

Relationship Between Fiber in Diet and Acute Appendicitis

Fauzia Siraj¹, Muhammad Azam Qureshi¹, Mushtaq Ahmad¹, Owais Siddiqi² and Bilal Hassan¹

ABSTRACT

Objective: To determine the relationship of fiber in diet and other socio-demographic factors with acute appendicitis among adult population of Rawalpindi.

Study Design: Case control study

Place and Duration of Study: This study was conducted at the Department of Surgery & histopathology of Benazir Bhutto Hospital and Isra University Medical College Islamabad for two years from Jan 2018 to Jan 2020.

Materials and Methods: Two hundred patients operated for acute appendicitis and confirmed by histopathology report were included in the study along with equal number of age and gender matched controls from the community. Detailed dietary history was obtained with the help of structured questionnaires to calculate the amount of fiber in diet of both the cases and controls. Level of fiber in diet, Body mass index, family income and presence of co morbid diseases were compared among the cases and controls with chi-square. Mean dietary fiber in grams was also compared among the cases and controls by student-t test.

Results: Out of 200 confirmed cases with acute appendicitis, 123 (61.5%) showed the presence of low dietary fiber while 73 (38.5 %) had adequate or high dietary fiber. Among the healthy controls 91 (45.5%) showed the presence of low dietary fiber while 109 (54.5%) had adequate or high dietary fiber (N=400). Mean age of the cases was 30.5±2.15 years and of the controls was 30.3±3.311 years. After applying the chi-square, we found that amount of dietary fiber and family income had significant difference among the cases and controls (p-value<0.05). Mean dietary fiber in grams among the cases was 22.6±2.12 grams while for the controls was 32.7±2.91 grams (p-value <0.05).

Conclusion: Low dietary fiber emerged as predictor of acute appendicitis as it was significantly present in the cases confirmed with acute appendicitis as compared to controls. In addition to dietary fiber low family income also had a significant relationship with the presence of acute appendicitis among the cases.

Key Words: appendicitis; dietary fiber; relationship.

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INTRODUCTION

Appendectomy has been one of the most common surgical procedures performed all over the world.¹ Surgical units around the globe have high indices of patients presenting with acute appendicitis.² Diagnosis is usually clinical, supported by the relevant investigations. Surgical management has been the treatment of choice in most of the patients.³

¹. Department of Anatomy, Al Nafees Medical College, Isra University Islamabad.

². Department of General Surgery, Benazir Bhutto Hospital, Rawalpindi.

Correspondence: Dr. Fauzia Siraj Senior Lecturer, Department of Anatomy, Al Nafees Medical College, Isra University, Islamabad.

Contact No: 0333-2723555

Email: drsirajahmad.786@gmail.com

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If not intervened in time, this condition may have a high mortality and morbidity.⁴ Recently researches have been done to look for the factors which may prevent this condition.⁵

Dietary fiber has been regarded as one of the essential component of a balanced diet which has been usually overlooked. Adequate amount of fiber in the diet not only responsible to maintain adequate gut functioning but also prevents a lot of clinical condition. Studies done in recent past emphasize high fiber diet for overall being and health of the individuals.⁶

Few studies have been done in western population regarding the role of dietary fiber in prevention of acute appendicitis among the adult and pediatric population. Naeedar et al. in 1998 raised this point and performed a study with the negative findings that dietary fiber may not be the important factor in acute appendicitis and other luminal and/or morphological factors may be predisposing factors.⁷ Nelson et al. studied this phenomenon long ago in 1984 and concluded that there were no statistically significant differences in the average daily intake of cereal in the cases and controls, giving limited support to reduced cereal fiber intake acting as a determinant of appendicitis. Low water

intake may also be a causative influence. There is some evidence that infection and a familial predisposition may increase susceptibility to the disease.⁸Damanic et al. in 2016 performed a similar study on the pediatric population and revealed that There's a significant correlation between low-fiber diet with appendicitis incidence ($p=0.0001$). From the 19 patients with low-fiber diet, 14 of them (73.7%) have acute appendicitis. Meanwhile only 2 of the patients (12.5%) with high-fiber diet have acute appendicitis.⁹ Adamidis et al, published a similar study in 2000 and concluded that Appendectomized children had statistically significant lower mean daily intake of fiber (17.4 g versus 20.4 g, $P < 0.001$) including all fiber fractions: cellulose, uronic acid, pentose, expose and lignin. No statistical difference was found for energy, protein, carbohydrate and fat intake. Discriminate analysis proved that only cellulose and expose are independently correlated to appendicitis and lower fiber intake is thought to be the cause in 70% of the cases. Recurrent abdominal pain, chronic constipation and positive family history of appendectomy were more frequent in appendectomized children ($P < 0.001$). This study gives evidence that low fiber intake could play an important role in the pathogenesis of appendicitis.¹⁰

Limited data has been available in this regard. A very interesting study done in Gilgit population which is north of Pakistan analyzed the general food intake pattern of patients with appendicitis and concluded that females (67.4%) were more prone to appendicitis as compared to male (36.8%). More than (55.2%) young adults between the ages of 18-30 years were suffering from appendicitis as compared to other life stage groups. All the appendicitis suffered volunteers had less servings of fruits and vegetables while the servings of fast/junk food was much higher given in Food Guide Pyramid as recommended by WHO. Nutritional health status emerged as a leading factor responsible for appendicitis in Gilgit city of Pakistan.¹¹We planned this study with the objective to determine the relationship of fiber in diet and other socio-demographic factors with acute appendicitis among adult population of Rawalpindi.

MATERIALS AND METHODS

This case control study was conducted at the department of Surgery and histopathology, Benazir Bhutto Hospital. Study duration was two years (Jan 2018 to Jan 2020). Ethical approval (IRB letter number: F, 2/IUIC-ANMC/EC-127/2016) was granted by the ethical committee of ISRA university. WHO sample size calculator was used to calculate the sample size for this study with population prevalence proportion of 54.3%.⁹ Non probability consecutive sampling was done to collect the cases and controls were recruited from the community after that by matching the age and gender of the cases. All the patients between the age of

18 and 60 years presenting with symptoms of acute appendicitis and operated with histopathology proven diagnosis were included in the study. Exclusion criteria were the patients more than 60 years of age or those who did not consent to or those with a past or current history of any eating disorder or any other diagnosed nutritional deficiency. Patients with non-inflamed appendix at gross appearance or negative histopathology report were also excluded from the study.

Normal dietary fiber was regarded as between 25 and 35 grams of fiber in diet per day. Low fiber diet was regarded as less than 25 grams of fiber each day¹²

After formal consent from the patients and controls after providing them all the information regarding the study and mentioning them their right to withdraw at any time from the study if they don't feel comfortable being the part of study. Controls were age and gender matched people living in the community without having any symptoms of acute appendicitis and never operated from acute appendicitis in life. Family income was categorized into equal to or more than outgoing or less than outgoings with the help of a recent economic survey done in Pakistan.¹³

A Performa was designed in collaboration with the dietician to assess the usual intake of whole-grain breads and cereals, fruits, vegetables, legumes, nuts, and seeds. For each food group, cases and controls were given a standard serving size, and each food group was also weighted according to its relative mean crude fiber content as determined from standard food tables.¹⁴Daily total fiber and whole-grain bread and cereal intake scores were calculated for each subject.

Descriptive statistics were used in the study to describe the variables of the study. Qualitative variables like BMI, patients with low or high fiber diet, patients with low or high income and presence of co morbid illness were expressed by frequency and percentage. Mean and standard deviation for age was calculated for both the cases and controls. Chi-square was the statistical test applied initially to establish any correlation between the variables among the cases and controls. Student t-test was applied to look for the difference of mean values of dietary fiber in both the cases and controls. SPSS-23.0 was the software used to process all the data and perform the analysis. Differences between groups were considered significant if p-values were less than or equal to 0.05.

RESULTS

A total of 200 cases and 200 control were included in the final analysis. Out of these cases confirmed with acute appendicitis, 123 (61.5%) showed the presence of low dietary fiber while 73 (38, 5%) had adequate or high dietary fiber. Among the healthy controls 91 (45.5%) showed the presence of low dietary fiber while 109 (54.5%) had adequate or high dietary fiber. Mean

age of the cases was 30.5 ± 2.15 years and of the controls was 30.3 ± 3.311 years.

Table 1 shows that after applying the chi-square, we found that amount of dietary fiber and family income had significant difference among the cases and controls (p -value < 0.05) while BMI and presence of co morbid conditions has no such significant relationship (p -value > 0.05).

Table II showed Mean dietary fiber in grams among the cases was 22.6 ± 2.12 grams while for the controls was 32.7 ± 2.91 grams (p -value < 0.001 when student t-test was applied).

Table No.1: Characteristics of the patients and controls: Chi-square test

Factors	Patients	Controls	P-value
Body Mass Index			
Normal	111 (55.5%)	106 (53%)	0.616
Overweight or obese	89 (44.5%)	94 (47%)	
Dietary Fiber			
Low fiber	77 (38.5%)	91 (45.5%)	0.001
High fiber	123 (61.5%)	109 (54.5%)	
Presence of co morbid illness			
No	125 (62.5%)	137 (68.5%)	0.207
Yes	75 (37.5%)	63 (31.5%)	
Family income			
More than outgoing	132 (66%)	153 (71.5%)	0.020
Less than outgoing	68 (34%)	47 (28.5%)	

Table No.2: Comparison of mean dietary fiber in grams among the patients and controls

Variable	Patients	Controls	p-value
Mean dietary fiber in grams	22.6 ± 2.12	32.7 ± 2.91	< 0.001

DISCUSSION

This study is instrumental in understanding the relationship of underlying dietary deficiency with an acute surgical condition. Acute appendicitis has not been uncommon condition all over the world. Situation is not different in our part of the world and all age groups get affected by this condition but young population is usually more at risk.¹⁵ it would be of utmost importance if clinicians and researchers would find any dietary modifications to prevent this condition which pose a lot of strain on health budget due to high incidence. Western clinicians, dietitians and researchers have been working on this phenomenon for years but limited work has been done in our part of the world. We therefore planned this study with the objective to determine the relationship of fiber in diet and other socio-demographic factors with acute appendicitis

among adult population of Rawalpindi.

Arnbjörnsson published a paper more than thirty years ago in 1983 in which study design was similar to ours but sample size was small. He concluded that the average daily dietary fiber intake was 17.4 g in the group with appendicitis and 21.0 g in the control group. The difference was statistically significant. The results supported the hypothesis that diet, in particular a lack of fiber, may be an important factor in the pathogenesis of acute appendicitis.¹⁶ Our sample size was quite large as compared to his sample size but still results were quite similar and statistically significant difference was found among dietary fiber intake of the cases and controls.

Brender et al. in 1985 published similar paper but chose pediatric population as study sample. They concluded that estimated risk of appendicitis decreased as monthly intake of whole-grain foods increased. Children 7 to 18 years of age who had an intake of whole-grain foods in the upper fiftieth percentile were estimated to have a 50 per cent lower risk of appendicitis. This reduction in risk was not observed in the group of children less than 7 years of age.¹⁷ Though our design and target population was different but still high fiber diet emerged as protective factor for acute appendicitis as healthy population without appendicitis had significantly high fiber intake as compared to the cases with appendicitis (p -value < 0.01).

Inam et al. published an interesting study in Pakistan Armed forces medical journal in 2012 with the objective to determine the association of socioeconomic strata with fecoliths in acute appendicitis. They came up with the findings that out of 80, 40 patients belonged to high social class and 40 patients belonged to low social class. Both the groups were comparable with respect to age ($p = 0.435$) and gender ($p = 0.104$) (Table-1 and 2). On naked eye examination fecoliths was present in 20 (50%) patients of high social class and 9 (22.5%) patients of low social class ($p = 0.011$). Odds ratio calculated was 1.759. Though our objective was a bit different but still low monthly income emerged as predictor of acute appendicitis in our study. There could be multiple reasons for that as dietary patterns may be altogether different in different social classes. Though high fiber diets usually don't lie in category of high-priced diets but still this phenomenon need exploration in future researches.

Our study had few limitations. Cases were enrolled from one hospital which was a public sector hospital which reduce the chances of high-income people to get enrolled in the study. Recall bias regarding the type of diet and amount of fiber calculation based on that information also weakens the possibility of generalization of the results. Future studies with use of more sophisticated methods and enrolling sample from multiple public and private sector hospitals may generate better results.

CONCLUSION

Low dietary fiber emerged as predictor of acute appendicitis as it was significantly present in the cases confirmed with acute appendicitis as compared to controls. In addition to dietary fiber low family income also had a significant relationship with the presence of acute appendicitis among the cases.

Author's Contribution:

Concept & Design of Study: Fauzia Siraj
 Drafting: Muhammad Azam Qureshi, Mushtaq Ahmad
 Data Analysis: Owais Siddiqi, Bilal Hassan
 Revisiting Critically: Fauzia Siraj, Muhammad Azam Qureshi
 Final Approval of version: Fauzia Siraj

Conflict of Interest: The study has no conflict of interest to declare by any author.

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