



Original Research

Cardiovascular Disorders and Dietary Total Antioxidant Capacity among General Public Aged 25-50years, A Cross-Sectional Study in Rawalpindi and Islamabad, Pakistan.

UmeHabiba Johar^{a*}, Qandeel Tahir^b

^{a*}Al-Shifa School of Public Health, PIO, Al-Shifa Trust Eye Hospital, Quaid-e-Azam University Islamabad Pakistan

^bAl-Shifa School of Public Health, Al-Shifa Trust Eye Hospital, Rawalpindi.

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Abstract

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Correspondence:
umehabiba25@gmail.com

Keywords: Antioxidants;
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Background: Cardiovascular diseases are increasing rapidly while there is increasing evidence about dietary antioxidants protecting oxidative stress in chronic disorders including cardiovascular diseases.

Primary Study Objective: The objectives of the study were to find out proportion of Dietary Total Antioxidant Capacity consumed by individual's aged 25-50 years with cardiovascular disease residing in Rawalpindi and Islamabad, Pakistan and determining relationship between Dietary Total Antioxidant Capacity and cardiovascular disorders of population under study. **Methods/Design:** Descriptive cross-sectional study

Setting: Famous malls and parks of twin cities of Pakistan.

Participants: A cross sectional study with 227 participants was carried out, majority of the participants 61.2% were males and were in the age range 25-37 years.

Primary Outcome Measures: Adapted Food frequency questionnaire (FFQ) was implemented after checking reliability.

Results: Major contributor in Daily DTAC consumption was coffee with 14.44% of daily consumption. Chi-square test of association was run at 95% confidence interval which showed that low dietary intake of antioxidants was significantly associated with presence of cardiovascular diseases ($\chi^2 = 5.122$ (1), p-value 0.024). Being overweight (as observed) was also found significantly associated with low intakes of dietary antioxidants ($\chi^2 = 16.837$ (3), p-value 0.001).

Conclusion: Study results concluded that individuals aged 25-50 years with CVDs fall in category "1" of Low dietary antioxidant intake and if the DTAC values could be increased that would have a preventive effect for CVDs.



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Introduction

Worldwide Non-communicable diseases (NCDs) are the root cause of disease and death¹. Prevention is better than cure” is a well-known proverb^{2, 3}. The prime focus of public health is prevention⁴ lack of health care facilities and less emphasis on preventive side of medicine is affecting developing countries more severely³. Public health interventions and action should focus on prevention. It is need of hour for Health system to re-establish medical practice back to preventive⁵ measures. It is said that 80 percent of disease burden now a days is due to NCDs becoming the cause behind every 7th death out of 10 in developing nations. Cardiovascular disorders, chronic respiratory problems, cancer and diabetes are considered to be the major cause³ of these deaths.

Cardiovascular complaints are constantly aggravating and proving to be the major cause of global deaths⁶. Around 80-86% of this mortality is occurring within low- and middle-income countries. Many South Asian countries including Pakistan make up for about quarter LMICs and are found to have aggravated risk of Coronary heart diseases in comparison with other parts of the world.³

Health and diet relationship have always been significant while dietary antioxidants role in health has caught specific attention. Bioactive compounds in dietary components are antioxidants in broader term. Dietary antioxidants Beta carotene, Vitamin E and Vitamin C are studied the most. Dietary antioxidants decrease pro-oxidant postprandial effect by delaying inflammation onset and are considered helpful in decreasing risk of cardiovascular disorders⁷.

Oxidative stress can damage cell functioning and possibility of ultimately leading to cell death. Oxidative stress can be a major factor towards chronic diseases⁸. It is established now that Carbohydrates and fat specially coupled with less intake of antioxidants lead to risk of atherosclerosis⁹. A meal with high fat content can cause increase in cardiovascular disease risk factors linked to obesity. Fat rich diet instigates a strong response of inflammation process¹⁰.

Various epidemiological studies have shown that there exists an inverse relationship between risk factors of cardiovascular problems¹¹ and intake of diet rich in dietary antioxidants. Dietary TAC represents total antioxidant compounds and interactions that occur between those compounds in a food. Dietary TAC has shown itself to be a universal measure for measuring dietary antioxidant which have strong ability to reduce various risk factors of cardiovascular disease.¹ For using Dietary TAC (DTAC) in a study a reliable instrument for assessment is a Food Frequency Questionnaire (FFQ)¹². In 2016 Pakistan Health Research Council determined that NCDs risk factors in Pakistan are increasing. Data shows poor diet and less physical exertion are one of the main determinants of CVD. INTERHEART study consisting of 52 countries selected world widely including Asia also identified Lack of fruits and vegetables, lack of exercise to be Two of NINE Modifiable Contributors causing acute myocardial infarction (AMI) which ultimately causes CVD. 41 % of adult population in Pakistan is estimated to be

hypertensive, 17.3 % to have high cholesterol while 2.8 % suffer from dyslipidemia and stroke³. According to a recent study 17.5 % of studied population in Punjab Province is affected by CVDs¹³.

Pakistan is currently facing double burden of disease³ in the form of communicable and non-communicable diseases which is a reason of dearth of data availability for CVDs prevalence. For the same reason probably, less research has been done for finding an association of dietary total antioxidant capacity with CVDs within our country. So, the objectives of this study were to find out Proportion of Dietary Total Antioxidant Capacity consumed by individual's aged 25-50 years with cardiovascular disease residing in Rawalpindi and Islamabad, Pakistan and to determine relationship between Dietary Total Antioxidant Capacity and cardiovascular diseases of population under study.

Methodology

A cross sectional study was conducted by making two clusters of famous malls and parks within twin cities i.e. Rawalpindi and Islamabad, Pakistan. Inclusion criteria for the participants was set at an age range of 25-50 years, both genders were included with minimum of 12 years of education and having less than three co-morbidities. Using Open-epi software, total number of respondents was calculated to be 227, considering prevalence of CVDs as 17.5 % in Punjab Province¹⁴. These respondents were then approached by non-probability consecutive sampling. The study was completed in six months from Jan 2021- to June 2021.

Data Collection Procedure:

Dietary total antioxidant was calculated on the basis of adapted semi quantitative food frequency questionnaire which is considered as a reliable tool to measure DTAC. Ethical approval was taken from Institutional Review Board and informed consent was taken from participants. Cronbach's alpha was found to be 0.765. It was self-administered, pilot tested and then given to the selected number of respondents. Questionnaire was used for a Seven (07) day recall in order to overcome recall bias.

Data Analysis Procedure:

After data collection in the form of semi quantitative FFQ, TAC values based upon ORAC or FRAP analysis were given to each food item consumed. Reported food frequencies were converted into Daily intake in grams by using household measures (e.g 1 slice of bread=40gm, ½ cup of cooked rice =75 gm)¹. Afterwards they were converted into standard serving size per 100gm for all food items.

Daily intake of food was multiplied with assigned TAC values to get value for Dietary Total antioxidant capacity (DTAC). Sum of all daily TAC from all food items was considered as Daily DTAC consumed¹². Percentage contribution of TAC was calculated as follows¹³.

$$\% \text{ Contribution of TAC} = \frac{\text{Contribution of TAC (f)}}{\text{Contribution of TAC (all foods)}}$$

Initially Daily DTAC was kept as a continuous variable. It was converted to categorical variable measured on 4-point Likert scale by setting Median as cut off point for further analysis. For applying Chi-square Daily DTAC

was converted into binary variable keeping median as cut off point. Finally, Chi-square test of significance was applied to check for relationship among dietary total antioxidant capacity, cardiovascular diseases and other independent variables using SPSS. Means and SDs were reported for continuous variables while percentages were reported for categorical variables. P- Value <0.05 was considered significant for all values that were reported.

Results

A total of 250 respondents were contacted for this study. Out of which 227 were considered for further data analysis, rest were discarded because of incomplete or incorrect information (selected two options for same question) given in the questionnaire.

Out of all respondents 61.2 % were male and 38.8 % were female. Majority of the respondents around 60.8% were in the age range of 25-37 years while 39.2% were in age range of 38-50 years and 58.2% respondents participated were found to be overweight as observed.

Assigned TAC values based upon ORAC (mmol TE/100g) or FRAP (mmol Fe²⁺/100 g) was multiplied with Daily intake values to calculate dietary total antioxidant capacity (DTAC). Individual food contribution was calculated in percentages. In individual categories coffee alone was found to be the major contributor in daily dietary antioxidant consumed with percentage of 14.44%. Raisins with 10.42 % were the major individual contributors of daily dietary TAC consumed within fruit group. As a whole food group fruit food group with the percentage of 48.09 % was found to be the major contributor in Daily DTAC with apples and strawberries to have the main contribution with percentages of 8.07 % and 6.74 %.

Daily DTAC was computed by adding up all the dietary total antioxidant capacity (DTAC) values in SPSS. Median of Daily Dietary total antioxidant capacity (Daily DTAC) was found to be 61. Keeping 61 (Median) as cut off point Daily DTAC was scored on 4-point Likert scale of being Low (1), Moderate (2), Moderately High (3) and High (4). Category "1" on 4 – point Likert scale was found to have highest frequency of 114 and percentage of 50.22%, Fig 1.

Chi-Square test with 95 % confidence interval was applied to check for relationship among daily dietary total antioxidant capacity, Heart related problems, age, gender, education, physical appearance, diabetes and family history of heart diseases. For this purpose, Daily DTAC was transformed into binary variable using Median (61) as a cutoff point. So, category "1" was labeled as "Low Daily DTAC" included all values ranging from 1-61 while values above median were included in category "2" labeled as "Medium to High Daily DTAC". One of the reasons for this categorization was the maximum number of respondents falling in category "1 (Low, 114 (50.22%)" of Likert scale. Independent categorical variable of "Heart related problems" and continuous variable of "Age" were transformed into binary variables for analysis purpose.

Results revealed that Low dietary intake of antioxidants was significantly associated with presence of cardiovascular diseases ($\chi^2 = 5.122$ (1), p-value 0.024). Being overweight (as observed) was also found significantly associated with low intakes of dietary

antioxidants ($\chi^2 = 16.837$ (3), p-value 0.001). Results of Chi square test of association along with degree of freedom (df) and P- value are mentioned in Table 1.

Discussion

Results of the current study showed that Low dietary total antioxidant capacity was found associated with increased prevalence of hypertension and angina. In the current study it was found out that 69.2 % of people who were hypertensive or 20.3 % of individuals with Angina were found to have Low Daily Dietary intake of antioxidants. Another point of concern revealed was that coffee alone contributed around 14.44 % of Daily DTAC consumed by respondents which predicts increased intake of caffeine whose excess has its consequences on overall health. Fruits as a whole food group were major Daily DTAC contributions with 48.09 % percent only which is medium level contribution and thus points toward prevalence of unhealthy dietary habits with low antioxidant intake in daily routine among the respondents.

Significant association was also found between weight and Daily DTAC of the respondents as 58.2 % of respondents were observed to be overweight. Being overweight is another unhealthy indicator of the study which consequently corresponds to unhealthy dietary patterns including decreased intake of dietary antioxidants.

Despite having significant association between cardiovascular problems and intake of dietary antioxidants, the most important limitations are recall duration of last one week which may not be indicative of routine dietary pattern. Secondly diet information is self-reported which cannot be regarded as fully accurate because of recall bias. In this study TAC of dietary supplements is not included because of less data available on dietary supplements.

Conclusion

Study results concluded that individuals aged 25-50 years with CVDs fall in category "1" of Low dietary antioxidant intake and if the DTAC values could be increased that would have a preventive effect for CVDs. Further research and studies with larger sample size and broader aspect should be conducted to check for any causal association between dietary antioxidants and CVDs in Pakistan. Statistical evidence should be enhanced for establishing significance of dietary antioxidants as a preventive factor of CVDs.

References

1. Farhangi MA, Najafi M. Dietary total antioxidant capacity (TAC) among candidates for coronary artery bypass grafting (CABG) surgery: Emphasis to possible beneficial role of TAC on serum vitamin D. *PLoS One*. 2018;13(12):1-13.
2. Abshirini M, Siassi F, Koohdani F, et al. Dietary total antioxidant capacity is inversely associated with depression, anxiety and some oxidative stress biomarkers in postmenopausal women: a cross-sectional study. *Ann Gen Psychiatry*. 2019;18 (1):1-9.
3. Barolia R, Sayani AH. Risk factors of cardiovascular disease and its recommendations in Pakistani context. *J Pak Med Assoc*. 2017;67(11):1723-1729.
4. Prior RL. Oxygen radical absorbance capacity (ORAC): New horizons in relating dietary antioxidants/bioactives and health benefits. *J Funct Foods*. 2015;18:797-810. doi:10.1016/j.jff.2014.12.018
5. Adams R. Prevention is better than cure: Tackling non-communicable diseases in developing countries by focusing on prevention. *Perspect Public Health*. 2015;135(3):121-122.

6. Prior RL, Wu X. Diet Antioxidant Capacity: Relationships to Oxidative Stress and Health. *Am J Biomed Sci*. Published online 2013:126-139.
7. Liaquat A, Javed Q. Current Trends of Cardiovascular Risk Determinants in Pakistan. *Cureus*. 2018;10(10).
8. Burton-Freeman B. Postprandial metabolic events and fruit-derived phenolics: A review of the science. *Br J Nutr*. 2010;104(SUPPL.3).
9. Peluso I, Morabito G, Urban L, Ioannone F, Serafi M. Oxidative Stress in Atherosclerosis Development: The Central Role of LDL and Oxidative Burst. *Endocrine, Metab Immune Disord Targets*. 2012;12(4):351-360.
10. Wang Y, Chun OK, Song WO. Plasma and dietary antioxidant status as cardiovascular disease risk factors: A review of human studies. *Nutrients*. 2013;5(8):2969-3004.
11. El Kinany K, Garcia-Larsen V, Khalis M, et al. Adaptation and validation of a food frequency questionnaire (FFQ) to assess dietary intake in Moroccan adults. *Nutr J*. 2018;17(1):1-12.
12. Kim SA, Joung H, Shin S. Dietary pattern, dietary total antioxidant capacity, and dyslipidemia in Korean adults. *Nutr J*. 2019;18(1):1-12.
13. Kobayashi S, Murakami K, Sasaki S, et al. Dietary total antioxidant capacity from different assays in relation to serum C-reactive protein among young Japanese women. *Nutr J*. 2012;11(1):1.
14. Zubair, F., Nawaz, S.K., Nawaz, A. *et al*. Prevalence of cardiovascular diseases in Punjab, Pakistan: a cross-sectional study. *J Public Health (Berl.)* . 2018; 26: 523–529.

Table 1: Association between Daily DTAC values and Demographic Variables

Sr.No	Independent Variables	Daily DTAC		Chi-square	df	P-Value
		1-61* (Low Daily DTAC)	Above 61 * (Medium to High Daily DTAC)			
1.	Heart related Problem					
	1. BP, Angina (Mild-Moderate)	114(55.3 %)	92(44.7 %)	5.122	1	0.024*
	2. Car. arrest, Capillary Prob (Severe)	17(81.0%)	4.0(19.0%)			
2.	Age					
	1. 25-37	80(58.0 %)	58(42.0 %)	0.010	1	0.921
	2. 37-50	51(57.3 %)	38(42.7 %)			
3.	Gender					
	1. Male	77(55.4 %)	62(44.6 %)	1.405	2	0.495
	2. Female	53(60.9 %)	34(39.1 %)			
4.	PAAO					
	1. Normal	17(63.0 %)	10(37 %)	16.837	3	0.001*
	2. Underwt	38(79.2 %)	10(20.8 %)			
	3. Overwt	62(47 %)	70(53.0 %)			
	4. Obese	14(70.0 %)	06(30 %)			
5.	Education					
	1. HSSC	12(75.0%)	4(25.0%)	5.237	3	0.155
	2. Graduate	53(63.9 %)	30(36.1 %)			
	3. Masters	42(51.2 %)	40(48.8 %)			
	4. Mphil/PHD	24(52.2 %)	22(47.8 %)			
6.	Diabetes					
	1. Yes	28(57.1 %)	21(42.9 %)	0.008	1	0.928
	2. No	103(57.9 %)	75(42.1 %)			
7.	Family History					
	1. Yes	54(51.9 %)	50(48.1 %)	2.633	1	0.105
	2. No	77(62.6 %)	46(37.4 %)			

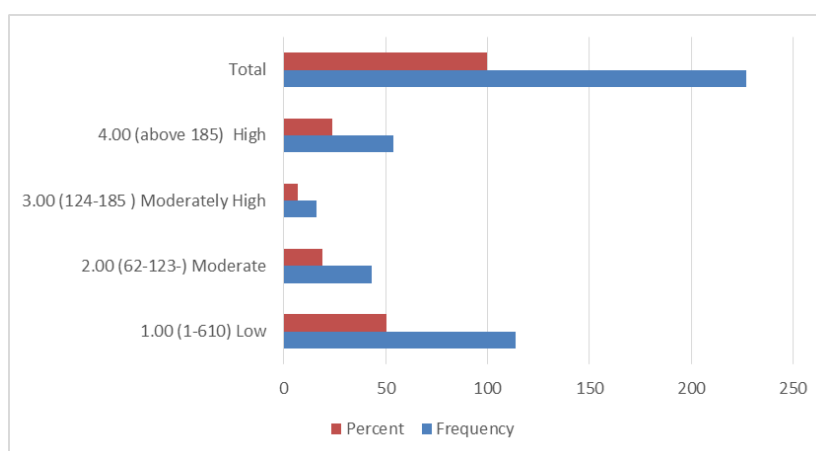


Figure 1: Daily Dietary total antioxidant capacity (Daily DTAC)