Heart Assoc [Internet]. 2014 Sep 16 [cited 2019 Sep 25];3(5). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4323833/
22. Wilson PWF, D'Agostino RB, Sullivan L, Parise H, Kannel WB. Overweight and Obesity as Determinants of Cardiovascular Risk: The Framingham Experience. Arch Intern Med. 2002 Sep 9;162(16):1867–72.
23. Diep L, Kwagyan J, Kurantsin-Mills J, Weir R, Jayam-Trouth A. Association of physical activity level and stroke outcomes in men and women: a meta-analysis. J Womens Health (Larchmt). 2010 Oct;19(10):1815–22.
24. Li J, Siegrist J. Physical Activity and Risk of Cardiovascular Disease—A Meta-Analysis of Prospective Cohort Studies. International Journal of Environmental Research and Public Health. 2012 Feb;9(2):391–407.
25. Kurth T, Everett BM, Buring JE, Kase CS, Ridker PM, Gaziano JM. Lipid levels and the risk of ischemic stroke in women. Neurology. 2007 Feb 20;68(8):556–62.
26. Glasser SP, Mosher A, Howard G, Banach M. What is the association of lipid levels and incident stroke? Int J Cardiol. 2016 Oct 1;220:890–4.
27. Fahimfar N, Khalili D, Mohebi R, Azizi F, Hadaegh F. Risk factors for ischemic stroke; results from 9 years of follow-up in a population based cohort of Iran. BMC Neurol. 2012 Oct 2;12(1):117.