

## Modifiable Life Style Risk Factors for CAD in Young Dyslipidemic Gujarati's

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### Abstract

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*Background and Objective:* Earlier reports have mentioned a four-fold rise in coronary artery diseases (CAD) in the last four decades in India. Dyslipidemia is amongst the major modifiable risk factors for cardiovascular diseases. A particular dyslipidemic pattern has been observed in South Asians, borderline or normal low density lipoproteins and high triglycerides with low high density lipoproteins. There are evidences mentioning predisposition for CAD in young Gujarati population. In this study, we aim to analyze the prevalence of modifiable risk factors in young asymptomatic dyslipidemic Gujaratis for timely prognosis, management and delaying of the onset of CAD. *Material and Methods:* This cross sectional study was carried out at U.N. Mehta Institute of Cardiology and Research Centre, Ahmedabad, Gujarat, India in September 2015. Total 426 young asymptomatic dyslipidemic participants between 18 - 40 years of age, apparently healthy and disease free were enrolled for the study. Data analysis was carried out by SPSS version 22.0 (Chicago, IL, USA). Comparison between the groups was done using Mann-Whitney U test and the cut off value of  $p < 0.05$  was considered to be statistically significant. *Results:* The study population was male dominant (69.2%). Decreased consumption of fruits was major risk factor observed and diabetes was the least prevalent. Most common dietary habit was the consumption of vegetables. Apolipoprotein B/ Apolipoprotein A1 ratio was found abnormal in majority of study participants. Amongst 61.7% of the population following a sedentary lifestyle, majority were males (86.4%). *Conclusion:* On the basis of our observations, we would like to suggest physically active life style, decreased junk food consumption and increased consumption of fruits and nuts in young dyslipidemic individuals of Gujarati origin to lower their risk for coronary artery diseases.

**Keywords:** Dyslipidemia; Sedentary Lifestyle; Coronary Artery Disease.

### Introduction

Prevalence of coronary artery diseases (CAD) and cardiovascular diseases (CVD) associated mortality has burgeoned in the past two decades in South Asian countries including India as no exception. Earlier reports have mentioned a four-fold rise in CAD in the last four decades in India. Current estimates from epidemiologic studies from various parts of the

country indicate a prevalence of coronary heart diseases to be between 7-13% in urban and 2-7% in rural populations [1-3]. Amongst all the other prevailing risk factors for CAD, dyslipidemia has been considered as the major modifiable risk factor. Dyslipidemia along with other prevailing risk factors increases individuals risk many folds for coronary artery diseases [2,4]. Dyslipidemia includes lipid irregularities namely- increased levels of low-density lipoprotein cholesterol (LDL-C), triglycerides (TG)

and/or decreased high-density lipoprotein cholesterol (HDL-C) levels. Elevation of serum LDL-C levels has been well established with atherosclerosis and coronary heart diseases [1].

A particular dyslipidemic pattern that has been observed in South Asians, is characterized by borderline high levels of LDL-C, low levels of HDL-C and Apo-A1 and high levels of TG and Apo B. High ratios of TC/HDL-C TG/HDL-C and Apo B/ Apo A1 have been observed in Asian Indians [5-7]. This particular kind of lipid profile is of importance particularly because it has been reported to have correlation with premature incidence and severity of CAD, as well as acute myocardial infarction [5,8,9]. This particular increase in LDL-C and TG with decreased HDL-C is popularly known as Atherogenic Dyslipidemia. The term "Atherogenic Dyslipidemia" was first described by Austin *et al.*, to a risk conferring lipid profile consisting of a higher proportion of LDL-C, reduced HDL-C, and increased triglycerides to increased incidence of CVD and mortality due to cardiovascular events [10,11].

Gujarat is at the forefront in contributing diabetic patients in India owing to a diet rich in oil and sugar. Ethnic Gujarati people are presumed to have high prevalence of CAD risk factors: Obesity, metabolic syndrome, diabetes, hypertension, dyslipidemia because of traditional Gujarati food and less physically active lifestyle [12].

There are emergence of evidence indicating alarming high prevalence of morbidity and mortality associated with CVD in Gujarati population. Many studies in Gujarati population have mentioned the predisposition for CVD in particular due to risk factors as disturbed lipid profile, hypertension, diabetes and bad dietary habits [13-15]. Also, the tendency for higher TG and lower HDL-C concentrations, contribute significantly also in raising metabolic syndrome in the subjects, which further raises the risk for CVD [16].

There is a lacuna in the knowledge regarding the modifiable risk factors associated with CVD specifically in young population of  $\leq 40$  years of age. Epidemiological studies in Gujarati population, depicts an increasing trend of the major cardiovascular risk factors such as tobacco consumption, obesity, hypertension and lipid abnormalities in young adults [13]. The study of modifiable risk factors can help in timely prognosis and be further useful in delaying and/or the onset of CVD. Dyslipidemia is one of the major risk factor contributing to CVD, and hence, in this study, we aim to analyze the prevalence of modifiable risk factors in young asymptomatic dyslipidemic Gujaratis and detailed study of the lipid components and the possible reasons for dyslipidemia.

### Subjects and Methods

This cross sectional study was conducted at U.N. Mehta Institute of Cardiology and Research Centre in September 2015. A total of 426 young asymptomatic dyslipidemic participants, were enrolled for the study. The participants were aged between 18-40 years of age, apparently healthy and disease free. The participants taking statins or any other medications for dyslipidemia were excluded from the study. Data regarding modifiable risk factors as dietary pattern, physical activity and other related risk factors were collected based on a questionnaire.

Blood investigations were carried out, post a fasting period of twelve hours. Complete lipid profile was measured by International Federation of Clinical Chemistry (IFCC) approved enzymatic methods using commercially available kit on auto analyser-ARCHITECH PLUS ci4100, Germany. Lipids levels were categorized according to the classification recommended by National Cholesterol Education Program and Adult Treatment Panel III guidelines.

*Cut Off Levels Used are as Listed in the Table Below. [17-19]*

Variable	Moderate Risk	High Risk
Lp (a)	-	>30 mg/dl
Apo B/ Apo A1	(0.70 - 0.89) - males (0.60 - 0.79) - females	(0.90 - 1.10) - males (0.80 - 1.00) - males
HDL	-	>40 mg/dl - males >50 mg/dl - females
LDL	$\geq 130-199$ mg/dl	$\geq 160$ mg/dl
Total Cholesterol	$\geq 200-239$ mg/dl	>240 mg/dl
Triglyceride	$\geq 150-199$ mg/dl	$\geq 200$ mg/dl

**Table 1:** General risk factor profile of dyslipidemic individuals

Details	Total N (%)	Male N (%)*	Female N (%)#
Total	426	295 (69.24)	131 (30.8)
Decreased Consumption of fruits/ vegetables	251 (58.9)	175 (59.3)	76 (58)
Physical Inactivity	216 (50.7)	142 (48.1)	74 (56.5)
Obesity	158 (37.1)	106 (35.9)	52 (39.7)
Personality Type - A	127 (29.8)	77 (26)	50 (38.2)
Hypertension	89 (20.9)	70 (23.7)	19 (14.5)
Tobacco consumption (any form)	40 (9.4)	40 (13.6)	0
Diabetes	13 (3.1)	7 (2.4)	5 (3.8)
Psychosocial Stress	125 (29.3)	70 (23.7)	45 (34.3)

\*- percentage out of total males of study group, #- percentage out of total females of study group

**Table 2:** Dietary and lifestyle profile of the participants included

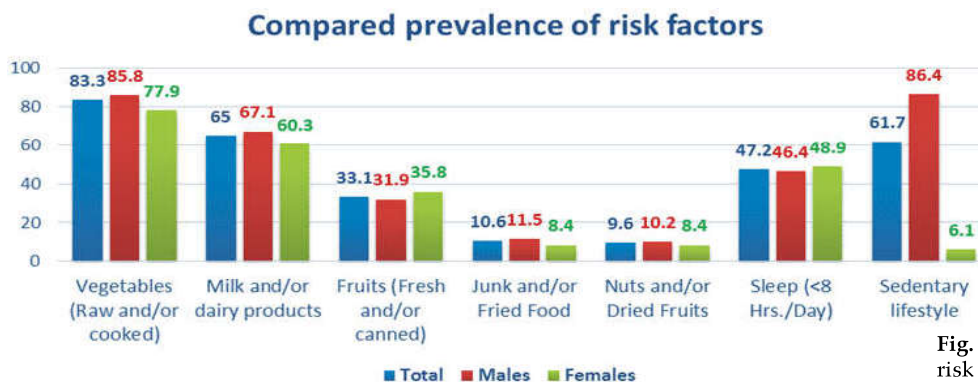
	Total 426 (%)	Males 295 (%)*	Females 131 (%)#
<b>Dietary components</b>			
Vegetables (Raw and/or cooked)	355 (83.3)	253 (85.8)	102 (77.9)
Milk and/ or dairy products	277 (65.0)	198 (67.1)	79 (60.3)
Fruits (Fresh and/or canned)	141 (33.1)	94 (31.9)	47 (35.8)
Junk and/or Fried Food	45 (10.6)	34 (11.5)	11 (8.4)
Nuts and/or Dried Fruits	41 (9.6)	30 (10.2)	11 (8.4)
<b>Lifestyle components</b>			
Sleep (<8 Hrs./ Day)	201 (47.2)	137 (46.4)	64 (48.9)
Sedentary lifestyle	263 (61.7)	255 (86.4)	8 (6.1)
Physically Activity	163 (38.3)	40 (30.5)	123 (41.7)

\*- percentage out of total males of study group, #- percentage out of total females of study group

**Table 3:** Detailed dyslipidemic profile

Variables	Abnormal levels	Total N (%)		Males N (%)*		Females N (%)#	
		Moderate	High	Moderate	High risk	Moderate	High risk
Apo A1	102 (23.9)	-	102 (23.9)	-	84 (28.5)	-	18 (13.7)
Apo B	26 (6.1)	-	26 (6.1)	-	21 (7.1)	-	5 (3.8)
Apo B/Apo A1	367 (86.1)	159 (37.3)	208 (48.8)	104 (35.2)	154 (52.2)	55 (42)	54 (41.2)
Lp (a)	120 (28.2)	-	120 (28.2)	-	81 (27.4)	-	39 (29.7)
LDL	209 (49.1)	163 (38.3)	46 (10.8)	113 (38.3)	39 (13.2)	50 (38.2)	7 (5.3)
TC/ HDL	26 (6.1)	25 (5.9)	1 (0.2)	23 (7.8)	1 (0.3)	2 (1.5)	-
TG	47 (11.0)	39 (9.2)	8 (1.9)	31 (10.5)	1 (0.3)	8 (6)	-
Cholesterol	172 (40.4)	172 (40.4)	-	126 (42.7)	-	46 (35)	-
HDL	160 (37.6)	-	160 (37.6)	-	132 (44.8)	-	28 (21.4)
Total Lipids	92 (21.6)	-	92 (21.6)	-	75 (25.4)	-	17 (12.8)

\*- percentage out of total males of study group, #- percentage out of total females of study group



**Fig. 1:** Compared prevalence of risk factors in total population, males and females

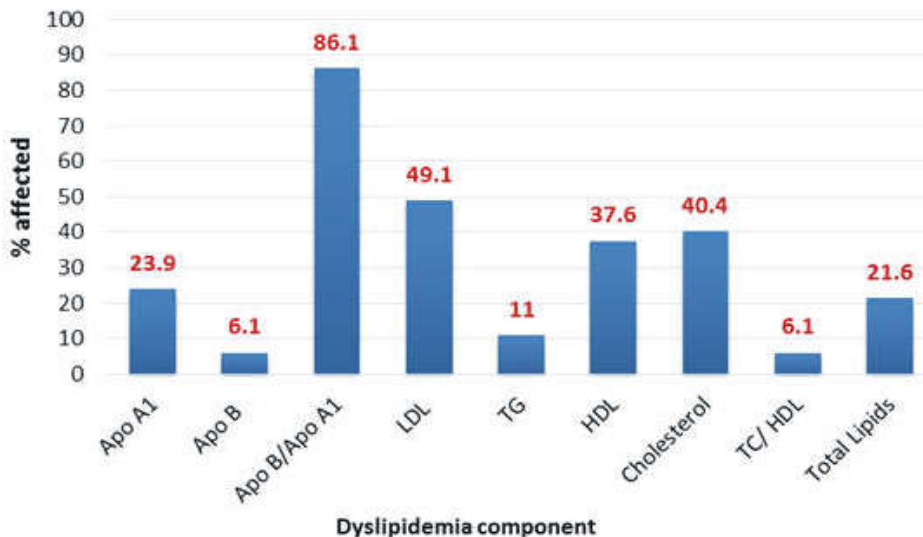


Fig. 2: Dyslipidemic component profile of the study participants

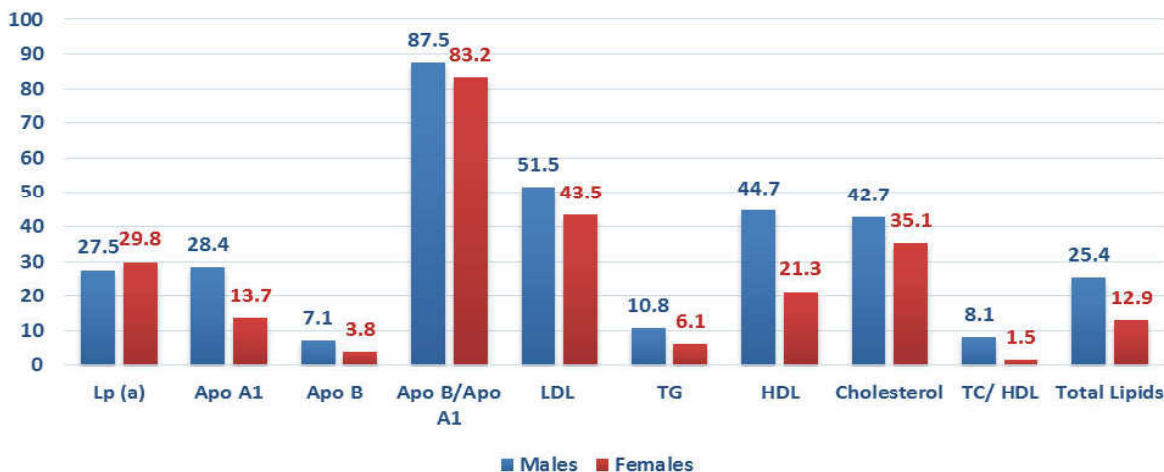


Fig. 3: Comparison of lipid profile components in males and females

*Statistical Analysis*

Data analysis was carried out by SPSS version 22.0 (Chicago, IL, USA). Values of various lipids were expressed as mean ±SD. The categorical data obtained from standard cut-offs were presented as proportions. Comparison between the groups was done using Mann-Whitney U test and the cut off value of p<0.05 was considered to be statistically significant.

**Results**

General risk factor profile has been described in Table 1. A total of 426 dyslipidemic individuals, of which 295 (69.24%) males and 131 (30.76%) females were enrolled for the study. Decreased consumption

of fruits was found in majority of the individuals (259, 58.9%) with 59.3 and 58 percent in males and females respectively followed closely by physical inactivity with 50.7% (Males-48.1% and females-56.5%). Diabetes was the least prevalent risk factor amongst the dyslipidemic individuals (Total-3.1%, males-2.4 and females-3.8).

Table 2 described the detailed analysis of dietary and lifestyle components in the participants of the study. Dietary habits were categorized into five categories namely vegetables (Raw and/or cooked), milk and/ or dairy products, fruits (fresh and/or canned), junk and/or fried food, nuts and/or dried fruits. The most common dietary habit observed in the study participants was the consumption of vegetables either raw and/or cooked in majority (83.3% total, 85.8% males and 77.9% females) of

population. This was followed by consumption of milk and/ or other dairy products (total-65.5% with males-67.1% and females-60.3%). The consumption of nuts and/ or dried fruits was the least observed food habit, in our study population and only a 9.6% of the study population, with 10.2% males and 8.4% females consuming it. The comparison of dietary habits with sedentary life style habits and the hours of sleep was shown in Figure 1.

Table 3 describes the detailed lipid profile of the study participants. We have assessed prevalence of various lipoprotein fractions using current definitions in young adults (<40 years of age) in Gujarati population. An overall picture of the dyslipidemic profile was presented in Figure 2. The ratio of Apo B/ Apo A1 was abnormal maximally, affecting 367 (86.15%) individuals. This was further categorized into a moderate and high risk, where 208 (48.8%) individuals had Apo B/Apo A1 ratio falling into high risk category, with 154 (52.2%) males and 54 (41.2%) females; and moderate risk levels were observed in 159 (37.3%) participants with 104 (35.2%) males and 55 (42%) females. High concentrations of LDL-C concentrations were observed in 209 (49.1%) with 163 males and 46 females followed by lower levels of HDL as noticed in 160 (37.6%) participants (132(44.8%) males and 28 (21.4%) females). Amongst the major dyslipidemic components of the atherogenic dyslipidemia, hypertriglyceridemia was the least observed in the study group with 47 (11.0), 32 (10.8%) and 8 (6%) in total, male and female participants. The comparison of lipid profile in males and females was depicted in Figure 3. Majority of the lipid components were observed to be higher in males as compared to females, except for Lipoprotein (a), which was found to be higher in females.

## Discussion

Cardiovascular diseases are the top most cause of mortality around the world. The identification of individuals at increased risk of CVD is utmost important. Dyslipidemia is one amongst the established risk factors for CVD as reported worldwide. Dyslipidemia at a younger age (<40 years) is generally due to an erroneous lifestyle. Apart dyslipidemia the other contributing factors for cardiovascular diseases are increased junk food consumption, physical inactivity, hypertension and tobacco consumption in any form. These observations have been stated by Framingham Study group too [20]. The modifiable risk factors for cardiovascular

disease mainly include dyslipidemia, smoking, hypertension, diabetes mellitus and obesity. Study the prevalence of these risk factors amongst dyslipidemic individuals, is of particular importance because this contributes in early detection, designing of management and primary prevention programs for CVD. We aimed to study the prevalence of these modifiable lifestyle and dietary risk factors in association to various lipid sub fractions in Gujarati dyslipidemic individuals, mainly to delineate the disease management strategies.

Dyslipidemia prevalence in Indians has been ranged 10-73 per cent in India [21]. The prevalence of high Lp (a) and low HDL in a Gujarati population have been reported as 32.15% and 36.53% respectively [13]. We observed 28.2% of study participants having higher Lp (a) and lower HDL levels were observed in 38.6%, which was in synchronization with other studies. Low HDL-C levels are stronger predictor of occurrence and reoccurrence of myocardial infarction and cardiovascular stroke. Low levels of HDL-C have also been associated with premature and severity of CVD [22]. As mentioned earlier, this is a form of the atherogenic dyslipidemic profile in South Asians, increasing their susceptiveness for CAD. Additionally, Apo B/ Apo A1 ratio was high in a majority of the study participants (86.1%). Hence, we would also like to suggest the use of Apo B/ Apo A1 ratio for the better prediction and for the diagnosis of dyslipidemia as compared to the other classical components of dyslipidemia.

Decreased consumption of fruits and/ or vegetables is mentioned to be the major reason for the atherogenic form of dyslipidemia. In this study of dyslipidemic Gujarati individuals, we observed that the predominant risk factor was decreased consumption of fruits and/ or vegetables followed by having a sedentary lifestyle. Research in past have mentioned food habits including high cereals, legumes, vegetable products, fish, oils and wine were associated with low or relatively low mortality rates from coronary heart diseases. Diets like Mediterranean, which are mainly composed of by and largely vegetables and fruits which provides high dietary fibers and is low in fat contents has been stated having a cardio protective effect. This kind of vegetable rich diets are in general, found to be inversely correlated with coronary heart disease mortality [23].

In general, Gujarati cuisine is mainly a healthy combination of a balanced meal with cereals, pulses, vegetables and rice. But in present times there is an increasing trend of junk food consumption. The

consumption of fast food have been reported in between meals, which mainly being formed of fats and carbohydrates, results in an unnecessary intake of extra calories. These extra calories with the lack of physical activity, observed in a majority of study (61.7%), tends to the rising risk to cardiovascular diseases and mortality. Amongst all those following a sedentary lifestyle, majority were males (86.4%) with only a few number of females following this habit. By decreasing the junk food consumption with the normalization of anthropometric variables and/or and promoting the consumption of fruits and/or vegetables and whole grains [24], the clinical condition of dyslipidemic individuals can be developed.

On the basis of our observations, we would like to suggest physically active life style, decreased junk food consumption and increased consumption of fruits and vegetables in young dyslipidemic individuals of Gujarati origin to lower their risk for coronary artery diseases.

#### Key Messages

- A physically active life style along with decreased junk food consumption and increased consumption of fruits and nuts can improvise the dyslipidemic profile of young Gujarati individuals having dyslipidemia and lower their risk for coronary artery diseases.
- Most of the young Gujarati males led a sedentary lifestyle which causes a predisposition towards coronary artery diseases, following a healthy and active lifestyle habit is essential to reduce this risk.

#### References

1. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. National Cholesterol Education Program: second report of the Expert Panel on Detection, Evaluation, and Treatment of high blood cholesterol (Adult Treatment Panel II). *Circulation*. 1994;89:1329-1445.
2. Bamba V, Rader DJ. Obesity and atherogenic dyslipidemia. *Gastroenterology*. 2007;132:2181-90.
3. Krishnan MN. Coronary heart disease and risk factors in India—On the brink of an epidemic?. *Indian heart journal*. 2012;64(4):364-7.
4. Miller M. Dyslipidemia and cardiovascular risk: the importance of early prevention. *QJM*. 2009;102(9):657-67.
5. Enas EA, Mohan V, Deepa M, Farooq S, Pazhoor S, Chennikkara H. The metabolic syndrome and dyslipidemia among Asian Indians: a population with high rates of diabetes and premature coronary artery disease. *Journal of the cardiometabolic syndrome*. 2007;2(4):267-75.
6. Smith J, Cianflone K, Al-Amri M, Sniderman A. Body composition and the apoB/apoA-I ratio in migrant Asian Indians and white Caucasians in Canada. *Clinical Science*. 2006 Sep 1;111(3):201-7.
7. Sierra-Johnson J, Somers VK, Kuniyoshi FH, et al. Comparison of apolipoprotein-B/apolipoprotein-AI in subjects with versus without the metabolic syndrome. *Am J Cardiol*. 2006;98:1369-1373.
8. Joshi P, Islam S, Pais P, et al. Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. *JAMA*. 2007;297:286-294.
9. Enas EA, Chacko V, Pazhoor SG, Chennikkara H, Devarapalli HP. Dyslipidemia in south asian patients. *Current atherosclerosis reports*. 2007 Nov 1;9(5):367-74.
10. Austin MA, King MC, Vranizan KM, Krauss RM. Atherogenic lipoprotein phenotype. A proposed genetic marker for coronary heart disease risk. *Circulation*. 1990, 82:495-506.
11. Musunuru K. Atherogenic dyslipidemia: cardiovascular risk and dietary intervention. *Lipids*. 2010 Oct 1;45(10):907-14.
12. Pandya H, Lakhani JD, Dadhania J, Trivedi A. The prevalence and pattern of dyslipidemia among type 2 diabetic patients at rural based hospital in Gujarat, India. *Indian J Clin Pract*. 2012;22(12):36-44.
13. Sahoo SS, Madan T, Sharma KH, Jain SR, Shah KH, Kandre YA. Prevalence and Profiles of Dyslipidemia in Apparently Healthy Adult Gujarati Population. *Age*. 2015;28:5-62.
14. Prajapati J, Jain S, Virpariya K, Rawal J, Joshi H, Sharma K, Roy B, Thakkar A. Novel atherosclerotic risk factors and angiographic profile of young Gujarati patients with acute coronary syndrome. *J Assoc Phys Ind*. 2014 Jul;62:584-8.
15. Karna SK. Prevalence of Dyslipidemia among Adults Attending Preventive Health Checkup Program of a Tertiary Care Hospital in Rural Gujarat. *International Journal of Medical and Clinical Research*, 2015;6(1):321-325.
16. Joshi H, Shah K, Patel P, Prajapati J, Parmar M, Doshi D, Chaurushia S. Novel indexes for diagnosing metabolic syndrome in apparently healthy Gujarati Asian Indians: a cross-sectional study. *QJM: An International Journal of Medicine*. 2016 Apr 15;109(11):717-22.
17. Lima LM, Carvalho MdG, Sousa MO. Índice apo B/ apo A-I e predição de risco cardiovascular. *Arquivos brasileiros de cardiologia*. 2007;88:e187-e90.

18. 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), Executive Summary. (<https://www.nhlbi.nih.gov/files/docs/guidelines/atp3xsum.pdf>)
  19. Dauchet L, Amouyel P, Dallongeville J. Fruit and vegetable consumption and risk of stroke a meta-analysis of cohort studies. *Neurology*. 2005 Oct 25;65(8):1193-7.
  20. Kannel WB. Risk stratification of dyslipidemia: insights from the Framingham Study. *Curr Med Chem Cardiovasc Hematol Agents* 2005;3:187-93.
  21. Misra, A., Luthra, K. and Vikram, N.K. "Dyslipidemia in Asian Indians: determinants and significance", *Journal of Association of Physicians India*, 2004;52:137-142.
  22. Enas EA, Yusuf S, and Mehta JL. Prevalence of Coronary Artery Disease in Asian- Indians. *Am J Cardiol* 1992; 70:945-49.
  23. Matalas AL, Panagiotakos DB. Dietary habits and cardiovascular disease risk in middle-aged and elderly populations: a review of evidence. *Clinical interventions in aging*. 2009;4:319-30.
  24. Takahashi MM, de Oliveira EP, Moreto F, Portero-McLellan KC, Burini RC. Association of dyslipidemia with intakes of fruit and vegetables and the body fat content of adults clinically selected for a lifestyle modification program. *Archivos latinoamericanos de nutricion*. 2010 Jan 1;60(2):148.
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