

Original article

Study of association of high fiber diet to blood Pressure & cardiac risk ratio – A case control study

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Abstract:

Introduction – Consumption of high fiber diet can be effective in controlling hypertension & reducing cardiovascular risk. Cardiac risk ratio (CRR) has a better predictive power of cardiovascular disorders. Hence this study was designed to know the association of high fiber diet to blood pressure & CRR.

Material and Methodology – 255 subjects visiting K. J. Somaiya Hospital, were interviewed, out of which 150 subjects were selected & divided into four groups, namely high fiber consuming and low fiber consuming men & women. The systolic & diastolic blood pressure was measured. 12 hrs. fasting venous blood samples of the subjects were collected & analyzed for total & HDL cholesterol. The percent prevalence of subjects having hypertension & CRR >5 was determined in each group. The odds ratio was calculated, to find the association of high fiber consumption to hypertension and to CRR.

Observations & Results – Amongst the 120 men & 135 women interviewed, only 28.3 % men & 28.8 % women were found to be regularly consuming high fiber diet. There is a higher prevalence of CRR > 5 in men (14.71%) & women (19.34%) amongst low fiber consuming compared to high fiber diet group. Also a higher prevalence of hypertension observed in males (5.89%) & female (21.92%), consuming low fiber than high fiber diet. The odds ratio was significant, indicating an association between high fiber consumption & hypertension in women.

Conclusion – Consumption of high fiber diet regularly is effective in preventing hypertension & reduces cardiovascular risk.

Keywords: Dietary fiber, Hypertension, Cardiac risk ratio.

Introduction:

In the present day changing lifestyle, it is necessary to understand that a simple, low cost habit of consumption of salad regularly can be effective in controlling hypertension & reducing cardiac risk, as salads add high fiber content to the diet. Hypertension or high blood pressure is defined as systolic blood pressure of greater than 140 mmHg or diastolic blood pressure greater than 90 mmHg or both ⁽¹⁾Hypertension is the third risk factor for death from cardiovascular disease, together with LDL-cholesterol and smoking, which is called the silent

killer. Besides, hypertension is the major risk factor for stroke and renal dysfunction. ⁽²⁾ Epidemiological studies suggest that consumption of fruit, vegetables may protect against high blood pressure. ^(3,4,5,6) Vegetables, fruits may decrease blood pressure due to presence of phytochemicals. ^(7,8) Phytochemicals are the functional nonnutrient food factors, found in vegetables and fruits and are effective for health promotion and disease prevention. ^(7,8,9) Phytochemicals like anthocyanidins, reseratro lutein, lycopene, β -carotene, isoflavones are present in berries, radish, spinach, lettuce, tomato, pumpkin,

carrot, exert a positive effect on heart & blood vessel health. ⁽¹⁰⁾ Cardiac risk ratio (CRR) means Total Cholesterol : HDL Cholesterol ratio. CRR has a better predictive power of cardiovascular disorders than the individual parameter. ⁽¹¹⁾ Hence this study was designed to know the association of high fiber diet to blood pressure & CRR. This epidemiological study can be useful to prevent future CAD by counseling patients about taking salads in their diet for therapeutic lifestyle changes.⁽¹²⁾

Aims & Objectives : To study the effect of consumption of high fiber diet on blood pressure & cardiac risk ratio in men & women.

Material and Methods :

Out of 255 subjects interviewed, 150 subjects (75 males & 75 females) visiting K. J. Somaiya Hospital, were enrolled in this cross – sectional study during August 2013 to June 2014. The age of the participants ranged between 25 yrs. to 70 yrs. A convenient sampling method was used. A protocol for study was approved by the ethics committee of K. J. Somaiya Medical College & Hospital. A written consent of the participants was obtained before commencement of the study. The patients having Diabetes mellitus, hypo & hyper thyroidism, Nephritis, Liver diseases, Pancreatitis, Pregnancy and Malnutrition were excluded from the study. Those, taking salad in their diet occasionally & not regularly were also excluded from the study. The information about dietary habits was collected in a pre-validated questionnaire. The demographic information of the

Results:

Table 1 : Characteristics of study population

Characteristics	High fibre diet	Low fibre diet
Male, Age in years (mean+SD)	46.09 ± 13.3	45.68 ± 17.7
Female, Age in years (mean+SD)	45.10 ± 11.7	42.48 ± 10.1
Male, (n)	34	34
Female, (n)	39	33

participants was also gathered in a pre-validated format. The participants were divided in to four groups, namely high fiber consuming men & women and low fiber consuming men & women. Those who include salad in their everyday diet were considered as high fiber consuming. Those who never consume salad in the diet were considered as low fiber consuming. A measurement of systolic blood pressure (SBP) & diastolic blood pressure (DBP) was carried out using deluxe sphygmomanometer for each subject between 9 am to 11 am as per the routine clinical procedure. The 12 hrs. fasting venous blood samples of the subjects were collected in plain bulb. The serum was separated within 2 hrs. of the collection & then analyzed using a fully automated Biochemistry analyzer Chemwell P2900 series, manufactured by Awareness Technology, Florida, USA. The serum total cholesterol concentration was determined by enzymatic colorimetric assay using reagents supplied by Siemens.

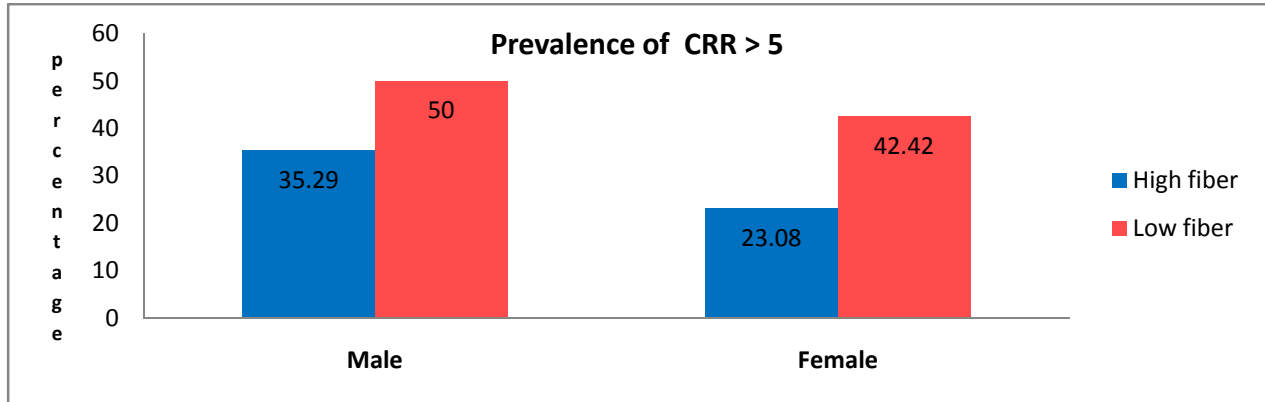
The HDL cholesterol concentration was determined by direct enzymatic colorimetric method using Spinreact reagents. The Cardiac Risk Ratio (CRR) was calculated for individual subject.

Statistical Analysis: The percent prevalence of subjects having hypertension & those with CRR >5 was determined in each study group. The odds ratio was calculated & 95% confidence interval was determined, to find the association of high fiber consumption to hypertension and to CRR.

Amongst the 120 men & 135 women interviewed, only 34 (28.3 %) men & 39 (28.8 %) women were found to be regularly consuming high fiber diet. The cut-off risk level & target level of CRR as primary

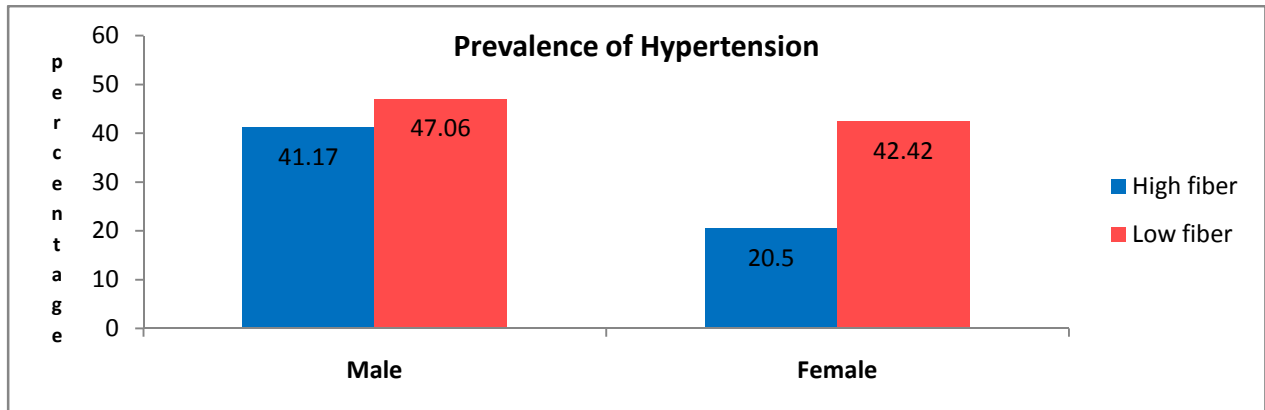
target in prevention of cardiovascular risk is >5 & >4.5 respectively for men which is >4.5 & >4 for women.⁽¹¹⁾

Fig. 1: Prevalence of CRR > 5 in men & women



In the Fig 1, there is a higher prevalence of cases with CRR > 5 in in men (14.71%) & women (19.34%) consuming low fiber compared to their counterparts consuming high fiber. This is statistically insignificant.

Fig. 2 : Prevalence of Hypertension in men & women



In Fig. 2, the prevalence of hypertension is 5.89% higher in male & 21.92% higher in female consuming low fiber in their diet than their counterparts consuming higher fiber.

Table 2: Odds ratio (OR) & 95% confidence interval (CI) for finding association of high fiber diet to the event.

Event		OR	95 % CI	
			Lower limit	Upper limit
Hypertension	Male	0.78	0.309	2.05
	Female	0.35	0.123	0.981
CRR > 5	Male	0.55	0.65	4.54
	Female	0.41	0.149	1.125

The odds ratio was found to be significant within 95 % confidence interval indicating an association between high fiber consumption & hypertension in women. The same is not statistically significant for men. The odds ratio was not found to be significant within 95 % confidence interval indicating that association is not established between high fiber consumption and CRR in both the sexes.

Discussion:

Epidemiological studies suggest that consumption of a diet high in fruits and vegetables is associated with a reduced risk of chronic disease. (13)The phytochemicals like flavonoids, polyphenols, carotenoids present in vegetables & salads, reduces inflammation occurring in the arterial wall & prevent blood cells from sticking together. (2)

Flavonoids present in salads are scavengers of free radicals like superoxide anions and lipid peroxyl radicals and prevent oxidation of LD-Cholesterol, which is atherogenic. It decreases the formation of atherosclerotic plaques and reduces arterial stiffness, leaving arteries more responsive to the endogenous stimuli of vasodilatation. (4,14)

Polyphenols and carotenoids have hypotensive effect by virtue of inhibition of NADPH oxidase driven generation of reactive oxygen species. This is due to suppression of mRNA expression. Polyphenols and carotenoids causes improvement in endothelium-

dependent vasodilatation in the aorta (7,15,16). Carotenoids also

enhance nitric oxide (NO) generation and reduce blood pressure in hypertensive patients (17)The results of this study clearly emphasize more beneficiary effect of fiber consumption in females than males. This could be due to synergistic effect of estrogen. The hormone estrogen in females affects the vascular system by promoting a lower vascular tone by releasing of endothelium - derived Nitric Oxide. (18,19) The study done in Japanese population reveals that total, insoluble, and soluble dietary fiber intakes were inversely associated with risk of mortality from CHD and total CVD for both men and women (20), which is in congruence with the present study. A systematic review carried out by Diane E Threapleton, Darren C Greenwood, Charlotte E L Evans, et al. reveals that greater dietary fiber intake is associated with a lower risk of both cardiovascular disease and coronary heart disease. (21) Their findings are aligned with general recommendations to increase fiber intake. The present study also concludes similarly that awareness regarding good effects of fiber consumption is less & there is a need to recommend high fiber diet. According to a meta-analysis of randomized placebo-controlled trials to estimate the effect of fiber supplementation on blood pressure overall and in population subgroups concluded that in western populations, where intake of fiber is far below

recommended levels, increase in the intake of fiber may contribute to the prevention of hypertension. ⁽²²⁾

The results of present study show a similar inference that high fiber diet contribute to prevention of hypertension.

Conclusion:

The high fiber diet has a significant association to blood pressure in women. Regular intake of high fiber diet decreases CRR in men & women. It is

necessary to increase awareness about benefits of high fiber diet.

Limitation Scope: There is a need to study the mode of action of different types of fiber components from different dietary sources

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