Potato consumption as high glycemic index food, blood pressure, and body mass index among Iranian adolescent girls

Motahar Heidari-Beni(1), Jafar Golshahi(2), Ahmad Esmailzadeh(3), Leila Azadbakht(3)

Abstract

BACKGROUND: Potato as a high glycemic index food has different effects on healthy nutritional status. In the current study, we investigated the association between potato consumption and obesity and blood pressure among adolescent girls.

METHODS: This cross-sectional survey was conducted on 205 girls (11-13 years old) in 2013 who were selected by systematic cluster random sampling from schools of all regions of Isfahan, Iran. Dietary intakes were collected by 53-items food frequency questionnaire. Anthropometric measurements were done based on a standard protocol.

RESULTS: Adolescents that consumed all kinds of potato more than once per week had significantly higher prevalence of overweight and obesity (prevalence of overweight and obesity was 86.7 and 13.3%; P < 0.0010 in more than once per week and less than once per week groups, respectively) as well as prevalence of abdominal obesity in more than once per week consumption group was higher than less than once per week consumption group (78.2 vs. 21.8%; P < 0.001). Potato consumption (as independent variables) increased body mass index and waist circumference (as dependent variables) in crude and adjusted regression models (P < 0.050). Mean blood pressure was not significantly different among lower and higher potato consumers.

CONCLUSION: Our findings suggested a positive association between potato consumption and obesity. We did not find any association between potato consumption and blood pressure in adolescents.

Keywords: Potato, Obesity, Blood Pressure, Adolescence

Introduction

Prevalence of obesity and overweight is increasing among adolescents and is associated with many chronic disorders. Adolescent obesity is a strong predictor of obesity in young adulthood.

According to recent studies, hypertension and obesity are related to certain lifestyle habits as well as sun healthy dietary habits.1,2 Therefore, dietary modification is suggested as the first step for hypertension and obesity control in adolescence.3,4 Refine grains consumption are associated with higher prevalence of metabolic syndrome and some of its components.5 Unfortunately, refine grains consumption are more popular among Iranian, and this may be associated with enhanced chronic diseases.6

Recently, it is revealed that the glycemic index (GI) and glycemic load (GL) have been associated with some chronic disease. Epidemiologic evidence and meta-analysis supported a positive association between GI, GL, and risk of chronic disease.7 High carbohydrate foods such as potato, rice, and bread might induce high glycemic response and increase postprandial hyperglycemia and hyperinsulinemia.8

Low GI foods promote satiety and enhance weight control, but high GI foods with high carbohydrate such as white flour, rice, bread, and potato promote weight gain.8

Date of submission: 16 Aug 2014, Date of acceptance: 18 Nov 2014

References

1- Isfahan Cardiovascular Research Center, Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran
2- Associate Professor, Cardiac Rehabilitation Research Center, Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran
3- Associate Professor, Food Security Research Center AND Department of Community Nutrition, School of Nutrition & Food Science, Isfahan University of Medical Sciences, Isfahan, Iran
Correspondence to: Leila Azadbakht, Email: azadbakht@hlth.mui.ac.ir
Most of the studies investigated dietary plan. And a few studies have focused on specific food on problem health in an adolescent. According to the results of the recent study, potato consumption was associated with some risk factors of cardiovascular disease (CVD) such as fasting blood sugar level, high-density lipoprotein level, and diabetes mellitus in adult. Evidence showed the intake of potato chips and potatoes was more strongly associated with weight gain among men and women. In general, finding about potato is controversial, and studies concern that potato consumption especially in large amount because of the high amount of rapidly digestible starch is related to some cancers and risk of Type 2 diabetes. Today, dietary habit especially in an adolescent move to consumption of French fries and chips potato that consist of hydrogenate oil and trans fatty acid. One study showed that French fries positively associated with Type 2 diabetes in women.

Most of the studies on blood pressure or obesity have focused on the relation between these problems and nutrient intake, but intake of specific foods is rarely considered in this regard. Most of the prior data are from Western countries, and few studies have been conducted in Middle East region and Iran. There is no investigation about the association between potato consumption and risk factors of progression of CVD such as blood pressure and obesity in adolescent and findings about the effect of low or high GI and GL diet on the top of the iliac crest (narrowest girth) by un-stretchable tape without any pressure in standing position to the nearest of 0.1 cm. BMI was calculated as weight (kg) divided by height (m) squared. Overweight and obesity were defined based on World Health Organization guidelines as BMI = 85-95th percentile and > 95th, respectively.

Systolic blood pressures (SBP) and diastolic blood pressures (DBP) were taken using a standardized mercury sphygmomanometer (Beurer BM70 Blood) on the right arm, after a 15 min rest in a sitting position. Before measuring the blood pressure, the participant was asked about drinking tea or coffee, physical activity (PA), smoking, and full bladder. The SBP was defined as the appearance of the first sound (Korotkoff phase 1), and DBP was defined as the disappearance of the sound (Korotkoff phase 5). Personal information such as age, sex, disease history, and medication use were obtained by questionnaires. For the calculation of PA, each participant wrote kind of their activities and their duration 3 days a week (2 working days and 1 holiday). Mean of PA was calculated according to below equation:

\[
PA_{\text{mean}} = \frac{\sum (\text{Time}_{\text{activity}} \times \text{MET})}{72}
\]

Where, \(PA_{\text{mean}}\) is the mean of PA, \(\text{Time}_{\text{activity}}\) is the total time (h) of each activity within 3 days (72 h), and \(\text{MET}\) is the metabolic equivalent extracted from reference table.

All statistical analyses were performed with SPSS for Windows (version 16, SPSS Inc., Chicago, IL, USA). 

Materials and Methods

In this cross-sectional study, 205 Isfahanian female students aged 11-13 years old are selected by the use of systematic sampling in May 2013. In this study, we randomly selected some regions from among all the regions of Isfahan, Iran. We selected 12 clusters. We tried to include different regions with different socioeconomic status in the present study. Then some schools were randomly chosen from selective regions. The list of students’ records was obtained from each school, and the students were randomly selected according to a computer-based random sequencing program. All students were eligible to enter this study unless they were on a specific diet. Finally, 205 adolescents completed the study. Written informed consent was taken from each student and one of her parents.

The 53-items food frequency questionnaire (FFQ) was used for assessment of usual daily intake. We randomly selected 92 subjects and evaluated the reliability of FFQ and compared nutrient consumption on two occasions. FFQ contain three kinds of potato items including boiled potato, French fries, and chips potato. Validity and reliability of this FFQ were good. Students and one of their parents were trained to fill the FFQ. All data were converted to the daily amount and gram per day.

Height was measured in a standing position by the meter to the nearest 1 cm without shoes that shoulders and heels were in a normal position. Weight was measured by Seca scales (Germany) without shoes and with minimal clothing by standard scale to the nearest 0.1 kg. Waist circumference (WC) was measured in the middle of the lowest gear and the total time (h) of each activity within 3 days (72 h), and MET is the metabolic equivalent extracted from reference table.
USA). Means continuous variables (age, height, PA, SBP, DBP were compared with independent Student's t-test and chi-square test was applied for qualitative variables (BMI, WC). Energy-adjusted distribution of nutrient intake in each frequency of potato consumption items were analyzed with ANCOVA. The relationships between dependent variables and potato consumption were examined using multiple linear regression and logistic regression analysis in crude model and after controlling for confounders such as energy intake, meat, fruit, vegetable, dairy, grain, bread, oils, rice, and PA. P < 0.0500 was considered statistically significant.

Results

Demographic characteristic of an adolescent in three kinds of potato items consumption is shown in table 1. Older adolescents consumed more potato in all kinds of potato items than young adolescents (P < 0.0500). Subjects that consumed all kinds of potato more than once per week had significantly higher prevalence of overweight and obesity as well as abdominal obesity. SBP and DBP were not significantly different among lower and higher potato consumers.

Table 2 shows the energy-adjusted (except for energy intake) distribution of nutrients intake by the frequency of potato consumption per week. Adolescents who consumed potato more than once per week had more energy intake and consumed more amount of fat, saturated fatty acid and sodium. Adolescents with higher consumption of potato intake had lower amounts of fiber, vitamin D, vitamin C, potassium, calcium, iron, magnesium, and zinc intake.

Multiple linear regression analysis showed that higher consumption of potato associated with increase the amount of BMI and WC. The significant relationships remained after adjusting for energy intake and food groups. There were no significant associations between potato consumption and SBP and DBP (P > 0.0500) (Table 3).

Table 4 shows total potato consumption more than once per week increase the risk of overweight and general or central obesity in crude and adjusted model significantly. Potato consumption did not have any significant effect on blood pressure in crude and adjusted model.

Discussion

In the present study, we found a significant positive relationship between potato consumption and general obesity and abdominal obesity in adolescent girls. It seems that a higher amount of potato consumption is related to increase prevalence of obesity. Adolescent who consumed a higher amount of potato had a lower amount of vitamins and minerals intake and higher amount of fat and energy intake. It may be one reason of increasing prevalence of obesity among potato consumers. This is the first study to investigate the association between potato consumption and obesity and blood pressure in the adolescent population.

Poor nutritional habits may be formed during the teenage years, and most nutritional habits in adults result from nutritional behaviors gained during adolescence. Nowadays, adolescents tend to consume chips potato and French fries more than before and investigation the effect of unhealthy food choices on health status is essential.16,17

Current evidence showed that high GI foods such as potato were associated with obesity. However, findings are controversial. Ludwig6 reported that high GI foods enhanced blood glucose and subsequently increased insulin secretion. Therefore, blood glucose dropped again and subsequently leads to hunger, eat more, and finally obesity. The Nurses’ Health Study investigated specific dietary and lifestyle behaviors. They found that high daily intake of some food items such as potato chips, potatoes (including boiled or mashed potatoes and French fries), French fries and boiled, baked, or mashed potatoes lead to 1.69 lb, 1.28 lb, 3.35 lb, and 0.57 lb weight gain after 4 years follow-up, respectively. They reported potato products (which are low in sugars and high in starches) had the strongest relationship with weight gain.9 Furthermore, crossover study showed that body weight and energy intake in low GI diet groups were less than high GI diet groups during 5 weeks.18

Leathwood and Pollet19 compared bean puree as low GI starch with potato as high GI starch. They showed that bean puree lead to lower plasma glucose, lower insulin levels, and finally slower return to hunger. More studies showed hyperinsulinemia after high GI foods intake promoted storage of fat, stimulate the intake of food and weight gain.20,21 These findings were also reported among children.22 Others suggested low GI diet might be effective in treating adolescent obesity.23,24 Obese teenage boys that consumed high GI breakfast and lunch had a higher score in hunger test, and their energy intake were 53% greater than a teenager with lower GI meal. Thus high GI food enhanced hunger and finally eats more.25
Table 1. Demographic characteristics of subjects that consumed all kinds of potato, boiled potato, French fries, and chips potato

| Variables          | Total potato (n = 100) | Boiled potato (n = 114) | French fries (n = 88) | Chips potato (n = 95) |
|--------------------|------------------------|-------------------------|-----------------------|----------------------|
| Age (year)         | 12.1 ± 1.0             | 12.1 ± 0.9              | 12.0 ± 1.0            | 12.0 ± 1.0           |
| Height (cm)        | 150.2 ± 7.7            | 150.4 ± 7.7             | 150.7 ± 7.7           | 150.3 ± 7.7          |
| PA (METs/day)      | 13.8 ± 4.6             | 13.6 ± 4.7              | 13.8 ± 4.9            | 13.7 ± 4.9           |
| SBP                | 115.3 ± 12.8           | 115.6 ± 12.5            | 115.2 ± 13.2          | 115.2 ± 13.0         |
| DBP                | 71.9 ± 11.0            | 72.4 ± 10.9             | 71.5 ± 11.0           | 71.6 ± 11.2          |
| BMI > 85th (%)     | 13.3 ± 2.7             | 11.9 ± 8.1              | 4.5 ± 9.5             | 4.5 ± 9.5            |
| WC > 75th (%)      | 21.8 ± 7.8             | < 0.0010                | 32.1 ± 67.9           | < 0.0010             |

*P values resulted from t-test analysis for quantitative variables and χ2 for qualitative variables; PA: Physical activity; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; BMI: Body mass index; WC: Waist circumference

Table 2. Energy-adjusted distribution of nutrient intake by frequency of potato consumption per week

| Variables          | Total potato (n = 100) | Boiled potato (n = 114) | French fries (n = 88) | Chips potato (n = 95) |
|--------------------|------------------------|-------------------------|-----------------------|----------------------|
| Energy intake (kcal)** | 2069.2 ± 807.4         | 2175.0 ± 886.1          | 2112.4 ± 799.7        | 2048.2 ± 719.1       |
| Protein (g)        | 76.0 ± 18.2            | 74.9 ± 18.1             | 75.4 ± 18.2           | 75.4 ± 18.4          |
| Fat (g)            | 77.8 ± 24.6            | 80.4 ± 24.5             | 77.6 ± 24.3           | 77.6 ± 23.3          |
| SFA (g)            | 25.4 ± 7.7             | 24.7 ± 7.7              | 24.7 ± 7.7            | 24.7 ± 7.7           |
| Fiber (g)          | 13.5 ± 0.4             | 13.2 ± 3.9              | 13.3 ± 3.9            | 13.3 ± 3.9           |
| Cholesterol (mg)   | 179.3 ± 89.2           | 159.8 ± 88.2            | 178.8 ± 88.4          | 178.8 ± 88.4         |
| Sodium (mg)        | 2412.0 ± 529.7         | 2466.0 ± 524.5          | 2398.0 ± 526.3        | 2403.0 ± 533.5       |
| Vitamin D (µg)     | 2.7 ± 2.3              | 2.5 ± 2.3               | 2.5 ± 2.3             | 2.5 ± 2.3            |
| Folate (µg)        | 60.7 ± 6.3             | 45.0 ± 7.4              | 59.3 ± 9.6            | 59.3 ± 9.1           |
| Potassium (mg)     | 230.7 ± 53.2           | 226.8 ± 52.6            | 226.9 ± 52.9          | 226.9 ± 53.6         |
| Magnesium (mg)     | 3455.0 ± 943.5         | 3153.0 ± 938.0          | 3142.0 ± 943.6        | 3140.0 ± 956.1       |
| Calcium (mg)       | 1563.0 ± 621.0         | 1436.0 ± 617.0          | 1540.5 ± 624.8        | 1434.0 ± 956.1       |
| Iron (mg)          | 9.5 ± 2.0              | 9.0 ± 2.0               | 9.5 ± 2.0             | 9.6 ± 2.0            |
| Magnesium (mg)     | 283.7 ± 68.2           | 268.4 ± 67.8            | 269.2 ± 68.1          | 284.2 ± 68.1         |

*P values are mean ± SD unless indicated (P < 0.05 was considered as significant); **P values of energy intake are resulted from t-test analysis for crude analysis and ANCOVA test was used for energy-adjusted analysis for all variables except energy intake. “ Energy was not adjusted for any variable; SFA: Saturated fatty acid; SD: Standard deviation
Table 3. Multiple linear regression analysis on the association among three kinds of potato items consumption and obesity and blood pressure

| Items                          | BMI     | WC     | DBP     | SBP     |
|-------------------------------|---------|--------|---------|---------|
|                               | B (P)   | B (P)  | B (P)   | B (P)   |
| Total potato                  |         |        |         |         |
| Crude                         | 0.07 (<0.0010) | 0.16 (<0.0010) | 0.03 (0.2300) | 0.05 (0.0900) |
| Model 1∗                      | 0.06 (<0.0010) | 0.14 (<0.0010) | 0.02 (0.5100) | 0.03 (0.3100) |
| Model 2                        | 0.03 (<0.0010) | 0.10 (<0.0010) | 0.01 (0.4200) | 0.03 (0.2300) |
| Boiled potato                 |         |        |         |         |
| Crude                         | 0.08 (<0.0010) | 0.17 (<0.0010) | 0.035 (0.1500) | 0.061 (0.0600) |
| Model 1                        | 0.06 (<0.0010) | 0.15 (<0.0010) | 0.026 (0.3600) | 0.046 (0.1900) |
| Model 2                        | 0.05 (<0.0010) | 0.15 (<0.0010) | 0.017 (0.2700) | 0.036 (0.1800) |
| French fries and chips potato |         |        |         |         |
| Crude                         | 0.09 (<0.0010) | 0.18 (<0.0010) | -0.02 (0.7200) | -0.01 (0.8800) |
| Model 1                        | 0.06 (<0.0010) | 0.13 (0.0070) | -0.04 (0.4900) | -0.05 (0.5800) |
| Model 2                        | 0.07 (<0.0010) | 0.17 (0.0010) | -0.03 (0.3800) | -0.02 (0.4900) |

*B-coefficient; values are adjusted for energy intake in Model 1 and further adjusted for meat, fruit, vegetable, dairy, grains, bread, rice, and physical activity; BMI: Body mass index; WC: Waist circumference; DBP: Diastolic blood pressure; SBP: Systolic blood pressure

Table 4. Multivariate adjusted odds ratio for being obese or central obese or having high blood pressure by frequency of total potato consumption per week

| Items                          | Total potato consumption | P       |
|--------------------------------|--------------------------|---------|
|                                | Less than once per week  | More than once per week |       |
| Overweight and obesity         |                          |         |
| Crude                          | 1.00                     | 3.15 (1.34-5.57)** | 0.0040 |
| Model 1∗                       | 1.00                     | 3.04 (1.19-5.38)   | 0.0300 |
| Model 2                        | 1.00                     | 2.91 (1.02-5.17)   | 0.0300 |
| Central adiposity              |                          |         |
| Crude                          | 1.00                     | 3.46 (1.45-5.81)   | 0.0030 |
| Model 1                        | 1.00                     | 3.22 (1.27-5.57)   | < 0.0300 |
| Model 2                        | 1.00                     | 3.01 (1.10-5.34)   | < 0.0400 |
| High blood pressure            |                          |         |
| Crude                          | 1.00                     | 2.93 (0.83-5.05)   | 0.3800 |
| Model 1                        | 1.00                     | 2.68 (0.76-4.81)   | 0.5500 |
| Model 2                        | 1.00                     | 2.81 (0.89-4.93)   | 0.7500 |

*Values are adjusted for energy intake in Model 1 and further adjusted for meat, fruit, vegetable, dairy, grains, oils, bread, rice, and physical activity in Model 2; ** OR (Confidence interval 95%); OR: Odds ratio

However, some studies did not show any preference between low GI and high GI diets on appetite and body weight, and others showed a protective effect of potato on weight gain. One long-term interventional study (4 months) in 24 subjects with impaired glucose tolerance showed that low GI diet (0.19 kg) had smaller weight loss than high GI diet (0.49 kg). Our previous study showed a negative association between higher potato consumption and weight and BMI in adult. Leeman et al. suggested potato as a protective agent to weight gain and could control appetite.

According to these inconsistent findings, several studies still prefer low GI to high GI foods. High GI foods alter fuel partitioning in order to the storage of body fat. In contrast, low-GI foods may enhance weight control, increase satiety, reduce postprandial insulin secretion, and keep insulin sensitivity. Intervention studies in humans and long-term studies in animal models have also shown that high GI starches enhance weight gain, visceral adiposity, and higher concentrations of lipogenic enzymes compare with low GI starches.

We did not find any significant association between potato consumption and blood pressure. Sloth et al. did not observe any significant differences between low and high GI diet groups in resting heart rate or SBP or DBP changes, which was similar to our findings. In contrast, a crossover trial on hypertensive participants did not show any significant effect of potato consumption on fasting plasma glucose, blood lipids, and weight gain, however, diastolic and SBP decreased significantly. Low GI diets such as dietary approaches to stop
hypertension (DASH) diet contain more fiber and nutrients, and this could be a possible reason for their beneficial effects on metabolic parameters.\textsuperscript{26}

There are a few interventional studies to assess the effects of dietary GI on CVD risk factors and available findings are controversial.\textsuperscript{12} However, some studies showed that high GI foods such as potato induced lipid profile disorders and increased risk factors of diabetes and CVD.\textsuperscript{31,32} Halton et al.\textsuperscript{12} suggested a modest positive association between the potato consumption and the risk of Type 2 diabetes in women 34-57 years of old. This association enhanced when whole grains were replaced with potatoes.

Hyperglycemia and hyperinsulinemia which usually occur after consumption of high GI foods lead to the generation of reactive oxygen species, oxidative stress, tissue damage, and endothelial dysfunction. These changes may be associated with hypertension.\textsuperscript{33,34}

These results were affected by some limitations. Due to the cross-sectional nature of the present study, causal relationship could not be concluded. Moreover, we used an FFQ consists of 53 food items for dietary assessment. Although the validity and reliability of this FFQ had been assessed, the variation of food choices might be more than 53 food items. Small sample size is another limitation. However, the sample was drawn through well-conducted random sampling, and the study finding showed statistically significant associations. However, data from large sample size studies are more credible.

**Conclusion**

Findings showed potato consumption as high GI food might increase the risk of general or abdominal obesity. However did not have any significant effect on blood pressure among Iranian adolescents.

**Acknowledgments**

We thank Isfahan University of Medical Sciences. The authors express our thankfulness to participants.

**Conflict of Interests**

Authors have no conflict of interests.

**References**

1. Bird A, Gage H, Owen C, Storey L. Understanding of blood pressure and behavioural risk factors amongst British adolescents. Public Health 2005; 119(12): 1069-79.

2. Gholami-Fesharaki M, Kazemnejad A, Zayeri F, Sanati J, Akbari H. A retrospective cohort study on factors associated blood pressure using multilevel modeling. ARYA Atheroscler 2013; 9(5): 293-9.

3. Couch SC, Saelens BE, Levin L, Dart K, Falciglia G, Daniels SR. The efficacy of a clinic-based behavioral nutrition intervention emphasizing a DASH-type diet for adolescents with elevated blood pressure. J Pediatr 2008; 152(4): 494-501.

4. Sajjadi F, Gharipour M, Mohammadifar N, Nouri F, Maghrourn M, Alikhasi H. Relationship between legumes consumption and metabolic syndrome: Findings of the Isfahan Healthy Heart Program. ARYA Atheroscler 2014; 10(1): 18-24.

5. Esmaillizadeh A, Kimiaiar M, Mehrabi Y, Azadbakht L, Hu FB, Willett WC. Dietary patterns and markers of systemic inflammation among Iranian women. J Nutr 2007; 137(4): 992-8.

6. Azadbakht L, Esmaillizadeh A. Macro and Micro-Nutrients Intake, Food Groups Consumption and Dietary Habits among Female Students in Isfahan University of Medical Sciences. Iran Red Crescent Med J 2012; 14(4): 204-9.

7. Chiu CJ, Liu S, Willett WC, Wolever TM, Brand-Miller JC, Barclay AW, et al. Informing food choices and health outcomes by use of the dietary glycemic index. Nutr Rev 2011; 69(4): 231-42.

8. Ludwig DS. Dietary glycemic index and obesity. J Nutr 2000; 130(2 Suppl): 280S-3S.

9. Mozaffarian D, Hao T, Rimm EB, Willett WC, Hu FB. Changes in diet and lifestyle and long-term weight gain in women and men. N Engl J Med 2011; 364(25): 2392-404.

10. Azadbakht L, Fard NR, Karimi M, Baghaei MH, Surkan PJ, Rahimi M, et al. Effects of the Dietary Approaches to Stop Hypertension (DASH) eating plan on cardiovascular risks among type 2 diabetic patients: a randomized crossover clinical trial. Diabetes Care 2011; 34(1): 55-7.

11. Khosravi-Boroujeni H, Mohammadifar N, Sarrafaazadegan N, Sajjadi F, Maghrourn M, Khosravi A, et al. Potato consumption and cardiovascular disease risk factors among Iranian population. Int J Food Sci Nutr 2012; 63(8): 913-20.

12. Halton TL, Willett WC, Liu S, Manson JE, Stampfer MJ, Hu FB. Potato and french fry consumption and risk of type 2 diabetes in women. Am J Clin Nutr 2006; 83(2): 284-90.

13. Salmeron J, Hu FB, Manson JE, Stampfer MJ, Colditz GA, Rimm EB, et al. Dietary fat intake and risk of type 2 diabetes in women. Am J Clin Nutr 2001; 73(6): 1019-26.

14. Rouhani MH, Mirseifeinzhad M, Omrani N, Esmaillizadeh A, Azadbakht L. Fast Food Consumption, Quality of Diet, and Obesity among Isfahani Adolescent Girls. J Obes 2012; 2012:
How to cite this article: Heidari-Beni M, Golshahi J, Esmaillzadeh A, Azadbakht L. Potato consumption as high glycemic index food, blood pressure, and body mass index among Iranian adolescent girls. ARYA Atheroscler 2015; 11 (Suppl 1): 81-7.