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ASSESSMENT OF NUTRITIONAL STATUS OF PATIENTS SUFFERING FROM APPENDICITIS IN GILGIT CITY, PAKISTAN

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Appendicitis is the inflammation of appendix which is present at the first part of large intestine. The aim of the study was to assess the nutritional health status and correlation of appendicitis with diet. Previous studies investigate that most of the patients suffered from appendicitis were young adults among them females are more prone to this disease. It was also explored that less consumption of fiber were the main cause of prevalence of appendicitis. Accuracy were accessed after making two groups normal volunteers and appendicitis victims. Normal volunteers were randomly selected from schools and family members while appendicitis victims were selected from four different hospitals located in Gilgit city (District Head Quarter Hospital, Seehat Foundation, Aga Khan Health Hospital and City Hospital) Gilgit Baltistan, Pakistan. Stratified sample of 100 adults, aged 16-50 years. It was observed that females (67.4%) were more prone to appendicitis as compare 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. The finding of present study reveals that nutritional health status is also the leading factor responsible for appendicitis in Gilgit city of Pakistan.

Keywords: Appendicitis, Nutritional health status, Indicative biomarkers, Gilgit city, Pakistan

INTRODUCTION

Appendicitis is critical condition cause by the inflammations of appendix which is part of colon. Most of the patients suffering from appendicitis recover without any difficulty. The appendix may burst if treatment is delayed; resulting infection or even death occurs. Symptoms of appendicitis may include pain in abdomen first around the belly button, then moving to the lower right area, loss of appetite, nausea, vomiting, and constipation, inability to pass gas, low fever and abdominal swelling (NIH, 2004). It is encountered disease which increases the mortality and morbidity rate. In United State about 250,000 and 40,000 in England each year suffered from appendicitis (Simpson, 2008; and Deng *et al.*, 2010). It has been reported that about 90% suffering population are children and adults while 10% are elders up to 60 years (Temple, 1995). It is estimated that 11.2 to 30% of acute appendicitis patients suffer intestinal perforation due to diagnostic delay (Rothrock, 2000). The rate of acute appendicitis is greater than before in urban society as compare to rural areas (Steele, 2002). Acute appendicitis varies within countries, regions, races and occupational groups (Kokoska *et al.*, 2007). Epidemiological and demographic studies report the appendicitis incidences vary according to age, gender, race, socioeconomic status, food

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culture, and seasonal changes (Noudeh *et al.*, 2007; and Ergul, 2007). The epidemiological data on acute appendicitis with in Pakistan and Asian populations are still not available because most of the studies performed on Western counties (Al-Oman *et al.*, 2003). An increase in patient ratio in developed countries like Canada (Beverly *et al.*, 1985). Modern technologies (ultrasonography and computed tomography) are diagnostic tools for acute appendicitis and have made much more advances in diagnostic field (Kokoska *et al*., 2007). Despite all these techniques the accurate diagnosis of acute appendicitis is still difficult. The perforation rate is high up to 22-62% (Pal and Khan, 1998). About 90% of the substance passes through gastrointestinal track without any difficulty or problem, but when the heavier substance passes through digestive tract, it may enter into the appendix lumen. The peristaltic activity of appendix is not able to discharge this substance from the body. So the accumulation of this foreign substance may lead to inflammation of appendix. Foreign bodies which may cause appendicitis are metal needles, short particles swallowed by eating the animal meat, tooth stick, tooth fills as well as fruit seeds. Some fruits seed are removed from our body naturally while some seeds may enter into the appendix lumen and may cause inflammation. There are reported causes of appendicitis which are caused by seeds of fruits and vegetables such as cocoa, orange, melon, barley, oat, fig, grapes, date cumin and nut (Bertozzi *et al*., 2010; and Hulme, 2011). Genetics is also considered as a potential factor in some cases of appendicitis; for example, if appendicitis runs in families, it may be the result of genetic variation (NIH, 2004). Some studies have suggested that a positive family history increases the relative risk of being acute appendicitis nearly 3 times (Steele, 2002). The etiology and pathogenesis are still not conformed but are many possible causes of acute appendicitis which includes mechanical obstruction (Piper *et al.*, 1981), lymphoid hyperplasia (Lamps, 2004), insufficient dietary fiber intake (Brender, 1995), familiar susceptibility factor associated with improved socio economic condition (Andreu-Ballester *et al*., 2009), bacterial, viral and parasitic pathogens seeds of fruits and vegetables, tumors of large intestine (Turhan *et al*., 2009). Furthermore, two hypotheses have been proposed in this regard: "hygiene hypothesis" and the "diet hypothesis" (Walker, 1996). In obstructive appendicitis the fecolith material obstruct the appendiceal lumen in approximately 35% of acutely inflamed appendix. The fecal material get thicken and start to deposit around the foreign object in appendiceal lumen. Then the deposition of fecal material increases in size and sometime it may also be due to deposition of calcium and salts on the appendiceal lumen (Guillem *et al*., 2004; and Spurway, 2004). It is thought to be associated with transition from high fiber diet to refined foods that enhance fecolith formation which is causative agent in obstructive type of acute appendicitis (Steele, 2002; and Burkit, 2005). Acute appendicitis is caused by the diet which has low amount of dietary fiber and high intake of sugar and meat is other nutritional cause (Temple *et al.*, 1995). The use of high fiber diet decreases the ratio of acute appendicitis while western diet, low fiber diet and refined diet may cause high risk of acute appendicitis (Gut, 2002). The aim of present study was to assess the nutritional status of patients suffering from appendicitis in Gilgit city of Pakistan.

MATERIALS AND METHODS

The study was conducted in four different hospitals (District Head Quarter Hospital, Seehat Foundation, Aga Khan Health Hospital and City Hospital) of Gilgit city. A total of 100 volunteers fulfilled inclusion criteria, out of which 50 were from each group (50 from appendicitis and 50 from healthy victims). Patients unwilling for inclusion in the study were excluded. Permission from concerned authorities and 'Hospitals Ethics committee' was obtained. After taking informed consent from the patients, a detail history including demographics, family and medical history, biomarkers, physical activity, anthropometrics, energetics, body composition, Food Frequency Questionnaire (FFQ) and relevant examination of patients was carried out. Food Frequency Questionnaire (FFQ) was based on Food Guide Pyramid. The intake of serving number of each volunteer was calculated to draw out the mean serving number of each food group that was compared with the reference number of servings as given in Food Guide Pyramid recommended by WHO. A self-designed questionnaire was made to assess the nutritional status of volunteers. Body composition was checked by using a digital machine named Beurer German (BG, 64). The cross sectional study design was adopted for research work which is utilized for estimation of the prevalence of a disease to investigate the causes of disease, establishing links between risk factors and health outcomes or exposures to suspected factors over some period, commonly years rather than weeks or months. A wide spectrum of information about diet and health can be collected. The data was analyzed by using R (3.2.2). Descriptive analysis such as mean frequencies and percentage were used for interpretation of the data. After

analysis, tabulation process was done. Chi-square test was used to find out the relationship between dependent and independent variables. Furthermore, the data obtained was subjected to one way analysis of variance (ANOVA) techniques. The level of significance was kept at $p < 0.05$. To explore the deep correlational structure of the data, Principal Component Analysis approach was used which would help to identify the important factors for appendicitis victims.

RESULTS AND DISCUSSION

A total of 100 people fulfilled the criteria of the study, out of these 50 appendicitis patients and 50 healthy people. Both the groups were comparable with respect to life stage group and gender.

Relationship between life stage group and physiological status of volunteers was found to be highly significant as given in Table 1 of frequency distribution. After interpretation of data, the results showed that higher frequency of appendicitis was between young adults (18-30 years). These observations are supported by different studies. Khan *et al.* (2012) also observed high prevalence (47.76%) of appendicitis in teen age group, Kamran *et al.* (2008) also investigated that commonest age group suffered from appendicitis was 13-25 years. Addis *et al.* (1990) also reported that several investigation have documented a higher incidence of acute appendicitis in preadolescents and young adults. In this age group, a proliferation of submucosal lymph tissue was observed in the appendix. An increase in the amount of lymphoid tissue in the appendiceal wall is thought to be the key determinant of local immunological and inflammatory responses to infectious or environmental agents, resulting in acute appendicitis. Highly significant association was found between genders and physiological status as given in Table 2 of frequency distribution. Appendicitis was prevalent in females (67.4%) as compared to male (36.8%). These observations are supported by other researchers studies. Khan and Rehman (2005) also observed in their study that (59%) female and (41%) were male, among them most of the patients were of younger age group. Kamran *et al.* (2008) also observed that (58%) male and (42%) females was victim of appendicitis. Hamad (2011) also explored during study that ratio of incidence of appendicitis increases in males than females.

Table 1: Life Stage Group and Physiological Status of Volunteers

Life Stage Group		Physiological Status		Total
		Appendicitis	No Appendicitis	
Late Childhood	*f*	4	0	4
	%	100	0	100
Adolescent	*f*	11	0	11
	%	100	0	100
Young Adults	*f*	32	26	58
	%	55.2	44.8	100
1st Adulthood	*f*	2	17	19
	%	10.5	89.5	100
2nd Adulthood	*f*	1	7	8
	%	12.5	87.5	100

Note: Chi-square: 31.963[a], Degree of freedom: 4, $p < 0.001$**, Highly Significant.

Table 2: Gender and Physiological Status of Volunteers

Gender		Physiological Status		Total
		Appendicitis	No Appendicitis	
Male	*f*	21	36	57
	%	36.8	63.2	100
Female	*f*	29	14	43
	%	67.4	32.6	100

Note: Chi-square: 9.180[a], Degree of freedom: 1, $p < 0.002$**, Highly Significant.

It was explored during the study that intake of fruits was higher in healthy volunteers as compared to appendicitis victims. Similarly healthy females were consuming more fruits as compared to healthy males as given in Figure 1. The consumption of vegetables was more in healthy volunteers as compared to appendicitied victim. Similarly healthy females were using more vegetables as compared to healthy males as given in Figure 1. Morris *et al.* (1987) also studied that fruit consumption may reduce the risk of acute appendicitis which might be due to fiber present in the fruits. In vegetable group, the intake was higher in females as compared to males, while comparing physiological status the healthy people had more vegetable consumption than appendicitis victims. Barker *et al.* (1986) investigated in their study that more vegetable consumption may reduce the risk of acute appendicitis by reducing

Figure 1: Relationship of Intake of Food Groups on Physiological Status of Volunteers

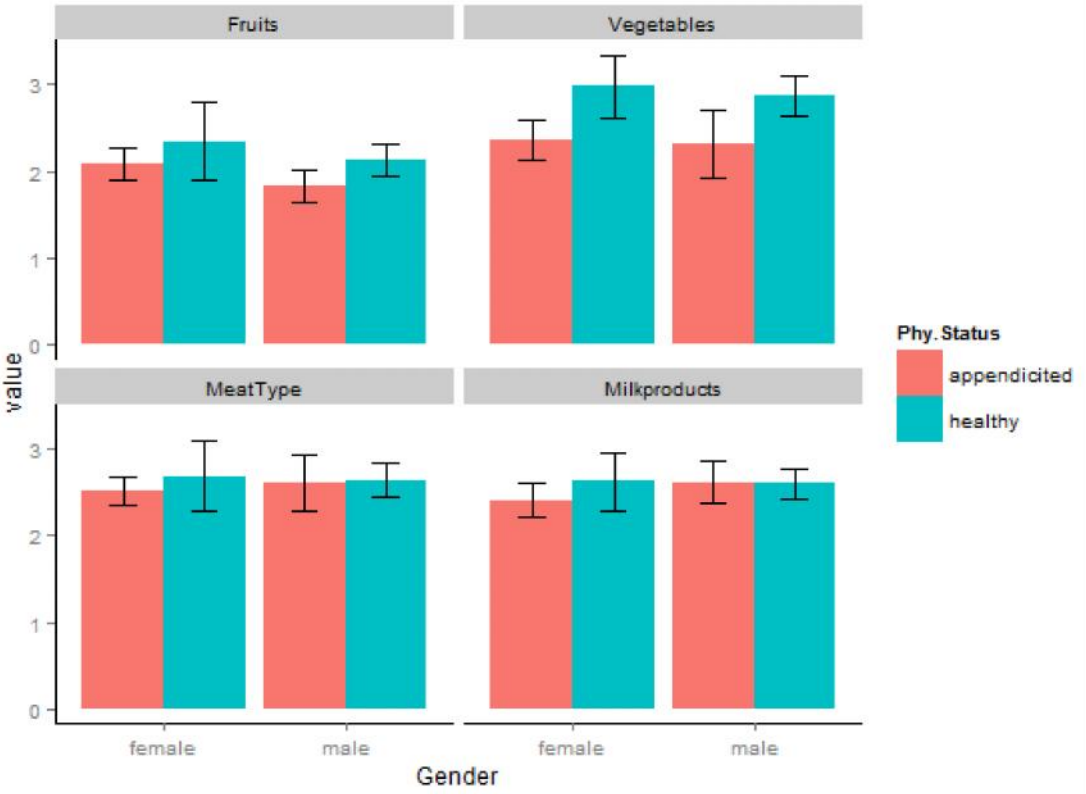


Figure 2: Correlation of Physiological Status of Volunteers with Other Variables

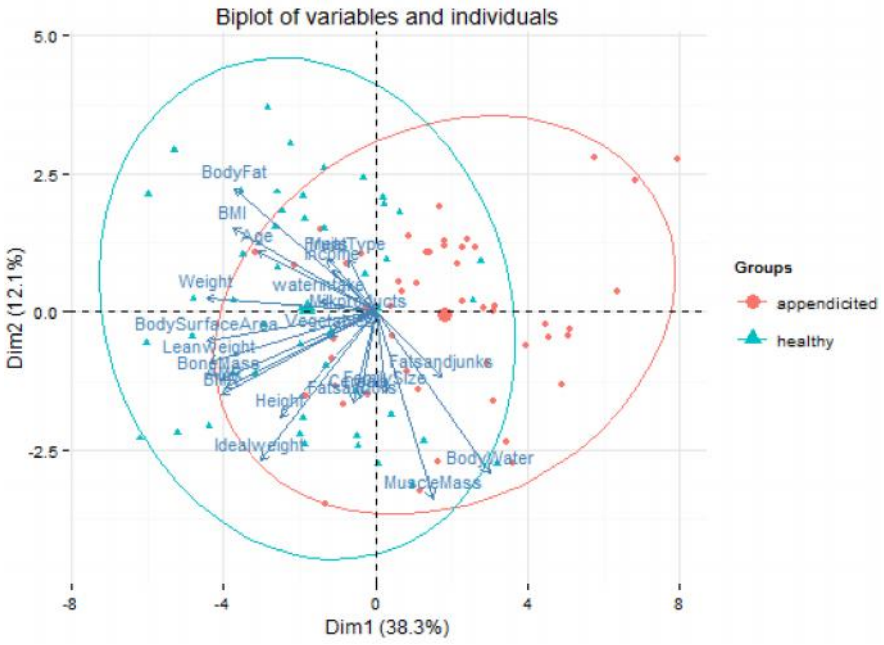
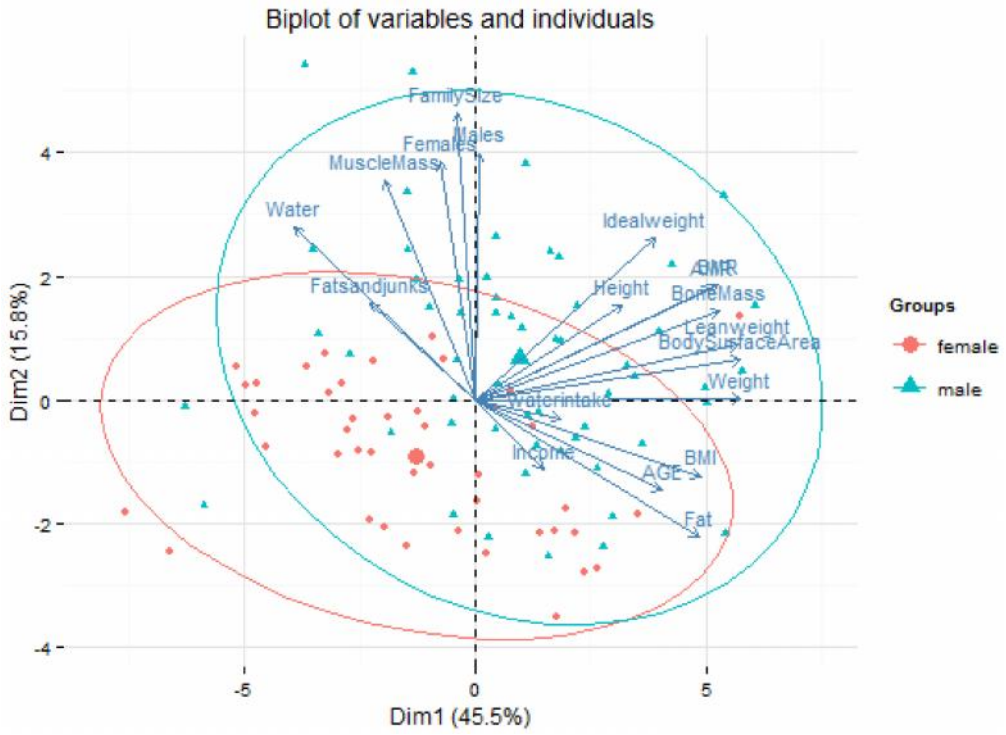


Figure 3: Correlation of Gender with Other Variables



bacterial flora . The intake of meat, seafood, poultry and egg was higher in appendicitis victims while there was no variation between genders of healthy people.

Above given graph is the biplot of first two PCs which explained the 50% variation of the data. It gives us the deep view of the correlational structure of the data which cannot be detected by using simple linear correlation. From the above graph it can be observed that Body Water, Muscle Mass, Fast and Junk foods, Family size, Height, Ideal Weight, Fats and Oils are weakly correlated to the appendicitis people as most of appendicitis persons (dots in red color) fall near these variables and most of these persons were far from these variable, while the other variables are highly correlated to healthy people. We can say that Fruit, vegetable, water intake, income, meat type and milk products are negatively or not correlated to the appendicitis people. As we can observe from the graph there are very few dots of appendicitis persons near to these mentioned variables so they are not the characteristics of appendicitis people. Morris *et al.* (1987) also stated a positive correlation between acute appendicitis and a diet poor in fiber, and negative correlation between acute appendicitis and a diet rich in fiber containing green vegetables and fruits.

The above graph shows that water intake, body fat, fast and junks food are weekly correlated with the females. The graph shows most of the females as shown in (red dots) are far from variables. We can say that the age, water intake and intake of fast and junks food were higher in females. While other variable like income, weight, height, lean weight, bone mass, muscle mass and body water were highly correlated and body water, ideal weight, body surface area, AMR, BMR has week correlation to males. Kamran *et al.* (2008) also observed in their study that 58% male were suffered from appendicitis while 42% females were victim of appendicitis. (Al-Omran *et al.*, 2003; and Sulu *et al.*, 2010). studies demonstrated that acute appendicitis is seen most commonly in western societies, particularly in youth and males.

CONCLUSION

The present study revealed that the frequency of appendicitis was higher in young adults (18-30 years) and among them, female gender was more prone to appendicitis as compared to male gender. The findings showed that majority of appendicitis suffered victims had positive correlation with fruit, vegetables and negative correlation with other diet groups. So it was concluded that fiber less

diet may be the causative agent which increase the risk of appendicitis. It is suggested that people of Gilgit city should consume those food commodities which contain more fiber through which risk of appendicitis can be decreased. The findings of present study reveal that nutritional health status is the leading factor responsible for appendicitis in Gilgit city of Pakistan.

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