Appendicitis: Trends in incidence, age, sex, and seasonal variations in South-Western Nigeria

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Abstract

Background: Appendicitis is a common clinical condition worldwide. Differences in incidences, sex, age, and seasonal variations have been reported widely, with paucity of information from Nigeria.
Aim: To assess the trends in incidence and pattern of variation with age, sex, and seasons of the year.
Materials and Methods: A review of the records of all patients with confirmed appendicitis treated in both the LAUTECH Teaching Hospital (LTH) and the Abake Medical Center (AMC), both situated in Osogbo, Nigeria, between January 2003 and December 2008, was done. LTH was a 320-bed University Hospital (with 100 surgical beds), while AMC was a 20-bed surgical center. The age, sex, and month of admission of all the histologically proven cases of appendicitis were retrieved and treated. Analysis was done using simple percentages, Student t or Chi-square tests, where applicable.
Results: A total of 299 out of 321 cases of appendicitis recorded during the observed period were confirmed histologically from both hospitals (69.56% from LTH). Fifty-two percent were males. It made up 0.94, 1.43, and 1.86% of the total hospital admissions in 2004, 2006, and 2008, respectively. There has been an increasing incidence in both sexes almost in a similar pattern. The overall mean age was 25.79 years (M 25.94 and F 25.43 years) with 6% below the age of ten and 1.3% above 60 years. The highest incidence in males and females occurred in the second and third decades, respectively. Incidences were higher during the rainy season (April to September) 68% (P<0.05), with peaks from June to August, when 39.5% of all cases presented.
Conclusion: The increasing incidence of appendicitis in both sexes in this region may be due to the change to a Western lifestyle. The age distribution has a similar pattern in both sexes and 87% are 40 years or less, although the incidence is marginally higher in males. Higher prevalence of infections and allergens from pollens in the rainy season could contribute to a higher incidence of appendicitis.

Keywords: Age distribution, appendicitis, incidence, seasonal variation, sex distribution, trends

Résumé

Arrière-plan: Appendicite est une condition clinique commune dans le monde entier. Différences entre les incidences, sexe, âge et variations saisonnières ont été signalées largement, avec la rareté des informations du Nigeria.
Objectif: Pour évaluer les tendances dans l’incidence et la répétition des variations avec l’âge, le sexe et les saisons de l’année.
Matériel et méthodes: A l’examen des dossiers des patients avec appendicite confirmé traités à la fois l’hôpital d’enseignement LAUTECH (LTH) et le centre médical Abake (AMC), les deux situés dans Osogbo, au Nigéria, entre janvier 2003 et décembre 2008, a été fait. LTH était un centre hospitalier universitaire de 320-lit (avec 100 lits chirurgiens), tandis que l’AMC a été un centre chirurgical de 20 lits. L’âge, le sexe et le mois d’admission de tous les cas histologique éprouvées d’appendicite ont été récupérées et traitées. Analyse a été réalisée à l’aide de simples pourcentages, Student t ou Chi2, lecaséchéant.
Résultats: Un total de 299 de 321 cas d’appendicite enregistrés pendant la période observée ont été confirmés histologique de deux hôpitaux (69.56% de LTH). Cinquante-deux pour cent étaient les hommes. Il compose 0.94, 1.43 et 1.86% de l’hospitalisation de total en 2004, 2006 et 2008, respectivement. Il y a eu une incidence croissante dans les deux sexes presque dans un modèle similaire. L’âge moyen global a été 25.79 ans (25.94 M et F 25.43 ans) avec
Appendicitis is the most common surgical cause of abdominal pain worldwide. Differences in incidences, sex, age, and seasonal variations have been reported widely, with paucity of information from Nigeria. The incidence is higher among the Caucasians and also in people living in the developed world, although this appears to be declining.

Report of increasing incidence in African countries has been reported by some authors in the last few decades. It is generally reported to be more common in males and usually occurs in the age range of 10 to 30 years, although Mangete from Port-Harcourt in Nigeria, found a significantly higher incidence in females. Higher incidences have been reported in the summer months by many authors. Ashley has reported an excess during spring, implicating a high prevalence of viral infections among others during these months, but Sanda et al. have suggested intense challenge to the mucosa-associated lymphoid tissue from allergens in the dust, during the sandstorms of the Spring months, in the Arabian Peninsula. The aim of this retrospective study is to assess the trends in incidence and patterns of variation with age, sex, and seasons of the year, thus contributing to the world of literature on appendicitis, from this part of Nigeria.

Materials and Methods

A review of the records of all patients with confirmed appendicitis treated in both the LAUTECH Teaching Hospital (LTH) and the Abake Medical Center (AMC), both in situated in Osogbo, Nigeria, during the period January 2003 to December 2008, was done. Osogbo, a semi-urban town with a population of 465000 (an annual population growth rate of 2.8 by 1995, Estimate), with few other suburban towns nearby, within south-Western Nigeria, is served mainly by LTH and few secondary and private hospitals. The LTH University Hospital has 100 surgical beds, while the AMC is a 20-bed surgical center.

The age, sex, and month of admission for all the histologically proven cases of appendicitis were retrieved and treated. The total number of hospital admissions for each year was obtained from the Medical Records Department of the hospitals, and this was used to calculate the percentage of admissions made, of confirmed appendicitis cases. Tables and figures were drawn and an analysis was done, using simple percentages, student’s t test, and the Chi square test, as found appropriate. The result here could not be absolute, as some cases were admitted to other hospitals within the vicinity especially during periods of industrial crisis; it nevertheless represented the pattern of the disease in this region.

Results

A combination of data from the two sources showed that a total of 299 out of 311 cases of appendicitis recorded during the observed period (January 2003 – December 2008) were confirmed histologically. There were 208 cases (69.56%) comprising of 109 males and 99 females from LTH, while (47 males and 44 females) were seen at AMC. Males constituted 52.17% (M: F 1.1:1). A continuous increase in incidence was noticed over the years; the incidence in 2008 almost doubled that of 2003, while the values of appendicitis as a percentage of the total hospital admissions were 0.94, 1.43, and
1.86 for the years 2004, 2006, and 2008, respectively. It also constituted 5.85 and 10.87% of all surgical admissions in 2003 and 2008, respectively. [Table 1 and Figures 2a and b]

There is an increasing incidence in both sexes almost in a similar pattern [Figure 1]. The overall mean age was 25.79 years (M 25.94 and F 25.43 years). Only 6% of the cases were recorded for the first decade of life, while 65.9% occurred in the age group 11 – 30 years [Figure 3]. The highest incidence in males and females occurred in the second and third decades, respectively.

Incidences were higher in the period between April and September (68% of all, P < 0.05), with peaks in June, July, and August. This started declining from the month of October, with the lowest in December, followed by gradual minimal increment from the month of January. [Table 2, Figure 4]

**Discussion**

The incidence of appendicitis varies substantially by country, geographical region, race, sex, age, and seasons.\(^3,6,13,17\) The finding of an increasing incidence in this study is in-keeping with the previous reports from Nigeria\(^8,10\) and other authors,\(^7,9\) generally from the developing world. This is in contrast to the common findings of reducing incidence in a larger part of the developed world.\(^3,4,6\) Several reasons could be adduced to this, ranging from the very youthful African population and changing to a Western lifestyle.\(^5,11\)

The predisposing factors to appendicitis are thought to be multifactorial, ranging from dietary, age, genetic predisposition, viral and bacterial infections, and parallel changes in humidity.\(^12\) Vascular disorders, stressful life,\(^3\) smoking,\(^20\) and inadequate childhood breast feeding,\(^21\) are also being suggested by some authors.

The increasing number of ‘fast food’ restaurants where mainly high-carbohydrate, low-fiber diets, confectionaries, and sweets are served could have contributed to the increase in the incidence, as an increasing number of young men and women, at times the whole family patronize these facilities, thus consuming less of the traditional high-fiber, less sugary diet. Large consumption of sweets and sugary diets has been implicated by some authors.\(^22,23\)

Most authors reported a higher incidence in males.\(^3,12,13,18\) The finding of M:F 1:1:1, suggests that the incidence is marginally higher in males, which is in-keeping with the finding of Ayoade et al, from Sagamu,\(^15\) also in South-Western Nigeria. The young females here tend to have a preference for a highly-refined diet, including confectionaries, which prolong the colon transit time, with the aim of reducing bowel motion frequency and maintaining

**Table 1: Distribution by year, 299 cases of appendicitis, total hospital and surgical admissions at L.T.H and A.M.C Osogbo between January 2003 and December 2008**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total no. appendicitis cases</th>
<th>Total no. of hospital admissions</th>
<th>Percentage of total hospital admissions</th>
<th>Total surgical admission</th>
<th>Percentage of total surgical admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>36</td>
<td>3096</td>
<td>1.17</td>
<td>615</td>
<td>5.85</td>
</tr>
<tr>
<td>2004</td>
<td>39</td>
<td>4118</td>
<td>0.94</td>
<td>670</td>
<td>5.82</td>
</tr>
<tr>
<td>2005</td>
<td>42</td>
<td>3833</td>
<td>1.1</td>
<td>656</td>
<td>6.40</td>
</tr>
<tr>
<td>2006</td>
<td>52</td>
<td>3629</td>
<td>1.43</td>
<td>489</td>
<td>10.63</td>
</tr>
<tr>
<td>2007</td>
<td>63</td>
<td>4584</td>
<td>1.37</td>
<td>632</td>
<td>10.87</td>
</tr>
<tr>
<td>2008</td>
<td>67</td>
<td>3595</td>
<td>1.86</td>
<td>616</td>
<td>9.96</td>
</tr>
<tr>
<td>TOTAL</td>
<td>299</td>
<td>22855</td>
<td>1.31</td>
<td>3648</td>
<td>8.19</td>
</tr>
</tbody>
</table>
a slim stature. This has been found to increase the possibility of developing appendicitis, diverticular diseases, and even colonic malignancies in South Africa.\textsuperscript{23,24}

The high prevalence of intestinal parasites in the developing world could also account for some cases of appendicitis, as it has been noticed to be initiated by or associated with them. The commonly associated parasites are schistosoma mansoni, haematobium, Enterbious vermicularis, ascaris, Entamoeba histolytica, and pin worm, among others. Badmus \textit{et al.}\textsuperscript{25} and Adebamowo \textit{et al.}\textsuperscript{26} have reported some cases of schistosomal appendicitis from South western Nigeria.

Appendicitis is generally a disease of young age. The usual finding of the highest incidence was seen in the second and third decades of life. The mean average age of 25.7 years is in-keeping with that cited by Al Omran \textit{et al.}\textsuperscript{3} and others. The age distribution has a similar pattern in both sexes; this supports the non-influence of sex or the X chromosome as a predisposing factor to appendicitis.\textsuperscript{18} With the relative rarity in the first decade and progressive decline after the third decade it may be inferred that the peak incidence seems to coincide with the age endowed with the most active lymphoreticular activity in the mucosa-associated lymphoid tissues, which make up most of the appendix.

Cases of appendicitis present throughout the year, but some particular months are associated with higher incidences, although this varies from region to region. Higher incidences are noted to be associated with summer months by many authors.\textsuperscript{3,14,27} The months of May to October present a high incidence (with peaks in June to August) in this study, this is in-keeping with the findings from California\textsuperscript{13} and Italy\textsuperscript{16}. The presence of seasonal variation shows the possibility of heterogenous extrinsic factors such as, humidity, allergens, sun radiation, and viral and bacterial infections in the etiogenesis of appendicitis. The steady increase in the number of cases from the month of April, corresponds with the onset of the rainy season, the intensity of which increases toward the months of July, August, and September. Higher humidity, which occurs during this period has been implicated by some authors.\textsuperscript{12,28} Khaevel \textit{et al.} also postulated the importance of the actual reduction of sun radiation and vast fluctuations in air temperature, in the incidence of appendicitis.\textsuperscript{29} Increase in the incidence of bacterial and viral infections (causing lymphoid hyperplasia leading to appendix lumen obstruction)\textsuperscript{29} and parasitic infestations during this period could also contribute to the higher incidence of appendicitis, in a region where the climate is characterized by high humidity and heavy rainfall, in an environment with poor sanitation. Allergic reaction to pollen from flowers and palm produce,\textsuperscript{30} for example, maize, during the rainy period may also account for some of the cases, which appear as lymphoid hyperplasia; a form of immunological response.

**Conclusion**

There is an increasing incidence of appendicitis in south western Nigeria, which affects both sexes equally, though the incidence is marginally higher in males. The age distribution has a similar pattern in both sexes, rare in the first decade, but peaks in the second and third decades; the period of a highly responsive lymphoreticular system. Appendicitis is more common during the rainy season, a period known for humidity, high incidence of bacterial and viral infections, and high prevalence of intestinal parasites.
References