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Original article

Dietary and lifestyle determinants of the lifetime cardiovascular risk during early adulthood

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Summary. *Background and aim:* Dietary and lifestyle parameters were used frequently to understand the susceptibility to chronic diseases. The aim is to investigate the impact of some dietary and lifestyle determinants on the lifetime cardiovascular risk during the early adulthood. *Methodology:* A total of 371 subjects (163 men and 208 women) aged 18-46 years were enrolled in a cross-sectional study. Dietary and lifestyle data were collected by using the simple lifestyle indicator questionnaire. Fasting glucose and lipid panel were analyzed, in addition to anthropometric measurements and blood pressure recording in the sitting position. Lifelong American college of cardiology/American heart association (lifetime ASCVD) risk score was calculated depending on the published tool using the age, gender, systolic blood pressure, body mass index or total and HDL cholesterol, smoking status, presence of diabetes and presence or treatment for hypertension. Multiple logistic regression was used to test determinants of long-term cardiovascular risk score. *Results:* Those having non-optimal risk levels for lifetime ASCVD risk were 46.6% and 32.1% of men and women groups respectively. Among Saudi women, following a dietary guidelines and having no family history of cardiovascular disease reduces the risk of lifetime ASCVD by about 89% and 80% {odds ratio (95% confidence interval) = 0.11 (0.02-0.52) and 0.20 (0.05-0.82), respectively, $p<0.05$}. Among men groups no significant predictors were found, however, the high-risk quartile was more smoker *($\chi^2 = 5.76$, df 1 & $P < 0.05$)*, more cola drinker, added more table salt, and had a family history of cardiovascular disease *($P>0.05$). Conclusion:* In this population, the long-term cardiovascular risk might be determined by some lifestyle and dietary factors such as following a dietary guideline that include variety and calorie control especially in women. In men, smoking and salt addition were associated with high-risk quartile.

Key Words: Cardiovascular risk, Dietary determinants, lifestyle determinates, lifetime ASCVD.

Introduction

Cardiovascular diseases (CVD) are the leading causes of death in men and women (1). CVD was the second most common cause of death in Saudi Arabia, in 2010 and 2011, representing 19.8 % of total deaths 29,275 (2). The major risk factors for CVD include male sex, age, systolic blood pressure (SBP), antihypertensive treatment, total and HDL cholesterol, smoking, and diabetes mellitus (3). At least half of these risk factors are preventable, making the prescription of a healthy lifestyle is the main preventive measure and the first line of management of CVD (4). The success of the preventive measures and the risk status of the CVD could be definitely assessed by predictive tools such as the lifelong CVD scoring system that was

developed jointly by the American College of Cardiology and American Heart Association (ACC/AHA) to detect atherosclerotic cardiovascular disease (life-time ASCVD risk) (5), as well as, ten years and thirty years Framingham risk scoring system (FS) (6).

Lifestyle and dietary pattern are related to the development many chronic diseases including metabolic syndrome and cardiovascular diseases (7). However, the full complexity of this relationship is not yet understood. Assessment of dietary pattern has emerged as an alternative method for examining the association of the diet with chronic diseases. In addition, the epidemiological and clinical studies reported an increasing evidence about plant-based dietary patterns, which are rich in fruits, vegetables, and whole grains, are valuable in preventing various chronic diseases, whereas a diet high in red and processed meat, refined grains and added sugar seems to increase the risk (8, 9). In particular, dietary habits have long been considered to be associated with cardiovascular (CV) disease prevalence, management, and prognosis. Dietary and lifestyle characteristics of cardiovascular health in Saudi population are still under investigated. Taken together, this study was conducted to investigate the effect of some dietary and lifestyle determinants on the lifetime cardiovascular risk among young and middle-aged Saudi population, and comparison of these determinants between men and women living in Riyadh, Saudi Arabia.

Methods

Study population

Recruitment of the study participants was done by advertising in social media. A total of 371 Saudi subjects (163 men and 208 women) living in Riyadh city, and aged 18-46 years were enrolled in this cross-sectional study in the period between October 2015 until July 2016. Exclusion criteria included non-Saudi, those from rural areas, any present illness or past history of cardiovascular diseases, heart failure, cancer, or any other diseases. All participants read and signed an informed consent before the study. The College of Applied Medical Sciences' research ethics committee approved the study protocol and all investigations were according to principle of Helsinki declaration.

Dietary and lifestyle variables

At the initial meeting with the study team member, each participant completed a translated copy of Simple Lifestyle Indicator Questionnaire (SLIQ) (10,11) with some modifications in addition to the study questionnaire about demographic, dietary and health-related data. Selected parameters for analysis included following a dietary guideline (which included variety and calorie control), consumption of vegetables, fruits and fishes, the addition of table salt, physical activity practice, smoking, and cola consumption.

Anthropometric measures

Body weights and heights were measured using Seca digital scale with a stadiometer (Seca co, Germany). BMI was calculated as body weight (kg) divided by square of height (in meter).

Biochemical analysis

Fasting lipid profile and blood glucose were screened by CardioChek PA lipid analyzer (Polymer Technology Systems Inc, Indianapolis, IN, USA) and a digital glucometer (ACCU-CHEK, Hoffmann-La Roche Ltd, USA) (12).

Blood pressure measurement

Systolic (SBP) and diastolic (DBP) blood pressures (mm Hg) were measured in sitting position during fasting or at least 4 hours after the last meal, by using commercially available blood pressure monitors (Omron Healthcare Co, Japan). Three readings were collected and the mean value reported as SBP and DBP (13).

Cardiovascular risk scoring

Long term CVD risk scoring were calculated for all participants. Lifetime atherosclerotic cardiovascular disease risk score (lifetime ASCVD) was calculated and used for prediction of cardiovascular risk status. This scoring system used age, gender, systolic blood pressure, body mass index or total and HDL cholesterol, smoking status, presence of diabetes and pres-

Table 1: Characteristics of the study population

Variables	Men Mean±SD (n=163)	Women Mean±SD (n=208)	P value
Height (cm)	170.44±5.69	158.34±5.63	0.000
Weight (Kg)	83.84±21.73	67.85±14.48	0.000
BMI (Kg/m^2)	28.83±7.37	27.03±5.49	0.007
Age (year)	25.98±7.16	29.43±5.78	0.000
Systolic blood pressure (mmHg)	118.03±11.77	99.67±12.39	0.000
Diastolic blood pressure (mmHg)	80.75±8.68	69.60±10.67	0.000
Glucose level (mg/dl)	94.37±9.41	95.60±14.66	0.354
Total cholesterol (mg/dl)	154.64±31.23	159.54±37.47	0.288
High density lipoprotein (mg/dl)	45.62±11.26	56.64±16.10	0.000
Low density lipoprotein (mg/dl)	90.02±30.68	80.03±30.73	0.016
Triglycerides (mg/dl)	99.02±49.45	115.78±64.07	0.029

ence or treatment for hypertension as items in the algorithm of the ASCVD risk calculator published by Goff et al (5).

Statistical analysis

Statistical analysis was performed using SPSS for Windows (version 19; SPSS Inc., Chicago, IL, USA). Data of continuous variables were summarized with mean, standard deviation (SD) while categorical variables were presented with numbers and percentages. The significant difference between men and women was test by independent sample t-test. Categorical variables were analyzed by using chi-square test. Spearman correlation coefficient was used to demonstrate the relation between the study variables and cardiovascular risk factors. Multivariate logistic regression analysis was used to analyze the relevant variables and to estimate the adjusted odds ratios and 95% confidence intervals. P≤0.05 was considered statistically significant.

Results

Descriptive characteristics of all study population and their comparison according to gender are shown in Table1 in form of means±SD. Independent sample t-test showed insignificant differences between Saudi men and women as regarding glucose and total cholesterol levels, while other variables showed significant differences.

Table 2 shows cross-tabulation of the studied dietary and lifestyle variables in addition to their analysis by using chi-square test. There was a significant difference between men and women as regarding smoking, consumption of vegetable, fish, and seafood, and cola drinking (*P<0.05*). Men were more smokers, less vegetable and fish consumer, and more cola drinker. On another hand, physical activity practice, following some special dietary guidelines, table salt addition and family history of CVD showed an insignificant difference. Furthermore, all CVD risk-scoring systems showed significant differences between men and women with higher percentages in men group.

Correlation of some cardiovascular parameters such as systolic blood pressure, glucose, total cholesterol, LDL, and HDL cholesterol with dietary and lifestyle parameters using Spearman correlation coefficient was shown in table 3. Smoking was negatively correlated with level of HDL, and physical activity practice was negatively associated with LDL level among women group only *(r= -0.201 and -0.235, respectively, p<0.05),* Salt addition showed a weak positive correlation with the systolic blood pressure among men *(r= 0.183, p<0.05)*. Apart from the weak negative correlation between fruits consumptions and systolic blood pressure *(r= -0.134, p<0.05),* vegetables and fruits consumption

Table 2. Selected dietary and lifestyle variables among men and women groups and their analysis by using chi square test.

Variables	Men group (n=163)			Women group (n=208)			P value
	Number	% within variable (raw)	% within group (column)	Number	% within variable (raw)	% within group (column)	
Smoking							0.009
Non smoker	148	42.3	90.8	202	57.7	97.1	
Smoker	15	71.4	9.2	6	28.6	2.9	
Physical activity							0.104
No regular physical activity	95	47.5	58.3	105	52.5	50.5	
1 to 3 times per week	26	41.9	16.0	36	58.1	17.3	
4 to 7 times per week	23	31.9	14.1	49	68.1	23.6	
Daily for 60 min or more	19	51.4	11.7	18	48.6	8.7	
Following a special dietary guidelines							0.114
Not following any dietary guidelines	145	45.6	89.0	173	54.4	83.2	
Following a special dietary guidelines	18	34.0	11.0	35	66.0	16.8	
Vegetables consumption							0.006
Less than 1 serving per month	28	58.3	17.2	20	41.7	9.6	
2 to 3 times per month	45	52.9	27.6	40	47.1	19.2	
2 to 4 days per week	84	39.4	51.5	129	60.6	62.0	
Every day	6	24.0	3.7	19	76.0	9.1	
Fruits consumption							0.062
Less than 1 serving per month	27	48.2	16.6	29	51.8	13.9	
2 to 3 times per month	65	51.6	39.9	61	48.4	29.3	
2 to 4 days per week	68	38.4	41.7	109	61.6	52.4	
Every day	3	25.0	1.8	9	75.0	4.3	
Fishes consumption							0.016
Less than 1 serving per month	54	48.6	33.1	57	51.4	27.4	
2 to 3 times per month	73	49.3	44.8	75	50.7	36.1	
2 to 4 days per week	34	34.0	20.9	66	66.0	31.7	
Every day	2	16.7	1.2	10	83.3	4.8	
Table-salt addition to the meal							0.906
Never added salt	22	47.8	13.5	24	52.2	11.5	
Sometimes but small amount	20	45.5	12.3	24	54.5	11.5	
Usually added	99	43.6	60.7	128	56.4	61.5	
Every day to every meal	22	40.7	13.5	32	59.3	15.4	
Cola Drinking							0.000
Less than 1 can per month	36	46.2	22.1	42	53.8	20.2	
2 to 3 cans per month	28	24.6	17.2	86	75.4	41.3	
2 to 4 cans per week	54	49.5	33.1	55	50.5	26.4	
Every day	45	64.3	27.6	25	35.7	12.0	
Family history of CVD							0.316
No	141	45.0	86.5	172	55.0	82.7	
Yes	22	37.9	13.5	36	62.1	17.3	
lifetime ASCVD risk							0.034
Low risk (M<5 %, F <8%)	87	55.1	53.4	71	44.9	66.4	
High risk (M>5 %, F >8%)	76	67.9	46.6	36	32.1	33.6	

Table 3. Correlation of lifestyle and dietary parameters with risk factors of cardiovascular disease using Spearman correlation coefficient.

Variables	Glucose		Cholesterol		LDL		HDL		SBP	
	M	F	M	F	M	F	M	F	M	F
Physical activity	-.051	-.055	-.045	-.144	-.079	-.235*	.077	.045	-.049	-.068
Following a special diet	.038	-.050	.135	-.155	.172	-.140	-.061	-.157	-.052	-.171*
Vegetables consumption	-.049	-.003	.045	-.031	.054	-.086	.065	.105	.023	-.117
Fruits consumption	.054	-.031	.078	.059	.071	.005	-.058	-.030	.059	-.134*
Fish consumption	.096	-.027	.260**	-.084	.240**	-.117	-.125	-.020	-.025	.001
Salt consumption	-.062	.043	.090	-.076	.099	.000	.080	-.067	.183*	-.054
Cola consumption	-.078	.042	.072	.087	.108	.073	.015	.103	.094	.023
Smoking	-.057	-.073	-.121	-.077	-.128	.047	.019	-.201*	-.096	-.015

*LDL: low-density lipoprotein, HDL: high-density lipoprotein, and SBP: systolic blood pressure. M: males, F: females, * Correlation is significant at the 0.05 level, and ** Correlation is significant at the 0.01 level.*

failed to make a significant correlation with any of the studied cardiovascular parameters. Paradoxically, the fish consumption showed a positive correlation with the total cholesterol and calculated LDL levels in men group *(r= 0.260 & 0.240 respectively, p<0.01)*.

Table 4 showed the comparison between low- and high-risk quartiles. Men with high lifetime ASCVD risk were more smoker *(χ = 5.76, df 1 & P <0.05), more cola drinker, added more table salt, and had a family history of CVD (P>0.05)*. High vegetables, fruits, fish consumption, following a special diet and physical activity practice could not reduce the percent of male subjects with high risk. The condition is slightly different among women group. The following the dietary guidelines significantly reduced the lifetime ASCVD risk *(χ^2 = 3.83, df =1 & P ≤0.05)*. Furthermore, the high lifetime ASCVD risk in women was associated with more smoking, less physical activity, fewer vegetables, fruits and fish consumption *(P>0.05)*. However, the addition of table salt, cola drinking or family history of CVD failed to raise the lifetime ASCVD risk *(P>0.05)*.

As shown in table 5, multiple logistic regression analysis revealed that following the dietary guidelines and having no family history of CVD are the significant predictors of lifetime ASCVD risk among Saudi women in the early adulthood. For following a dietary regimen and family history of CVD, odds ratio (95% confidence interval) = 0.11 (0.02-0.52) and 0.20 (0.05-0.82), respectively, p<0.05. This means that following a special guidance about diet reduces the risk of lifetime ASCVD by about 89% and having no family history of CVD reduce the risk by about 80%. Among men group, no significant predictors were found using multiple logistic regression analysis.

Discussion

Rapid urbanization and westernization of the lifestyle make the prevalence of cardiovascular diseases and its risk factors are progressively increasing in Saudi Arabia (14). This study revealed that men group showed about 46.6% of the men group have non-optimal risk levels for lifetime CVD risk, while women the percent was much less (32.1%). A previous study with large sample reported about 4.1% of adult Saudi had a high risk of coronary heart disease (CHD) in the next 10-year by using FS, and if diabetes was considered as CHD, this percentage raised to about 26%. Furthermore, the population of the early adulthood showed the majority of those with high risk (15). Another prevalence study showed that 25% of Saudi university population had >10% risk for CVD by using 10-years FS (16). In contrary to these old studies we used lifetime ASCVD scoring system for assessment of the long-term CVD risk status.

In this study, men showed much higher non-

Table 4. Comparison of the studied dietary and lifestyle parameters in low risk vs high lifetime ASCVD risk populations.

Variables	Men group (n=163) lifetime ASCVD risk				Women group (n=208) lifetime ASCVD risk			
	Low risk <5 % (% within variables)	High risk >5 % (% within variables)	χ^2	Sig	Low risk <8 % (% within variables)	High risk >8 % (% within variables)	χ^2	Sig
Smoking			5.76	0.016			1.51	0.220
Non smoker	37.7	62.3			67.3	32.7		
Smoker	0.0	100.0			33.3	66.7		
Physical activity			1.10	0.776			3.16	0.368
No regular physical activity	35.9	64.1			62.5	37.5		
1 to 3 times per week	39.1	60.9			58.3	41.7		
4 to 7 times per week	31.3	68.8			80.0	20.0		
Daily for 60 min or more	23.1	76.9			70.0	30.0		
Following a special dietary guideline			1.84	0.175			3.83	0.050
Not following any diet	36.1	63.9			62.1	37.9		
Following a special dietary guideline	12.5	87.5			85.0	15.0		
Vegetables consumption			2.78	0.426			2.89	0.409
Less than 1 serving per month	45.5	54.5			80.0	20.0		
2 to 3 times per month	24.2	75.8			71.4	28.6		
2 to 4 days per week	36.2	63.8			60.6	39.4		
Every day	33.3	66.7			80.0	20.0		
Fruits consumption			2.99	0.394			4.05	0.256
Less than 1 serving per month	47.6	52.4			84.6	15.4		
2 to 3 times per month	34.1	65.9			63.6	36.4		
2 to 4 days per week	30.6	69.4			62.1	37.9		
Every day	0.0	100.0			100.0	0.0		
Fishes consumption			1.08	0.781			0.37	0.947
Less than 1 serving per month	36.4	63.6			66.7	33.3		
2 to 3 times per month	31.4	68.6			63.6	36.4		
2 to 4 days per week	40.0	60.0			69.7	30.3		
Every day	0.0	100.0			60.0	40.0		
Table-salt addition to the meal			5.10	0.165			3.847	0.278
Never added salt	52.6	47.4			88.9	11.1		
Sometimes but small amount	16.7	83.3			80.0	20.0		
Usually added	34.8	65.2			60.9	39.1		
Every day to every meal	25.0	75.0			68.4	31.6		
Cola Drinking			5.69	0.128			5.01	0.171
Less than 1 can per month	50.0	50.0			86.4	13.6		
2 to 3 cans per month	17.6	82.4			62.2	37.8		
2 to 4 cans per week	38.1	61.9			60.0	40.0		
Every day	27.3	72.7			60.0	40.0		
Family history of CVD			0.74	0.390			2.49	0.114
No	36.0	64.0			62.8	37.2		
Yes	25.0	75.0			81.0	19.0		

Table 5. Multiple logistic regression analysis of the studied dietary and lifestyle parameters as determinants of lifetime cardiovascular disease risk scoring system.

Variables	Men group (n=163) lifetime ASCVD risk			Women group (n=208) lifetime ASCVD risk		
	Odds ratio	P-value	95% CI	Odds ratio	P-value	95% CI
Smoking						
Non smoker	1			1		
Smoker	6.39	0.999	0.00	4.29	0.399	0.15-126.2
Physical activity						
No regular physical activity	1			1		
1 to 3 times per week	1.20	0.755	0.38-3.78	2.04	0.295	0.54-7.70
4 to 7 times per week	0.54	0.414	0.12-2.36	0.37	0.176	0.9-1.56
Daily for 60 min or more	1.36	0.716	0.26-6.98	2.44	0.370	0.35-17.15
Following a special dietary guidelines						
Not following any diet	1			1		
Following a dietary guideline	6.90	0.122	0.60-79.95	0.11	0.006	0.02-0.52
Vegetables consumption						
Less than 1 serving per month	1			1		
2 to 3 times per month	1.19	0.846	0.21-6.63	0.67	0.771	0.04-10.39
2 to 4 days per week	0.60	0.548	0.11-3.19	1.24	0.872	0.10-16.05
Every day	0.365	0.532	0.02-8.60	0.46	0.639	0.02-12.19
Fruits consumption						
Less than 1 serving per month	1			1		
2 to 3 times per month	1.59	0.601	0.28-9.13	4.42	0.144	0.60-32.53
2 to 4 days per week	2.93	0.248	0.48-17.97	8.01	0.040	1.10-58.22
Every day	1.15	0.999	0.00	0.00	0.999	-
Table-salt addition to the meal						
Never added salt	1			1		
Sometimes but small amount	2.69	0.398	0.27-26.81	1.47	0.820	0.05-40.93
Usually added	1.26	0.796	0.22-7.30	3.11	0.432	0.18-52.80
Every day to every meal	1.70	0.640	0.19-15.62	1.16	0.924	0.05-25.35
Cola Drinking						
Less than 1 can per month	1			1		
2 to 3 cans per month	3.32	0.229	0.47-23.37	2.99	0.223	0.51-17.35
2 to 4 cans per week	1.29	0.776	0.22-7.53	5.27	0.073	0.86-32.42
Every day	2.35	0.336	0.41-13.37	9.93	0.069	0.83-118.4

optimal risk profile together with more prevalence of the traditional cardiovascular risk factors such as more smoking, low fiber-containing diet, and more consumption of added sugar or cola drinking than women (table 2). Taking into consideration the mean age of our sample which was 25.98 for men and 29.43 years for women. The female in early adulthood has a low risk of coronary heart disease in comparison with a post-menopausal woman and male with the high impact of the smoking, is also reported by Prescott et al (17). This also supported by data from the original Framingham heart study (18). However, our finding is disagreed by Möller-Leimkühler (19) who reported higher CVD risk in women. Furthermore, Appelman et al (20) stated a higher prevalence of CVD in women and concluded that impacts of obesity, hypertension, and dyslipidemia on CVD outcomes are similar between women and men, however, prolonged smoking is a more significant risk for women than for men. Gender as a factor affecting food choices especially for vegetables and fruits was also suggested by Thompson et al (21). Taken together, the old principle that the

female in early adulthood is protected against CVD is now dubious, however, she still has lower CVD risk possibility than the male.

Smoking showed a negative correlation with HDL in women rather than men (table 3) this means that smoking in women has a great impact on the reduction of HDL level as a mechanism of CVD risk. This was in line with results of Thompson et al (21). Moreover, physical activity showed a negative correlation with LDL in women group. Teramoto et al indicated that leisure time physical activity was inversely associated with CVD risk independent of smoking status, and if combined with smoking cessation, better prevent and control of CVD will result (22). The second important association in the women group was the negative correlation between fruit consumption and systolic blood pressure. The relation of fruits and systolic pressure also studied in a Chinese study (23) which concluded that the higher level of fruit consumption was associated with the lower blood pressure, especially in women. On the other hand, men group showed a positive correlation between the systolic blood pressure and the dietary salt intake. A meta-analysis about this topic concluded that the clinical evidence of low table salt as a preventive measure of cardiovascular morbidity and mortality is still insufficient (24). The unexpected association which was reported in this study between the fish consumption with total cholesterol and LDL levels in form of positive correlation. This paradox might be due to the local fish cooking process which includes addition of other unhealthy oils, in addition to fatty additives during eating. This increase in total and LDL cholesterol which was associated with fish consumption or fish oil supplementation also reported by the American Heart Association scientific statement (25). In another hand, Norwegian sample with mean age about 44 years reported association of fish consumption with healthy lipid profile especially increased HDL and decreased triglycerides (26). A randomized parallel study about the effect of fish consumption on lipid profile and inflammatory cytokines revealed that consumption of four servings of fish per week for 2 months did not affect serum lipid profile, cytokine concentrations, and blood pressure compared to a diet low in fish (27).

Low lifetime ASCVD risk-women were characterized by following a dietary regimen *($p \leq 0.05$)*, less smoking (*$p=0.220$*), more physically active (*$p=0.368$*), and consume more fruits and vegetables (*$p=0.256$ & 0.409, respectively*). Using multiple regression analysis, the main determinates of lifetime ASCVD risk in women were following a dietary regimen and having no family history of CVD (OR = 0.11 & 0.20 respectively). For men, low-risk quartile (table 4) was less smoking *($p<0.05$)*, less addition of table salt *($p=0.165$)*, less cola drinking *($p=128$)*, and no family history *($p=390$)*. No one of the studied lifestyle and dietary determinants showed a significant prediction of lifetime ASCVD risk by using multiple regression analysis. Previous studies stated similar variable conclusions. In India, Rastogi et al (28) observed a stronger association between vegetable intake and ischemic heart disease more than other dietary factors. For women, Akesson et al (29) proved that consuming a healthy diet with the moderate amount of alcohol, no smoking, being physically active and maintaining a healthy weight could prevent myocardial infarctions. Many studies reported that following of the Mediterranean dietary regimen showed a favorable impact on CVD risk in both men and women (30). In a longitudinal cohort study for 20 years, high consumption of fruits and vegetable in young adulthood was associated with lower prevalence of coronary artery calcium later in life (31). Another Mexican study reported that the dietary pattern including consumption of fresh fruit, vegetables, and whole grains was associated with a low risk by 10-years Framingham risk score (32). Furthermore, a meta-analysis of cohort studies showed that consumption of fruit and vegetable is associated with the lower risk of coronary heart disease (33), in addition to lower risk of all-cause mortality especially cardiovascular mortality (34). On another hand, Hung et al (35) reported that high fruit and vegetable intake was associated with a mild, statistically insignificant reduction in the development of the major chronic disease.

This study has some limitations such as subjective reporting of the dietary and lifestyle parameters. Careless filling the questionnaire, memory problems, and giving irrelevant answers greatly affect the interpretation of the study questioners. Supervised filling of the study questionnaires was used to overcome this limitation. Another important limitation is the restricted sample size and being only from Riyadh not from other urban areas in Saudi Arabia. However, the demographic nature of Riyadh, being the capital city of

Saudi Arabia, include population from all Saudi cities.

Finally, we can conclude that long-term cardiovascular risk in urban Saudi population might be determined by some lifestyle and dietary factors which differ between men and women. Following dietary guidelines that include variety, eating in moderation and calorie control was the best determinant in women, while in men the main factors were smoking and salt addition.

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