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Demographic and Epidemiologic Features of Acute Appendicitis

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1. Introduction

Acute Appendicitis (AA) is the most commonly encountered disease in emergency clinics, with about 250,000 cases of appendicitis reported in The United States and 40,000 in England each year (Deng et al., 2010; Simpson et al., 2008). The key form of treatment for the disease is surgery and the mortality, morbidity, and economic cost ratio rise the longer it remains untreated.

Despite the high prevalence of the disease, the uncertainty of just how many appendicitis patients will present to emergency clinics each day still remains an unpredictable situation for us surgeons, with some days bringing a large number of cases, and others relatively few. Ever since Amyand Claudius performed the first appendectomy in 1735 at St George's Hospital in London, this decrease and increase in cases has led researchers to conduct studies into both the etiology of AA and the disease's epidemiological and demographic characteristics.

The etiology of AA has, as of yet, not been clarified. Clarification of the etiology has been the main point of epidemiological studies and advancements in this area will influence the incidence of the disorder as well. There are various theories on the frequency and incidence of appendicitis at present and these are still debated, despite some having strong scientific backing.

2. Demographic features of appendicitis

Studies have demonstrated that AA is seen most commonly in western societies, particularly in youths and males (Addiss at al.,1990; Al-Omran et al., 2003; Noudeh et al., 2007; Sulu et al., 2010). Research carried out in our own region has also shown that AA is seen more commonly in young people aged 10-19 and in males **(Figure 1)**.

The appendix tissue possesses the features of a lymphoid organ and there is a larger amount of lymphoid tissue in young subjects. Lymphoid hyperplasia can be caused by any obstruction occurring in the lumen of the appendix and this can develop into appendicitis if the condition continues. Appendicitis is therefore seen more frequently in young people. Lymphoid tissue is vague. Lumen of the appendix enlarges after lymphoid tissue atrophies and probability of obstruction by decreases fall of in over aged people. For that reason, incidence of acute appendicitis decreases with age. Consequently only 5% to 10% of

acute appendicitis cases are seen in the elderly (Jones et al., 1985). The more common involvement of young people and men is easier to discern in Western societies than other regions. The lower incidence of AA and the less pronounced gender gap in regions such as Africa and Asia is worth mentioning (Ajao, 1979; Arnbjörnsson, 1983; Oguntola et al., 2010; Walker & Segal, 1995). This may be because people living in these regions are less influenced by the western-type diet (fast-food diet) with the majority of foods consumed being high in carbohydrates and low in fiber. The height of males as a factor in the development of the disease is not clear (Addiss at al., 1990). However, the effect of sex hormones in females alongside the predisposition of males to consume 'fast-food' are considered to be important (Walker & Segal, 1979).

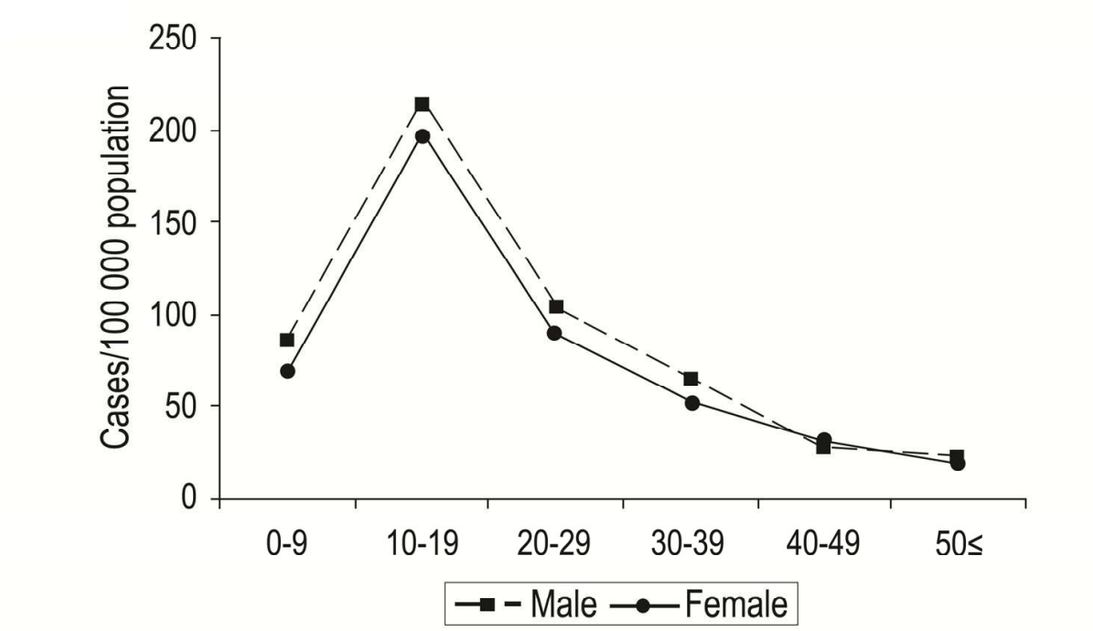


Fig. 1. The distribution of acute appendicitis according to age groups and sex (2004-2007).

3. Epidemiological theories for the development of appendicitis

The most widely accepted theories today are the diet and hygiene hypotheses (Walker & Segal, 1995). At the same time, these hypotheses have also formed the groundwork of AA's epidemiological features.

The dietary theory was first developed by Rendle Short in 1920. He stated that the AA incidence was higher with a lower ratio of cellulose in the diet and that this was the reason why Britain had been seeing an increase in the incidence of AA since the turn of the 20th century, as well as why the rate differed by country (Barker, 1985; Walker & Segal, 1995). This theory was further developed to reveal a positive correlation between AA and a diet poor in fiber but rich in such foods as meat, potatoes, and sugar, and a negative correlation between AA and a diet rich in fiber containing green vegetables, fruits, and tomatoes (Morris et al.,1987). In other words, a diet devoid of sufficient fiber triggers the formation of AA. A diet featuring low consumption of fiber reduces the colonic transit time by reducing

the lumen of the appendix, and the resulting lymphoid hyperplasia causes obstruction, ultimately leading to infection and appendicitis.

The hygiene theory was promoted by Barker in articles in the 1980s (Barker, 1985; Barker et al., 1988). Barker felt that the diet did not explain the decrease in incidence of appendicitis in England in the 1930's. He found that the appendicitis incidence had decreased, together with that of many diseases, such as tuberculosis, in relation to the introduction of better housing and water supply following World War II. He felt that these improvements had decreased exposure of young children to enteric microorganisms and that the number of deaths due to diarrhea in childhood had been somewhat reduced. As a result, children and adults now avoided the effect of bacteria and viruses causing enteric and respiratory infections which pave the way for appendicitis and instead developed immunity against them. An insufficient number of bathrooms, toilets, hot water, and sewage systems in communal areas can promote the enteric bacterial, viral, and parasitic infectious agents that are responsible for the formation of appendicitis. These improvements will decrease the incidence of deaths due to enteric organisms in children and adults and also decrease the risk of appendicitis. This outcome is strongly related with the incidence of infectius disease and scocioeconomic status of the patients with appendicitis. For example, Schistosomiasis is a waterborne parasitic disease that can be prevented by following principles of good hygiene and preventing, by the management of sewage networks, the spread of parasite eggs in water that is used for consumption. As a result, the incidence of Schistosomal appendicitis is 0.2% in the USA, where sewage networks are well maintained, while it is 20 times this rate in Nigeria (Terada, 2009). Interestingly, the patients who suffered from this illness in the USA were African Americans.

4. Factors influencing appendicitis incidence and current tendencies

Epidemiological and demographic studies report the appendicitis incidence to vary according to age, gender, race, socioeconomic status, food culture, and seasonal changes (Adamidis et al., 2000; Ergul, 2007; Noudeh et al., 2007; Oguntola et al., 2010; Sulu et al., 2010). Therefore, the frequency of AA is different in each country. For example, the rate of appendicitis in Europe during the 1980s was 116 per 100.000 while this rate was 96-120 in the USA, 75 in Ontario, 200 in Hong Kong, and 32-37 in Thailand for the same years (Al-Omran et al., 2003; Chatbanchai et al., 1989; Luckmann & Davis,1991; Zoguéreh et al., 2001).

Epidemiological studies report that the incidence of AA within a single country tends to increase or decrease at different times of the year. In fact, differences have even been reported between people living in the same country when the society is formed from individuals from various geographical locations, cultures, and races. Walker et al. reported the prevalence of appendicitis as 0.5% in rural blacks, 1.2% in urban blacks, and 14% in urban whites (Walker & Segal, 1979). Walker et al. also evaluated the relationship between ethnicity and appendicitis in a study of 56 high school age (16-18 years) young people in South Africa and found that the rate of appendectomies was 0.6% in rural Blacks, 0.7% in urban Blacks, 2.9% in Indians, 1.7% in Coloureds (Eur-African-Malay), and 10.5% in Caucasians (Walker et al., 1982). This situation is similar within different ethnic communities in western societies, where the gap between gender and ethnic origins has shown similar distributions. In California, the incidence of appendicitis was 137.5 per 100.000 for Caucasian males while this incidence was 162.7 for Hispanics, 98.0 for Asian/others, and 70.7 for blacks. The same was true in female patients (Andersson, 2008)

with rates per 100,000 of 98.8, 97.5, 64.6, and 49.6 for the above groups respectively. The authors reported that the difference observed between whites and blacks was associated with their consumption of different amounts of fiber.

However, the fact that studies performed in the last decade have reported a decrease in the incidence of AA in western countries (Andersson, 2008; Andersen et al., 2009; Andreu-Ballester et al., 2009; Cirocchi et al., 2008) but an increase in some African and Asian countries is interesting (Chavda et al., 2005; Lee et al., 2010). The rate of patients undergoing an appendectomy has decreased in the UK, the USA, and Europe (Williams et al., 1998). Even though there has been no change in the amount of fiber consumed in food in England and Wales during the 20st century, the mortality rate from appendicitis, which was 40 to 70 per millon in the first decade, dropped to 5 per million in the last decade (Barker, 1985). A study on Danish children has found a decreased appendicitis incidence in children from every age group (Andersen et al.,2009). The effect of better socioeconomic conditions created as a result of improving water supplies and hygienic conditions, has been found to be the reason for this decrease in Western societies. A recent study from Spain found a decrease in appendicitis in the last 10 years (Andreu-Ballester et al.,2009). A study from Greece evaluating the last 30 years found the age-standardized appendicitis rate to fall 75% from 652/100.000 to 164/100.000 (Papadopoulos et al.,2008). Both countries eat a Mediterranean diet rich in fiber but the decrease in Spain may be due to improved hygienic conditions with socioeconomic development. It is believed that the spread of the western-type diet in African and Asian societies today is responsible for the increase in the number of AA cases observed. However, we found in a previous study that short-term dietary changes had no effect on an increase in AA incidence (Papadopoulos et al., 2008). Studies conducted on the effects of fasting seem to support this conclusion. More than one billion Muslims consider the month of 'Ramadan' to be sacred and abstain from food or drink from sunrise to sunset for one month. During this month, devotees avoid performing any daily habitual action, such as the consumption of any food, drinks, drug therapy, smoking, or having sexual intercourse for a total of 12-19 hours each day. Since the body is used to receiving two meals a day, these changes in diet and the number of meals consumed each day change the metabolism (Sulu et al., 2010). This behavior has provided an ideal model for many researchers to investigate the effect that long-term hunger has on the human body. We have also used this opportunity to investigate the effect of changes in hunger and dietary habits on the development of AA in a study conducted throughout the month of Ramadan. We compared the frequency of AA before and after Ramadan in a 4-year study that included 4288 AA cases in two different cities. Of the 992 patients investigated, 37.1% developed AA in the period before Ramadan, 32.1% during the month of Ramadan, and 30.8% were diagnosed after the month of Ramadan. There was no significant difference between the values of these three periods. Based on these results, it is possible to infer that there is no short-term increase in the frequency of AA in societies starting to follow a western-type diet nor is there expected to be an increase in cases where migrants have moved to a new geographical location.

One further subject of discussion is whether environmental conditions have an influence on the frequency of the development of AA. It has been reported that seasonal changes, in particular, and moisture in the air (humidity) do have an effect (Al-Omran et al., 2003; Gallerani et al., 2006; Lee et al., 2010; Noudeh et al., 2007; Oguntola et al., 2010; Trepanowski & Bloomer, 2010). An increase in the frequency of cases in the AA summer months has been reported in many studies. However, studies have shown that this increase is observed in regions situated in low altitudes and close to the seaside **(Table 1)**.

Altitude (meters)		Appendicitis	Perforated
Ferrara	9	Summer	
Jersey City	25	Summer	
Ontario	86	Summer	
Beer Sheva	260	Autumn-Summer	
Hail	988	Spring-Summer	
Shahr-e-Rey	1050	Summer	
Kirman	1749	Winter	Summer-Autumn
İstanbul	100	Spring-Summer	Summer-Autumn
Kars	1750	Winter	

Table 1. The seasonal tendency of total and perforated appendicitis according to the altitude of different regions

In a study conducted in two Turkish cities with different climatic characteristics and altitudes, we found that the number of patients with acute appendicitis increases at low altitude in Istanbul during spring and summer ($p<0.05$). At high altitude in Kars, this increase is seen during winter ($p>0.05$). **(Table 2)**.

Hospital	Season				Age Groups					
	1*	2*	3*	4*	0-9	10-19	20-29	30-39	40-49	≥50
KSH	503	476	458	434	300	814	349	204	113	91
HNTEH	712	846	762	686	22	664	1133	606	289	292

KSH : Kars State Hospital, HNTEH: Haydarpasa Numune Teaching and Research Hospital 1*: Winter, 2*: Spring, 3*: Summer, 4*: Autumn

Table 2. A comparison of the seasonal and age distribution of patients with appendicitis in Kars and Istanbul (2004-2007)

A further study reported that AA was seen more frequently in the winter months in Kerman, an Iranian city with an altitude similar to that of Kars (Nabipour & Mohammad, 2005; Sulu et al., 2010). In other words, an increase in altitude resulted in more appendicitis cases being seen during the winter months. The reason for this trend is unclear, but it has been reported that several factors may play a part: 1) the varying effects of bacterial or viral pathogens that cause infections at different temperatures, 2) the effect of allergens occurring in summer and warmer months, 3) changes in the form of nutrition, and 4) the effect of migration for touristic purposes during the summer. Another controversial environmental

factor is daytime humidity. In a study by Brummer, a significant relationship was observed between humidity and AA, and it was reported, in their study on the physiology of hunger, that a decrease in body fluid loss, fecal stasis, and fecal dehydration prepared the ground for inflammation (Brumer, 1970). In contrast, van Nieuwenhoven et al. reported that changes in intestinal system functions such as intestinal permeability and orocaecal transit time were not the reason for dehydration occurring (van Nieuwenhoven et al., 2000). We also determined, during a 4-year (2004-2007) study using meteorological data in our region, that such data as moisture and amount of rain did not have an effect on the frequency of AA **(Table 3)**.

	Appendicitis	Perforated	z value	p value
Humidity (%)				
Winter	76.7±7.95 (54.0 – 94.0)	76.7±8.01 (60.7 – 94.0)	-0.054	0.957
Spring	68.2±10.24 (30.0 – 93.3)	67.7±10.77 (40.0 – 89.3)	-0.047	0.963
Summer	63.9±8.75 (35.0 – 87.8)	64.7±10.33 (36.0 – 87.8)	-1.191	0.234
Autumn	71.9±9.60 (47.3 – 94.0)	71.7±9.91 (48.7 – 93.3)	-0.148	0.882
General	70.4±10.32 (30.0 – 94.0)	69.6±10.75 (36.0 – 94.0)	-0.548	0.584
Temperature (°C)				
Winter	-5.8±6.41 (-21.1 – 8.5)	-6.5±7.19 (-19.7 – 7.2)	-0.751	0.453
Spring	10.7±5.14 (-4.6 – 19.7)	9.6±5.63 (-2.8 – 18.5)	-1.209	0.227
Summer	17.2±3.34 (8.7 – 28.6)	16.6±3.38 (6.2 – 23.3)	-1.031	0.302
Autumn	0.2±7.90 (-21.2 – 14.4)	0.8±9.48 (-21.2 – 14.4)	-0.912	0.362
General	5.3±10.81 (-21.2 – 28.6)	6.2±10.77 (-21.2 – 23.3)	-1.193	0.233

Table 3. Seasons, Humidity, and Temperature Distribution Levels by Group

Other factors said to influence AA development include vascular disorders, non-specific viral infections, depression and emotional problems due to a stressful lifestyle, being the child of a mother who smoked while pregnant, air pollution, and anemic diseases these have not, however, been widely accepted (Ahmed et al., 2005; Butland & Strachan, 1999; Ewald et al., 2001; Kaplan et al., 2009; Walker & Segal, 1995). As with the development of many diseases, the effect of genetics on the development of AA is unknown. In a survey of 282 patients, it was discovered that 21% of patients undergoing appendectomies had first-degree relatives (siblings, parents, and children), 12% had second-degree relatives (grandparents, grandchildren, uncles, aunts, nieces, and nephews), and 7% had third-degree relatives with a history of appendicitis (Basta et al., 1990). However, more research to reveal the transitional property of genetics in many bowel diseases is clearly needed.

5. Conclusion

As I have discussed briefly above, the development of AA is multifactorial. Many of these reasons are not clear and require further discussion **(Figure 2)**.

The most accepted are diet and hygiene. Appendicitis is considered a preventable disease due to the effect of factors such as diet and hygiene on its development. The morbidities that can result from this disease, as well as mortality rate, may therefore be reduced by improving the socioeconomic status of poorer communities, as well as by the members of

these communities modifying their dietary habits. The cost per patient for the surgical treatment of appendicitis in the United States ranges from $ 11,577 to $ 13,965 (Long et al., 2001). Therefore, a reduction in appendicitis will benefit not only public health but will also make a substantial contribution to the economy.

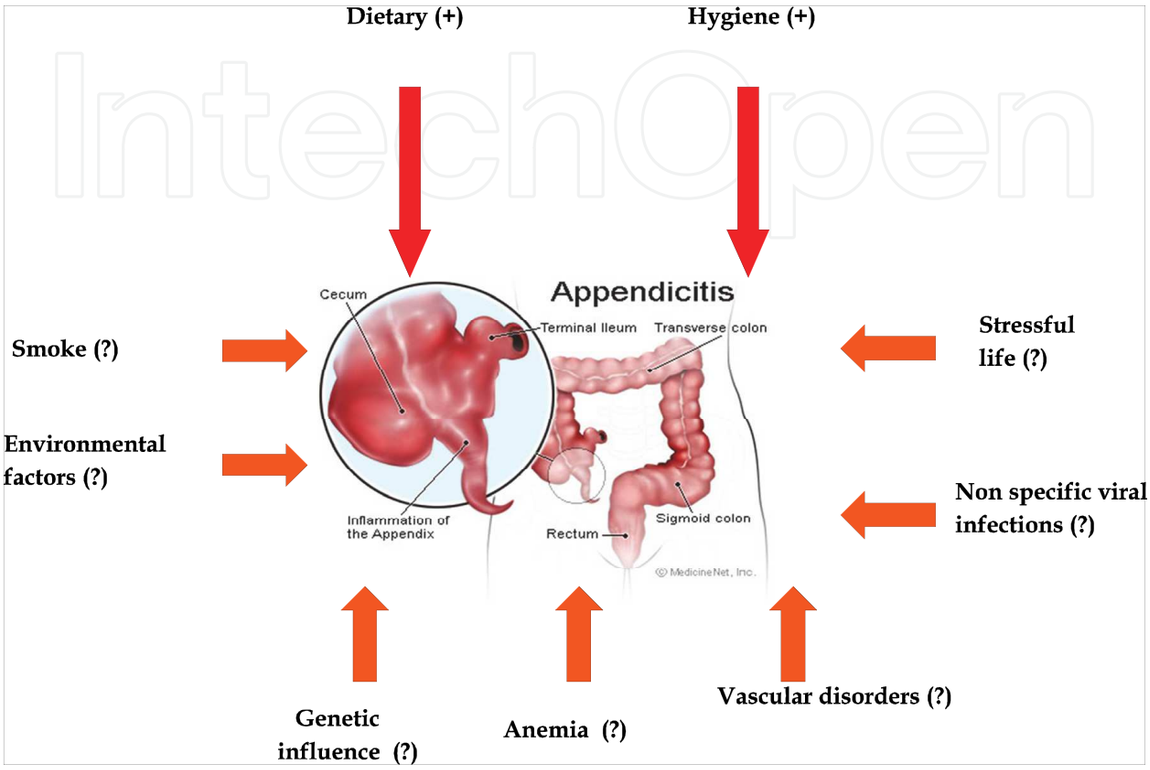


Fig. 2. Factors affecting the formation of appendicitis

6. References

Adamidis, D., Roma-Giannikou, E., Karamolegou, K., Tselalidou, E., & Constantopoulos, A. (2000). Fiber intake and childhood appendicitis. *Int J Food Sci Nutr*, Vol.51, No.3, pp.153-157, ISSN: 0963-7486

Addiss, DG., Shaffer, N., Fowler, BS., & Tauxe, RV. (1990). The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol*, Vol.132, No.5, pp.910-925, ISSN: 0002-9262

Ahmed, S., Shahid, RK., & Russo, LA. (2005). Unusual causes of abdominal pain: sickle cell anemia. *Best Pract Res Clin Gastroenterol*, Vol.19, No.2, pp.297-310, ISSN: 1521-691

Ajao, OG. (1979). Appendicitis in a tropical African population. *J Natl Med Assoc*, Vol.71, No.10, pp.997-999, ISSN: 0027-9684.

Al-Omran, M., Mamdani, M., & McLeod, RS. (2003). Epidemiologic features of acute appendicitis in Ontario, Canada. *Can J Surg*, Vol.46, No.4, pp.263-268, ISSN: 0008-428X

Andersson, RE. (2008). Changing trends in surgery for acute appendicitis (Br J Surg 2008; 95: 363-368). *Br J Surg*. Vol.95, No.9,pp.1187-1188, ISSN: 0007-1323

Andersen, SB., Paerregaard, A., & Larsen, K. (2009). Changes in the epidemiology of acute appendicitis and appendectomy in Danish children 1996-2004. *Eur J Pediatr Surg*, Vol.19, No.5,pp.286-289, ISSN: 0939-7248

Andreu-Ballester, JC., González-Sánchez, A., Ballester, F., Almela-Quilis, A., Cano-Cano, MJ., Millan-Scheiding, M., & del Castillo, JR. (2009). Epidemiology of appendectomy and appendicitis in the Valencian community (Spain), 1998-2007. *Dig Surg*, Vol.26, No.5, pp.406-412, ISSN: 0253-4886.

Arnbjörnsson, E. (1983). Acute appendicitis risk in various phases of the menstrual cycle. *Acta Chir Scand*, Vol.149, No.6,pp.603-605, ISSN: 0001-5482

Barker, DJ. (1985). Acute appendicitis and dietary fibre: an alternative hypothesis. *Br Med J (Clin Res Ed)*, Vol. 290, No.6475,pp.1125-1127, ISSN: 0267-0623

Barker, D.J, Morris, JA., Simmonds, SJ., & Oliver, RH. (1988). Appendicitis epidemic following introduction of piped water to Anglesey. *J Epidemiol Community Health*, Vol.42, No.2,pp.144-148, ISSN: 0143-005X

Basta, M., Morton, NE., Mulvihill, JJ., Radovanović, Z., Radojicić, C., & Marinković, D. (1990). Inheritance of acute appendicitis: familial aggregation and evidence of polygenic transmission. *Am J Hum Genet, Vol.*46, No.2, pp.377-382, ISSN: 0002-9297

Brumer, M. (1970). Appendicitis. Seasonal incidence and postoperative wound infection. *Br J Surg*, Vol.57, No.2, pp.93-99, ISSN: 0007-1323

Butland, BK., & Strachan, DP. (1999). Smoking and acute appendicitis. *Lancet, Vol.*353, No.9165,pp.1712, ISSN: 0140-6736

Chatbanchai, W., Hedley, AJ., Ebrahim, SB., Areemit, S., Hoskyns, EW., & de Dombal, FT. (1989). Acute abdominal pain and appendicitis in north east Thailand. *Paediatr Perinat Epidemiol*, Vol.3, No.4, pp.448-459, ISSN: 0269-5022

Chavda, SK., Hassan, S., & Magoha, GA. (2005). Appendicitis at Kenyatta National Hospital, Nairobi. *East Afr Med J*, Vol.82, No.10, pp.526-530, ISSN: 0012-835X

Cirocchi, R., Morelli, U., La Mura, F., Cattorini, L., Napolitano, V., Galanov, I., Covarelli, P., Giustozzi, G., & Sciannameo, F. (2008). Acute appendicitis: a descending trend? *Minerva Chir*, Vol.63, No.2, pp.109-113. ISSN: 0026-4733

Deng, Y., Chang, DC., Zhang, Y., Webb, J., Gabre-Kidan, A., & Abdullah, F. (2010). Seasonal and day of the week variations of perforated appendicitis in US children. *Pediatr Surg Int*, Vol.26, No.7, pp.691-696, ISSN: 0179-0358

Ergul, E. (2007). Heredity and familial tendency of acute appendicitis. *Scand J Surg*, Vol.96, No.4,pp.290-292, ISSN: 1457-4969

Ewald, H., Mortensen, PB., & Mors, O. (2001). Decreased risk of acute appendicitis in patients with schizophrenia or manic-depressive psychosis. *Schizophr Res*, Vol.49, No.3, pp.287-293, ISSN: 0920-9964

Freud, E., Pilpel, D., & Mares, AJ. (1988). Acute appendicitis in childhood in the Negev region: some epidemiological observations over an 11-year period (1973-1983). *J Pediatr Gastroenterol Nutr*, Vol.7, No.5,pp.680-684. ISSN: 0277-2116

Gallerani, M., Boari, B., Anania, G., Cavallesco, G., & Manfredini, R. (2006). Seasonal variation in onset of acute appendicitis. *Clin Ter*. Vol.157, No.2, pp.123-127. ISSN: 0009-9074

Jones, BA., Demetriades, D., Segal, I., & Burkitt, DP. (1985). The prevalence of appendiceal fecaliths in patients with and without appendicitis. A comparative study from Canada and South Africa. *Ann Surg*. Vol.202, No.1, pp.80-82. ISSN: 0003-4932

Kaplan, GG., Dixon, E., Panaccione, R., Fong, A., Chen, L., Szyszkowicz, M., Wheeler, A., MacLean, A., Buie, WD., Leung, T., Heitman, SJ., & Villeneuve, PJ. (2009). Effect of ambient air pollution on the incidence of appendicitis. *CMAJ, Vol.*181, No.9, pp.591-597, ISSN: 0008-4409

Lee, JH., Park, YS., & Choi, JS. (2010). The epidemiology of appendicitis and appendectomy in South Korea: national registry data. *J Epidemiol*, Vol.20, No.2,pp.97-105, ISSN: 0917-5040

Long, KH., Bannon, MP., Zietlow, SP., Helgeson, ER., Harmsen, WS., Smith, CD., Ilstrup, DM., Baerga-Varela, Y., & Sarr, MG. (2001). Laparoscopic Appendectomy Interest Group. A prospective randomized comparison of laparoscopic appendectomy with open appendectomy: Clinical and economic analyses. *Surgery*, Vol.129, No.4, pp.390-400. ISSN: 0263-9319

Luckmann, R., & Davis, P. (1991). The epidemiology of acute appendicitis in California: racial, gender, and seasonal variation. *Epidemiology,* Vol.2, No.5, pp.323-330, ISSN: 1044-3983

Morris, J., Barker, D.J, & Nelson, M. (1987). Diet, infection, and acute appendicitis in Britain and Ireland. *J Epidemiol Community Health*, Vol.41, No.1, pp.44-49, ISSN: 0143-005X

Nabipour, F., & Mohammad, BD. (2005). Histopathological features of acute appendicitis in Kerman-Iran from 1997 to 2003. *American J. Environmental Sci*, Vol.1, No.2, pp.130-132, ISSN: 1553-345X

Noudeh, YJ., Sadigh, N,. & Ahmadnia, AY. (2007).Epidemiologic features, seasonal variations and false positive rate of acute appendicitis in Shahr-e-Rey, Tehran. *Int J Surg, Vol.*5, No,2,pp.95-98, ISSN: 1743-9191

Oguntola, AS., Adeoti, ML., & Oyemolade, TA. (2010). Appendicitis: Trends in incidence, age, sex, and seasonal variations in South-Western Nigeria. *Ann Afr Med,* Vol. 9, No.4,pp.213-217, ISSN: 1596-3519

Papadopoulos, AA., Polymeros, D., Kateri, M., Tzathas, C., Koutras, M., & Ladas, SD. (2008). Dramatic decline of acute appendicitis in Greece over 30 years: index of improvement of socioeconomic conditions or diagnostic aids? *Dig Dis*, Vol.26, No.1, pp.80-84. Epub 2008 Feb 15. ISSN: 0257-2753

Simpson, J., Samaraweera, AP., Sara, RK., & Lobo, DN. (2008). Acute appendicitis--a benign disease? *Ann R Coll Surg Engl,* Vol.90, No.4, pp.313-316, ISSN: 0035-8843

Sulu, B., Gunerhan, Y., Ozturk, B., & Arslan, H. (2010). Is long-term hunger (Ramadan model) a risk factor for acute appendicitis? *Saudi Med J*, Vol.31, No.1, pp.59-63, ISSN: 0379-5284

Sulu, B., Günerhan, Y., Palanci, Y., Işler, B., & Cağlayan, K. (2010). Epidemiological and demographic features of appendicitis and influences of several environmental factors. *Ulus Travma Acil Cerrahi Derg, Vol.*16, No.1, pp.38-42, ISSN: 1306-696X

Terada, T. (2009). Schistosomal appendicitis: incidence in Japan and a case report. *World J Gastroenterol*, Vol.15, No.13, pp.1648-1649. ISSN: 1007-9327

Trepanowski, JF., & Bloomer, RJ. (2010). The impact of religious fasting on human health. *Nutr J*, Vol.9, No.57, ISSN: 1475-2891

van Nieuwenhoven, MA., Vriens, BE., Brummer, RJ., & Brouns, F. (2000). Effect of dehydration on gastrointestinal function at rest and during exercise in humans. *Eur J Appl Physiol*, Vol.83, No.6, pp.578-584, ISSN: 1439-6319

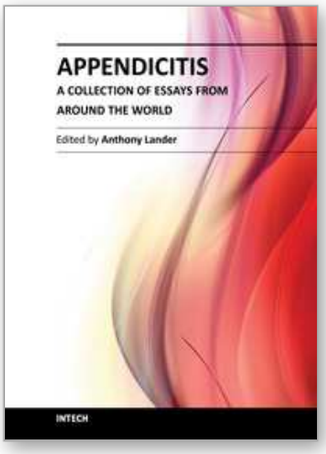
Walker, AR., & Segal, I. (1979). Is appendicitis increasing in South African blacks? *S Afr Med J,* Vol.56, No.13, pp.503-504, ISSN: 0256-9574

Walker, AR., Walker, BF., Duvenhage, A., Jones, J., Ncongwane, J., & Segal, I. (1982). Appendicectomy prevalences in South African adolescents. *Digestion*, Vol.23, No.4, pp.274-278, ISSN: 0012-2823

Walker, AR., & Segal, I. (1995). Appendicitis: an African perspective. *J R Soc Med*, Vol. 88, No.11, pp.616-619, ISSN: 0141-0768

Williams, NM., Jackson, D., Everson, NW., & Johnstone, JM. (1998). Is the incidence of acute appendicitis really falling? *Ann R Coll Surg Engl*, Vol.80, No.2, pp.122-124, ISSN: 0035-8843

Zoguéreh, DD., Lemaître, X., Ikoli, JF., Delmont, J., Chamlian, A., Mandaba, JL., & Nali, NM. (2001). [Acute appendicitis at the National University Hospital in Bangui, Central African Republic: epidemiologic, clinical, paraclinical and therapeutic aspects]. *Sante*, Vol.11, No.2,pp.117-125, ISSN: 1157-5999



Appendicitis - A Collection of Essays from Around the World

Edited by Dr. Anthony Lander

ISBN 978-953-307-814-4

Hard cover, 226 pages

Publisher InTech

Published online 11, January, 2012

Published in print edition January, 2012

This book is a collection of essays and papers from around the world, written by surgeons who look after patients of all ages with abdominal pain, many of whom have appendicitis. All general surgeons maintain a fascination with this important condition because it is so common and yet so easy to miss. All surgeons have a view on the literature and any gathering of surgeons embraces a spectrum of opinion on management options. Many aspects of the disease and its presentation and management remain controversial. This book does not answer those controversies, but should prove food for thought. The reflections of these surgeons are presented in many cases with novel data. The chapters encourage us to consider new epidemiological views and explore clinical scoring systems and the literature on imaging. Appendicitis is discussed in patients of all ages and in all manner of presentations.

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Barlas Sulu (2012). Demographic and Epidemiologic Features of Acute Appendicitis, Appendicitis - A Collection of Essays from Around the World, Dr. Anthony Lander (Ed.), ISBN: 978-953-307-814-4, InTech, Available from: http://www.intechopen.com/books/appendicitis-a-collection-of-essays-from-around-the-world/demographic-and-epidemiologic-features-of-acute-appendicitis

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