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Seasonal Variation in the Presentation of Acute Appendicitis: A Retrospective Analysis.

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ABSTRACT

Background: Acute appendicitis is the most commonly operated surgical condition of the abdomen. It has been reported to have the highest incidence in adolescents and young adults, more common in males than females and also to have a seasonal pattern, with some particular months having a higher incidence. **Methods:** Records of 551 consecutive cases of acute appendicitis who underwent emergency appendicectomy were analysed. The diagnosis was based on history, examination, investigation, surgery and histopathological examination. The variation in presentation of acute appendicitis in terms of age, gender and seasonal pattern were assessed. **Results:** Out of 551 patients, 62.98% were females. The highest incidence was seen in the 20-29 years age group. A higher incidence was observed in the months of August-November, which is a relatively warm period in the region of study, i.e Imphal, Manipur. **Conclusion:** A seasonal variation in incidence of acute appendicitis is seen. The females have higher incidence of acute appendicitis, as opposed to males having higher incidence in other studies, with 20-29 years being the most common age-group.

Keywords: Acute appendicitis, age & gender predisposition, appendicitis in summer, seasonal pattern.

INTRODUCTION

Acute appendicitis presents to surgical emergency throughout the year making it the most commonly operated surgical condition of the abdomen. Recently many researchers have reported that several acute medical illnesses do not happen to take place randomly rather they exhibit a higher frequency in particular months of the year. Acute appendicitis has been reported to be present throughout the year, but some particular months are associated with higher incidences.

Higher incidence is described by many authors during months of summer.[1] The reasons behind increased number of acute appendicitis cases in summer are not clearly known, although some researchers have indicated that the heterogeneous factors such as gastrointestinal infection, air pollution and low fibre diet, during summer months could be chipping in to the higher incidence of appendicitis.[2-7]

Consistently, other researchers have observed that in infant, acute appendicitis is relatively rare, and becomes increasingly common in childhood and early adult life, reaching a peak incidence in the adolescents and early 20s.[7-11] After middle age, the risk of developing acute appendicitis is quite small.[12,13] It is shown that males are slightly more affected than females (male: female ratio being 1.2-1.3:1).[7,12,14] One study showed that there is approximately equal incidence of acute appendicitis among males and females before puberty.[12]

To the best of our knowledge and although acute appendicitis is a common surgical condition, we could not find any report studying the seasonal pattern of acute appendicitis in Imphal city and generally, little is known about this point. Hence, this subject of seasonal variation was studied in this project on one hand and the gender and age variations on the other hand.

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MATERIALS AND METHODS

Imphal is the capital of Manipur, a state in the North-eastern region of India, the population of the state being 2,721,756 according to 2011 census. There are heavy rains in the region in the month of June and July, and a relatively warm climate from August to October, with gradual cooling through November to come to winter during December – February. Summer starts in May but due to the heavy rains in June and July, this period becomes a phase of relatively pleasant temperature.

The present study was a retrospective observational study of all the patients who underwent emergency appendicectomy for acute appendicitis admitted to Department of Surgery, Jawaharlal Nehru Institute

of Medical Sciences (JNIMS), Imphal from May 2017 to April 2018. The records were collected from the emergency surgery register maintained in the Operation Theatre, Department of Surgery and the Medical Records Department, JNIMS. Those treated conservatively and HPE reports showing negative appendicectomy were excluded.

The seasonal variation as well as the age and sex pattern in the presentation of acute appendicitis was assessed in this study. The study population was divided into subgroups based on gender and age in years i.e. 0-9, 10-19, 20-29, 30-39, 40-49 and ≥50. The months of the year were not grouped and considered into twelve 1-month intervals.

In this study the diagnosis was always made on the basis of clinical features (peri-umbilical pain shifting to right lower abdomen, nausea, vomiting, malaise, sometimes low fever), physical examination (tenderness, guarding and rebound tenderness on palpation of the right lower abdominal quadrant), laboratory data (leukocytosis with neutrophilia and raised ESR), imaging investigation (abdominal ultrasonography) and surgical operation.

RESULTS

In the one year's study- period, 551 consecutive cases of acute appendicitis underwent appendicetomy. It consisted of 2014 males (37.02%) and 347 females (62.98%). Their mean age (SD) was found to be 32.34 (±15.02) years. For males the mean age (SD) was 32.52 (±15.06) years and for females it was 2.35 (±14.97) years. The age of the patients ranged from four years to 84 years. The highest number of cases was from the age-group of 10-39 years (377; 68.4%). [Table 1]

Table 1: Sex and age distribution of appendicitis cases

Sex	Age-groups (in years)					
	0-9	10-19	20-29	30-39	40-49	≥50
Males (n=204)	8	34	49	53	32	28
Females (n=347)	3	75	95	71	55	48
Total (%)	11 (2.0)	109 (19.78)	144 (26.13)	124 (22.5)	84(15.25)	76 (13.79)

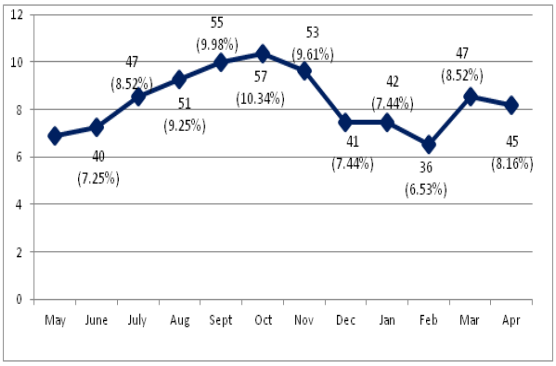

Figure 1: Month-wise number of appendicitis cases (percentage of all cases)

Table 2: Sex and month-wise distribution of cases

Month	Total (n=551)	Males (n=204)	Females (n=347)
May	38	15	23
June	40	17	23
July	47	19	28
August	51	18	33
September	55	18	37
October	57	23	34
November	53	20	33
December	41	14	27
January	41	13	28
February	36	9	27
March	47	21	26
April	45	17	28

Table 3: Age and month-wise distribution of cases (n=551)

Month	0-9 yrs	10-19 yrs	20-29 yrs	30-39 yrs	40-49 yrs	≥50 yrs
May	2	11	6	12 (7:5)*	3	4
June	1	3	15 (8:7)*	7	7	7
July	2	11	10	12	6 (4:2)*	6
August	1	16	11 (6:5)*	11	6	6
September	0	13	17	9	15	1
October	1	9	16	13 (7:6)*	9	9
November	1	9	13	13 (7:6)*	10	7
December	1	5	14	6	7	8
January	0	13	8	9	4	7 (4:3)*
February	0	6	9	7	7	7 (4:3)*
March	2	8	12	11	8	6
April	0	5	13	14 (8:6)*	5	8

*M:F ratio in incidence of appendicitis

[Figure 1] shows the seasonal distribution of acute appendicitis presenting to JNIMS, Imphal. A peak of higher frequency of events was found in the months of August - November and a reduced number in the months of February and May. The highest incidence was observed in the month of October with 57 cases (10.34% of all the cases). The second highest incidence was observed in the month of September with 55 cases (9.98%). The lowest incidence was observed in February with 36 cases (6.53%).

[Table 2] shows the monthly distribution of all cases of acute appendicitis based on gender. The incidence was more in females than in males in every month. The highest incidence of male patients was observed in October (n=23;11.27%), followed by November (n=20; 9.8%). However, in females, the highest incidence was observed in September (n=37; 10.66%), followed by October (n=34; 9.79%).

[Table 3] shows the incidence of acute appendicitis in the subgroups based on age, in the different months of the year. As the overall incidence was more in females in each month of the year, the table also indicates the instances of higher incidence in males than females in a particular age-subgroup in a particular month.

DISCUSSION

Several earlier studies have investigated the circannual pattern of acute appendicitis in different countries. The present study confirms the presence of a seasonal variability of acute appendicitis. In the current study the highest incidence of acute appendicitis was observed in the months of August to November and the lowest incidence in the months of February. This finding is in accordance with the results of other reports.[13] In other published reports, a higher incidence of acute appendicitis was observed in the summer months and a low incidence in the winter months.[7,15] As mentioned earlier, the hotter months in the place of study were August, September and October.

In the current study, the highest incidence of acute appendicitis was observed in people aged 20-29 years. This finding is consistent with the results of previous studies in which the highest incidence was seen in adolescents and young adults, although it was seen specifically in people aged 10-19 years in those studies.[1,10,13,15-17] In all age-groups, a higher incidence of appendicitis was observed in this study in female patients, except in 0-9 years' age-group where a higher incidence in males was seen during the 1 year period. Earlier studies around the world also showed a higher incidence among males in this age-group.[1,15]

The exact reason of why acute appendicitis case notification rates are high in summer is unknown, although several factors have been suggested to give a plausible explanation.[17] The increasing number of "fast food" restaurants where mainly high-carbohydrate, low-fibre diets, confectionaries and sweets are served, when individuals were most likely to be outside in summer, could have contributed to the increase in the incidence of appendicitis. The same study suggested that allergic reaction to pollen from flowers and palm produce an increase in incidence of infection during the rainy period; this might act as a pre-disposing factor to appendicitis in Nigeria, which appears as lymphoid hyperplasia leading to appendix lumen obstruction.[17]

The high prevalence of intestinal parasites infestations and bacterial infections have been accounted for some cases of appendicitis as it has been noticed to be initiated by or associated with them.[17] Infection causes lymphoid hyperplasia leading to appendix lumen obstruction. Seasonal peak of infection by campylobacteriosis, salmonellosis, Escherichia coli, cryptosporidiosis, Entamoeba histolytica, and Ascaris lumbricoides, Trichuris trichiura, Taenia saginata, Enterobius vermicularis and Strongyloides stercoralis that has been implicated in appendicitis pathogenesis, exhibits a summer-peak in some countries.[18,19] This may give us an explanation about the findings of this review regarding the role of infection in the pathogenesis of appendicitis, particularly in summer season.

Several studies have explored the connection between ulcerative colitis and appendicitis. A history of appendectomy is rare in patients with ulcerative colitis. The mechanism mediating the association between appendectomy and ulcerative colitis is not fully understood. It has been suggested that inflammation in one site of the large intestine may trigger ulcerative colitis at a different site in pre-disposed individuals.[20] Interestingly, the seasonal peak of ulcerative colitis incidence has been found to be higher in summer.[21] According to these results, one could conclude that patients with ulcerative colitis have a higher risk of appendicitis, particularly in summer months. Further investigation of the possible role of ulcerative colitis and appendicitis is expected to open new fields for basic scientific research and may lead to the improvement of our understanding for the disease pathogenesis.

CONCLUSION

Seasonal pattern of acute appendicitis is quite clearly demonstrated by the data showing a peak during the warmer months on the year. It was also shown that, in this region, the incidence is highest in the 20-29 years age group and females have a higher incidence than males (M:F = 1:1.7), as opposed to other studies showing a higher incidence in males.

The presence of a seasonal variation, consistent with a possible role for an infectious or environmental agent as initiator of an immunologic response, deserves further large-scale epidemiologic and genetic studies.

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