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Knowledge and Attitude on Cardiovascular Disease Risk Factors and Their Relationship with Obesity and Biochemical Parameters

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ABSTRACT

Background: According to the high prevalence of cardiovascular diseases (CVDs) in developing countries as well as high treatment expenses for patients and health-care systems, CVDs prevention in such societies has a great importance. One of the most effective strategies is improvement of knowledge and attitude towards the CVDs risk factors. This study aimed to evaluate the knowledge and attitude of females on CVDs risk factors and also the relationship between knowledge and attitude with obesity indices and biochemical parameters. **Methods:** This cross-sectional study was performed on 89 women with the age range of 11 to 67 y old and body mass index (BMI) of 24 to 51 kg/m^2. Participants were interviewed face to face using a valid questionnaire in order to evaluate their knowledge and attitude on CVDs risk factors. Blood sampling was implemented after 12 h of overnight fasting. Fasting blood glucose (FBG) and lipid profile were assessed by enzymatic methods. Anthropometric measurements were performed and obesity indices were calculated. **Results:** More than 70% of participants had moderate or good knowledge and attitude about CVDs risk factors. Participant's knowledge and attitude had a significant positive association with educational level and a significant reverse relationship with age, total cholesterol, LDL-cholesterol, and obesity indices. **Conclusions:** Results of this study indicated that knowledge and attitude levels on CVDs risk factors affect the obesity indices and metabolic profile. Hence, knowledge and attitude enhancement is the main target and initial step in improving life quality and preventing cardiovascular diseases.

Keywords: *Cardiovascular Diseases; BMI; Knowledge; Attitude*

Introduction

Although, at the beginning of the twentieth century, cardiovascular diseases (CVDs) were responsible for less than 10% of all mortalities in the world, recent studies have estimated that this ratio has reached to

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30% of all mortalities in the universe and approximately 80% of this rate is related to the developing countries (Mohammadi M, 2002). In 2001, CVDs was the first mortality cause in the developing world (Gaziano, 2005). According to the estimates of World Health Organization (WHO), one billion people in the world are overweight and about 300 million people are obese. These numbers can increase the incidence of type 2 diabetes (T2D) and hypertension that are accounted as the main CVDs risk factors. Combination of mentioned risk factors with some other factors such as physical inactivity, abdominal obesity, hyperlipidemia, and/or smoking, has the potential effect on increasing CVDs events.

CVDs not only reduce life quality and life expectancy of patients, but also force huge costs to the health-care system and economy of the nations. For example, in 2010, direct and indirect costs of CVDs in the United States were estimated as 444 billion dollars. Unfortunately, previous studies conducted in Iran have shown that women are more obese than men and the prevalence of obesity and overweight is greater among females than males. This could be attributed to their sedentary lifestyle, depression, or home staying (Khabazkhub M et al., 2008, Najafi S et al., 2008, Sarvghadi et al., 2007). On the other hand, some new investigations have declared that the incidence of CVDs in female population is gradually increasing, while overall mortality has been declined (Bello and Mosca, 2004, Wenger, 2004). Also, results of Framingham's study revealed that more sudden deaths occur in females because of myocardial infarction in the absence of any history of heart diseases (Muhamad et al., 2012). Considering the fact that CVD is a mortal disease, it can be prevented to a high degree by lifestyle modification. Since prevention is always better than the cure, providing preventive guidelines have an important effect.

Presenting beneficial education in the related fields such as reducing disease risk factors, making life style changes and corrections, and having healthy food choices and behaviors are some important strategies for prevention and control of CVDs. Because of the strong and direct association between education presentation methods and educational value of the presented programs by scientific substructures of each society and knowledge-based comprehensive capacities, conducting studies for evaluating basic knowledge and attitude have a great importance (Lloyd-Jones et al., 2010, Pearson et al., 2003). Results of such researches can help health-care providing officials and politicians to improve health education programs. On the other hand, these studies are crucial for providing a context in terms of evaluating the effectiveness of interventional programs and can reveal aspects of education needed to be strengthened (Talib et al., 1997, Tan et al., 1997).

According to the high prevalence of obesity among Iranian women, lack of research in this field, and the fact that women play a critical role in specifying dietary patterns and making healthy dietary selections, the present investigation was conducted to determine knowledge and attitude of females about CVDs risk factors and their relationships with obesity and biochemical parameters. It should be mentioned that, to our knowledge, the present study is the first Iranian project that not only evaluates the knowledge and attitude of females about CVDs risk factors, but also investigates the relationship between knowledge and attitude with biochemical parameters and anthropometric measurements.

Materials and Methods

Study design and participants: In this cross-sectional study (descriptive-comparative), 89 females with the age range of 11 to 67 years old and body mass index (BMI) of 24.4 to 50 kg/m^2 were selected using convenience sampling method. These participants were chosen among those referring to Sheikholraies Clinic, Tabriz, Iran. Those who met the inclusion criteria and had none of the exclusion criteria were considered for the study. People who were

pregnant, lactating, diabetic, taking lipid lowering agents, and taking drugs with an influence on the nervous system were not allowed to enter the study.

Forms and questionnaires: Demographic questionnaire was applied for collecting patients' background information. Face to face interview using validated questionnaire was used to estimate participants' knowledge and attitude about CVDs risk factors. Validation of the mentioned questionnaire was estimated and proved in a small pilot study (n = 20 and α = 0.72). Questions in each knowledge or attitude sections were related to CVDs risk factors, hypertension, and obesity.

According to the content and nature of the questions asked, the knowledge section was divided into the two separate parts. The first part was related to knowledge about CVDs and hypertension risk factors while the second part was related to knowledge about obesity risk factors.

The same method was applied for the attitude section. Finally four subgroups were defined as: I) Knowledge about CVDs and hypertension, II) Knowledge about obesity risk factors, III) Attitude to CVDs and hypertension risk factors, and IV) Attitude towards obesity risk factors. Statistical analyses were conducted once based on total scores and once for each subgroup.

Measurements: In order to reduce measuring bias, all the anthropometric measurements were performed by the same investigator, after overnight fasting, with light clothing, and without shoes. Body weight was measured to the nearest 0.1 kg using Seca scale (Seca, USA) and height was measured in relaxed position and freely hanged arms using Seca 206 Bodymeter measuring tape with wall stop to the nearest 0.5 cm. Quetelet or BMI was calculated by dividing weight (kg) by the square of height (m). Waist circumference (WC) was measured by a flexible non-stretching tape (Holton Ltd, Crymych, and Dyfed) at the level just below the lowest ribs at a normal minimal respiration to the nearest 0.1 cm. Waist to stature (WSR) ratio was also calculated by dividing WC by height (Dubey et al., 2007, Hsieh et al., 2003). BMI of 25 or greater (Singh and SG, 2008), WC of 88 cm and more (Lean and Han, 2002), and WSR of equal to or greater than 0.5 (Hsieh et al., 2003) were defined as the obesity indices.

After 12 h of overnight fasting, 5 ml of venous blood samples was collected. Serum was separated and stored at -20 °C for further analysis. Serum levels of fasting blood glucose (FBG), total cholesterol (TC), triglycerides (TG), and HDL-cholesterol (HDL-c) were analyzed by Enzymatic-Colorimetric Method and LDL-cholesterol levels (LDL-c) were estimated using Freidewald formula for TG levels less than 400 mg/dl (Kaitosaari et al., 2006). For samples with TG levels greater than 400 mg/dl, LDL-c level was estimated using Enzymatic-Colorimetric Method.

Data analyses: One-sample Kolmogorov-Smirnov *test* was conducted to establish the normal data distribution. Because all the data in this study had normal distribution, the present findings were expressed as mean ± SD or number and percentage for categorical variables. P-value of 0.05 or less was defined as the statistically significant level for comparison. Chi-Square *test* was used for determining the relationship between qualitative parameters and one-way ANOVA followed by Bonferroni's post-hoc *test* were applied for comparing the quantitative data between knowledge and attitude subgroups. Pearson's correlation coefficient was conducted to show the correlation between parametric parameters. Statistical Package for Social Sciences (SPSS), version11.5 was used for data entry and statistical analyses.

Ethical considerations: All the participants were fully informed about the study and an informed consent form was obtained from each subject in this study.

Results

Anthropometric and biochemical characteristics of the studied population are shown in **Table 1**.

More than half of the participants (62.9%) aged older than 30 years old. 34.8% of participants had primary, high, or guidance school degrees, 34.8% had diploma, and 30.3% had university degree.

Table 1. Characteristics of participants (n = 89)

Variables	Mean ± SD
Age (year)	36.2 ± 14.3
Weight (kg)	78.4 ± 12.4
Height (cm)	157.0 ± 5.4
Waist circumference (cm)	100.7 ± 13.0
Body mass index (kg/m^2)	31.8 ± 5.1
Waist to stature	0.6 ± 0.1
Fasting blood glucose (mg/dl)	91.3 ± 20.1
Triglyceride (mg/dl)	131.5 ± 77.1
Total cholesterol (mg/dl)	181.6 ± 43.5
High density lipoprotein cholesterol (mg/dl)	47.7 ± 13.7
Low density lipoprotein cholesterol (mg/dl)	111.4 ± 39.8

Based on obesity cut-offs, 94.4% of the participants were overweight and obese, 82% had WC equal or greater than 88 cm, and WSR (as index of central obesity) was high in 96.6% of participants.

According to our findings, approximately 8% of the participants had FBG more than 110 mg/dl, 25.8% had TG higher than 150 mg/dl, and 40.4% had HDL-c lower than 50 mg/dl. **Table 2** shows the total scores for knowledge and attitude based on poor, moderate, and good tertiles.

Table 2. Knowledge and attitude of study participants

Variables/Status		Poor	Moderate	Good
Knowledge				
Total	10 ± 3.3[a]	19 (21.3)[b]	36 (40.4)	34 (38.2)
Cardiovascular disease and hypertension	6.8 ± 2.7	22 (24.7)	34 (38.2)	33 (37.1)
Obese	3.3 ± 1.1	16 (18)	36 (40.4)	37 (41.6)
Attitude				
Total	26.1 ± 3.9	22 (24.7)	34 (38.2)	33 (37.1)
Cardiovascular disease and hypertension	13.7 ± 1.7	21 (23.6)	35 (39.3)	33 (37.1)
Obese	12.3 ± 3.0	24 (27.0)	33 (37.1)	32 (36.0)

[a] : Mean ± SD, [b] : Number (%)

Table 3. Comparing mean (± SD) of metabolic parameters in term of knowledge and attitude status

Knowledge & attitude category	FBG[e]	TG[f]	TC[g]	HDL - c[h]	LDL - c[i]
Knowledge (Total)					
Poor	97.9 ± 27.3	146.5 ± 56.6	202.9 ± 54.0[b,c]	45.3 ± 9.4	135.6 ± 46.0[b,c]
Moderate	93.4 ± 21.7	143.3 ± 102.0	189.0 ± 38.0	48.8 ± 16.5	117.2 ± 35.4
Good	85.5 ± 10.4	110.7 ± 48.5	161.8±34.6	48.7 ± 12.5	91.7 ± 31.2
p-value[d]	0.07	0.13	0.001	0.67	<0.001
Attitude (Total)					
Poor	94.0 ± 28.5	137.2 ± 50.4	202.5 ± 54.3[b]	50.2 ± 18.5	131.9 ± 46.9[b]
Moderate	91.5 ± 11.8	121.8 ± 49.8	185.3 ± 36.4	47.5 ± 11.2	114.5 ± 32.3
Good	89.2 ± 19.6	136.9 ± 109.4	162.8 ± 33.2	46.0 ± 11.9	93.3 ± 3.3
p-value	0.68	0.67	0.002	0.52	0.001
Knowledge (Cardiovascular disease and hypertension)					
Poor	99.2 ± 25.1	153.5 ± 50.5	212.6 ± 50.2[a,b]	45.5 ± 8.9	142.7 ± 42.5[a,b]
Moderate	89.9 ± 15.7	122.8 ± 53.2	177.6 ± 37.9	48.7 ± 17.0	107.4 ± 34.9
Good	87.5 ± 19.7	125.9 ± 106.3	165.1 ± 33.3	48.2 ± 12.8	94.2 ± 30.6
p-value	0.09	0.3	<0.001	0.68	<0.001
Knowledge (Obesity)					
Poor	103.9 ± 35.7[b]	162.3 ± 142	184.9 ± 52.6	46.0 ± 9.6	123.9 ± 42.9
Moderate	89.7 ± 15.7	133.4 ± 63.9	185.8 ± 42.3	50.2 ± 17.7	111.3 ± 41.7
Good	87.5 ± 11.4	117.5 ± 39.2	176.1 ± 41.0	45.9 ± 10.5	106.0 ± 36.3
p-value	0.01	0.15	0.60	0.36	0.32
Attitude (Cardiovascular disease and hypertension)					
Poor	87.2 ± 17.5	128.7 ± 37.4	180.4 ± 41.2	47.6 ± 21.9	113.0 ± 34.0
Moderate	94.3 ± 21.3	116.1 ± 50.5	188.5 ± 45.1	50.4 ± 09.2	113.4 ± 41.7
Good	90.8 ± 20.5	149.7 ± 11.0	175.0 ± 43.4	44.9 ± 10.6	108.2 ± 44.3
p-value	0.44	0.19	0.45	0.26	0.84
Attitude (Obesity)					
Poor	95.2 ± 28.4	143.8 ± 049.2	210.3 ± 49.3[a,b]	50.4 ± 19.4	138.3 ± 42.2[a,b]
Moderate	90.6 ± 11.9	121.9 ± 049.3	171.7 ± 38.6	47.5 ± 09.8	110.9 ± 34.2
Good	89.2 ± 19.7	132.3 ± 111.1	160.0 ± 30.3	45.9 ± 12.3	091.6 ± 31.8
p-value	0.53	0.57	<0.001	0.49	<0.001

[a]: Significant differences were found between Poor and Moderate groups, [b]: Significant differences were found between Poor and Good groups,[c]: Significant differences were found between Moderate and Good groups; [d:] One way ANOVA, [e]: Fasting blood glucose (mg/dl), [f:] Triglyceride (mg/dl), [g:] Total cholesterol (mg/dl), [h:] High density lipoprotein cholesterol (mg/dl), [i:] Low density lipoprotein cholesterol (mg/dl).

The participants' knowledge about obesity was better than knowledge about CVDs and hypertension, whereas such a difference was not observed in the acquired attitude score. More than 35% of the participants had good knowledge and attitude and less than 25% had poor total knowledge and attitude scores.

Table 4. Comparing mean (± SD) of anthropometric parameters in term of knowledge and attitude status

Knowledge & attitude category	WC (cm)[e]	BMI (kg/m^2)[f]	WSR[g]
Knowledge (Total)			
Poor	110.9 ± 9.9[b,c]	37.8 ± 4.8[a,b,c]	0.72 ± 0.1[a,b,c]
Moderate	105.4 ± 10.7	32.9 ± 3.2	0.67 ± 0.1
Good	089.9 ± 08.6	27.4 ± 2.1	0.57 ± 0.05
P-value	<0.001	<0.001	<0.001
Attitude(Total)			
Poor	112.3 ± 10.1[a,b]	36.4 ± 4.9[a,b,c]	0.72 ± 0.1[a,b]
Moderate	098.2 ± 12.6	31.7 ± 4.2	0.62 ± 0.1
Good	94.6 ± 9.7	28.6 ± 3.2	0.60 ± 0.1
P-value	<0.001	<0.001	<0.001
Knowledge(Cardiovascular disease and hypertension)			
Poor	110.2 ± 9.6[b,c]	37.4 ± 4.7[a,b,c]	0.72 ± 0.06[a,b,c]
Moderate	105.3 ± 10.9	32.8 ± 3.0	0.67 ± 0.07
Good	89.6 ± 8.5	28.2 ± 2.1	0.57 ± 0.05
P-value	< 0.001	< 0.001	< 0.001
Knowledge (Obesity)			
Poor	110.0 ± 12.3[b,c]	35.2 ± 5.9[b.c]	0.70 ± 0.08[b,c]
Moderate	103.2 ± 11.7	32.7 ± 4.4	0.66 ± 0.08
Good	94.2 ± 11.4	29.6 ± 4.4	0.60 ± 0.08
P-value	<0.001	<0.001	<0.001
Attitude(Cardiovascular disease and hypertension)			
Poor	108.2 ± 10.6[a,b]	33.9 ± 4.1[b]	0.69 ± 0.07[a,b]
Moderate	99.3 ± 13.3	32.4 ± 5.8	0.63 ± 0.09
Good	97.5 ± 12.7	29.9 ± 4.4	0.62 ± 0.08
P-value	< 0.01	0.01	<0.01
Attitude (Obesity)			
Poor	111.4 ± 10.3[a,b]	36.3 ± 5.1[a,b,c]	0.71 ± 0.07[a,b]
Moderate	111.4 ± 10.3[a,b]	36.3 ± 5.1[a,b,c]	0.71 ± 0.07[a,b]
Good	93.9 ± 9.6	28.5 ± 3.5	0.60 ± 0.07
P-value	<0.001	<0.001	<0.001

[a]: Significant differences were found between Poor and Moderate groups, [b]: Significant differences were found between Poor and Good groups,[c]: Significant differences were found between Moderate and Good groups; **[d]:** One way ANOVA, [e]: Waist circumference (cm)**, [f]:** Body mass index (kg/m^2)**, [g]:** Waist to stature.

Levels of total and subgroup scores for knowledge and attitude had a positive correlation with all the obesity indices, while this correlation was not found for biochemical parameters in knowledge or attitude subgroups and only total obtained scores for knowledge and attitude had a significant correlation with TC and LDL-c.

We also assessed the correlation between biochemical and anthropometric parameters and found that BMI was correlated with WC ($r = 0.80$, $P < 0.001$), WSR ($r = 0.84$, $P < 0.001$), TC and LDL-c ($r = 0.35$, $P < 0.001$), and FBG ($r = 0.26$,

P = 0.01). WSR was correlated with LDL-c (r = 0.32, *P* < 0.001) and TC (r = 0.27, *P* = 0.01). WC had a significant correlation with LDL-c (r = 0.29, *P* < 0.001) and TC (r = 0.22, *P* = 0.004). FBG was correlated with TG (r = 0.48, *P* = 0.02) and its correlation with TC was marginal (r = 0.17, *P* = 0.06). Knowledge and attitude scores had a significant reverse association with the age of participants (r = -0.05, *P* = 0.002 and r = -0.09, *P* = 0.001, respectively) which means that older participants had a lower knowledge and attitude scores. It should be mentioned that 52.8% of participants chose multimedia (such as television, radio, newspaper, or Internet) as the main sources of information about CVDs, hypertension, and obesity; fifty seven percent selected physicians and nutritionists as the main sources of information, and 4.5% chose family members and friends as the main sources of knowledge and attitude.

Discussion

This study aimed to evaluate the knowledge and attitude of females toward CVDs risk factors and their relationship with obesity indices and biochemical parameters. It was found that most of the participants in this cross-sectional study were overweight and obese; only 8% of them had FBG above 110 mg/dl and prevalence of higher serum TG and lower HDL-c were 25.8% and 40.4%, respectively. More than 70% of the participants could acquire good and moderate knowledge and attitude scores in terms of CVDs, hypertension, and obesity. The most important result of this study was the significant correlation between anthropometric measurements, knowledge, and attitude scores, representing that the prevalence of obesity and overweight in people with more knowledge and better attitude was less than the poor ones. This finding has been approved by other studies, representing that increased knowledge can lead to changes in nutritional behaviors (Sajjadi et al., 2008, Variyam et al., 1996). The study conducted by Lynch et al., showed that obesity and overweight in the participants with good knowledge about obesity (as a risk factor of CVDs) was less than those with poor knowledge (Lynch et al., 2006). Also, our study found a significantly negative relationship between the participants' age and their acquired scores for knowledge and attitude, while Jalali et al., found the opposite results in their study on knowledge and attitude among the citizens of Babol (Jalali F et al., 2004). They found that older people had good knowledge (but not attitude) about CVDs risk factors.

Another difference between these two studies was in their final scores acquired for knowledge and attitude so that, in the present study, 21.3% of the participants had poor knowledge and 24.7% had poor attitude about CVDs risk factors; however, in the previous work, approximately 65.3% of the participants had poor knowledge and 53.7% had poor attitude. It seems that the observed differences may be related to socio-economic or cultural diversity of the studied populations as well as the subject selection centers so that the presence of people in such centers can affect the knowledge or attitude of participants.

It should be emphasized the impact of socio-demographic variables on the knowledge and attitude levels. In this study, the significantly positive relationship between educational status and knowledge and attitude of the participants was observed; this finding was in the same line with the findings of other studies representing that knowledge of teachers or health workers about CVDs risk factors was higher than other participants (Khani et al., 2003, Mahbub S et al., 1999). Several studies have demonstrated that knowledge about CVDs risk factors is higher in the patients with cardiovascular diseases (Pancioli et al., 1998, Reeves et al., 2002, Schneider et al., 2003); but, this finding was not supported in the present research. Also, familial history of the participants was not related to their knowledge or attitude levels.

Finally, a significant relationship was illustrated between knowledge and attitude so that enhanced knowledge about CVDs was parallel to positive attitude (and vice versa), as it was proved by other studies (Holloway, 1996, Mohammadi M et al., 2002). This finding emphasized the need of

knowledge enhancement for the better attitude creation.

The present study was the first Persian study that could estimate the correlation between knowledge and attitude with biochemical assessments in case of cardiovascular risk factors, but also had some limitations. First, the cross- sectional design of the study didn't permit to estimate the effects of changes in knowledge and attitude levels on biochemical and anthropometric parameters. Second, the relatively small sample size that can affects the results of study and finally, lack of multiple analyses by controlling the effects of confounders on the obtained results.

Conclusions

It could be concluded from this study that enhanced knowledge and attitude levels have an important role in preventing obesity and hypercholesterolemia in human population. Thus, knowledge enhancement through training interventional programs is the key target for preventing and managing cardiovascular diseases and their risk factors.

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Author contributions

Toupchian O and Norouzi A participated to conception and design of study, managing the project and drafting the manuscript. Abdollahi S, Samadi M and Zeinali F participated to acquisition of data, data analysis and drafting the manuscript. HonarkarShafie E and Farsad Naeimi A participated to laboratory evaluation and drafting the manuscript. All authors read manuscript and they finally approved it.

Conflicts of Interest

The authors of this paper have no conflicts of interest to disclose.

References

Bello N & Mosca L 2004. Epidemiology of coronary heart disease in women. *Progress in cardiovascular diseases.* **46 (4)**: 287-295.

Dubey S, et al. 2007. Serum leptin levels in obese Indian children relation to clinical and biochemical parameters. *Indian pediatrics.* **44 (4)**: 257.

Gaziano TA 2005. Cardiovascular disease in the developing world and its cost-effective management. *Circulation.* **112 (23)**: 3547-3553.

Holloway A 1996. Patient knowledge and information concerning medication on discharge from hospital. *Journal of advanced nursing.* **24 (6)**: 1169-1174.

Hsieh S, Yoshinaga H & Muto T 2003. Waist-to-height ratio, a simple and practical index for assessing central fat distribution and metabolic risk in Japanese men and women. *International journal of obesity.* **27 (5)**: 610-616.

Jalali F, Haji Ahmadi M, Hosseinpour M, Angari M.Z & E A 2004. Knowledge, attitude and practice (KAP) of people living in Babol about clinical symptoms and risk factors of coronary artery diseases (CAD). *Journal of Babol University of medical sciences.* **6 (1))**: 43-49. (In Farsi)

Kaitosaari T, et al. 2006. Low-saturated fat dietary counseling starting in infancy improves insulin sensitivity in 9-year-old healthy children: the Special Turku Coronary Risk Factor Intervention Project for Children (STRIP) study. *Diabetes Care.* **29 (4)**: 781-785.

Khabazkhub M, Futuhi A, Hashemi H & K M 2008. Obesity and overweight in Tehran Population. *Iranian Journal of Diabetes and Lipid Disorders.* **7 (3)**: 315-324.

Khani M, Kazemi M & Javanshir S 2003. The awareness rate of the symptoms and risk factors of coronary artery disease in over 20- year- old urban population in Zanjan. *Journal of Qazvin of university of medical sciences.* **6 (4)**: 50-54.. (In Farsi)

Lean M & Han T 2002. Waist worries. *American Journal of Clinical Nutrition.* **76 (4)**: 699.

Lloyd-Jones DM, et al. 2010. Defining and setting national goals for cardiovascular health promotion and disease reduction the American Heart Association's Strategic Impact Goal through 2020 and beyond. *Circulation.* **121 (4)**: 586-613.

Lynch EB, Liu K, Kiefe CI & Greenland P 2006. Cardiovascular Disease Risk Factor Knowledge in Young Adults and 10-year Change in Risk Factors The Coronary Artery Risk Development in Young Adults (CARDIA) Study. *American journal of epidemiology.* **164 (12)**: 1171-1179.

Mahbub S, Alipour B, Areff Hosseini S, Kushavar H & S A 1999. Knowledge, Attitude and practice of official workers in Tabriz about nutritional factors which are effective in incidence of Atherosclerosis. *Scientific Journal of Tabriz University of Medical Science.* **1 (2)**: 10-18.

Mohammadi M, Dustkami H, Dadkhah B & H S 2002. Knowledge, Attitude and practice of Ardabil population about risk factors of CHD. *Ardabil Journal of Medical Sciences 2002.* **2 (2)**: 42-48.

Muhamad R, Yahya R & Yusoff HM 2012. Knowledge, attitude and practice on cardiovascular disease among women in North-Eastcoast Malaysia. *Int J Collaborative Res Int Med Public Health.* **4 (1)**: 85-98.

Najafi S, Momennasab M & MJ T 2008. Prevalence of Obesity and Overweight in Khoram Abad Population over Ages 25-64 in 2006. *Iranian Journal of Diabet and Lipid.* **8 (2)**: 167-176.

Pancioli AM, et al. 1998. Public perception of stroke warning signs and knowledge of potential risk factors. *Jama.* **279 (16)**: 1288-1292.

Pearson TA, et al. 2003. American Heart Association guide for improving cardiovascular health at the community level a statement for public health practitioners, healthcare providers, and health policy makers from the American Heart Association Expert Panel on Population and Prevention Science. *Circulation.* **107 (4)**: 645-651.

Reeves MJ, Hogan JG & Rafferty AP 2002. Knowledge of stroke risk factors and warning signs among Michigan adults. *Neurology.* **59 (10)**: 1547-1552.

Sajjadi F, et al. 2008. : Nutritional knowledge attitude and practice of health professionals about cardiovascular diseases. *Journal of Birjand University of Medical Sciences.* **15 (2)**: 65-72.

Sarvghadi F, et al. 2007. Prevalence of obesity in subjects aged 50 years and over in Tehran. *Iranian Journal of Endocrinology and Metabolism.* **9 (1)**: 99-104.

Schneider AT, et al. 2003. Trends in community knowledge of the warning signs and risk factors for stroke. *Jama.* **289 (3)**: 343-346.

Singh L & SG G 2008. Body Mass Index and Obesity: Tailoring "cut-off" for an Asian Indian Male Population. *MJAFI.* **64**: 350-353.

Talib R, Ali O, Arshad F & Kadir KA 1997. The effectiveness of group dietary counselling among non insulin dependent diabetes mellitus (NIDDM) patients in resettlement scheme areas in Malaysia. *Asia Pacific journal of clinical nutrition.* **6 (2)**: 84-87.

Tan A, Yong L, Wan S & Wong M 1997. Patient education in the management of diabetes mellitus. *Singapore medical journal.* **38 (4)**: 156-160.

Variyam JN, Blaylock J & Smallwood DM 1996. Modelling nutrition knowledge, attitudes, and diet-disease awareness: the case of dietary fibre. *Statistics in medicine.* **15 (1)**: 23-35.

Wenger NK 2004. You've come a long way, baby: cardiovascular health and disease in women: problems and prospects. *Circulation.* **109 (5)**: 558-560.