

# ACUTE APPENDICITIS IN MINORITY COMMUNITIES: AN EPIDEMIOLOGIC STUDY

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This study examines the incidence and epidemiological factors of acute appendicitis in various ethnic groups in an urban minority community. The charts of 278 consecutive patients who underwent appendectomy at The Bronx-Lebanon Hospital Center, Bronx, New York, between January 1988 and December 1990 were reviewed. Thirty-eight patients who underwent incidental appendectomy and one patient who had an interval appendectomy were excluded. The remaining 239 patients, all of whom had acute appendicitis, constituted the study population. The incidence of appendicitis for each ethnic group was calculated as a percentage of the total emergency surgical admissions for that group. Acute appendicitis constituted 3.1% of all emergency admissions to the surgical service over the period studied and represented 4.5% of surgical service admissions from the emergency department in Hispanics, 1.9% in African Americans, 1.5% in whites, and 21% in Asians. These differences were statistically significant except some comparisons involving whites. There were no significant differences in the pathological findings regarding the diseased appendix in different racial groups. These results indicate that acute appendicitis is responsible for a higher incidence of emergency admissions among Hispanics than among African Americans. This finding was statistically significant. High white blood cell counts indicated inflammation of the appendix, but had no predictive value for the type of pathology. Surgical findings were similar in all groups. (*J Natl Med Assoc.* 1997;89:168-172.)

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**Key words:** appendicitis ♦ minorities

The etiology of appendicitis, one of the most common surgical maladies, has been studied in various geographic locations. Analysis of its epidemiology has consistently demonstrated a higher incidence in whites than in other racial groups. Differences in dietary habits among ethnic groups has been the most widely accepted explanation. However, a precise cause-and-effect relationship has not been proven, and other factors have been considered to be

contributory. This retrospective study was undertaken to determine whether any differences existed between the incidences of acute appendicitis in different ethnic groups within a large surgical facility in a minority community setting in New York City.

## PATIENTS AND METHODS

Clinical and historical data pertaining to all patients who underwent appendectomy at our institution between January 1988 and December 1990 were recorded. Emergent or acute appendectomies were defined as those undertaken with a preoperative diagnosis of acute appendicitis. Patients' sex and age as well as surgical and pathological findings were considered in the analysis. Based on the surgical findings, cases were categorized along the following groups: inflamed,

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	By Ethnic Group						
	By Gender			Hispanics	African Americans	Asians	White
	Total	Males	Females				
Number	239	143	96	160	72	4	3
% of total	100	60	40	67	30	1.7	1.3
Average age*	26.0±15.0	24.3±13.9	27.6±16.1	25.6±14.9	26.2±15.2	23.0±15.3	19.3±10.1
ESA	7690	3692	3998	3588	3798	19	198
Appendectomies per 100 ESA	3.1	3.9	2.4	4.5	1.9	21	1.5

Abbreviations: ESA=emergency surgical admissions.  
\*Given as mean±standard deviation.

gangrenous, perforated, abscess, normal, and others. In the event of disagreement between surgical and histological diagnoses, the latter were accepted as determinative for the purpose of the study.

A total of 278 appendectomies were performed during the study period. Thirty-eight of these were incidental appendectomies, done as part of another procedure unrelated to appendicitis. These incidental appendectomies and one case of interval appendectomy were excluded from the study. The remaining 239 patients underwent emergency appendectomy and form the basis of this report.

The patients were categorized along four ethnic groups: Hispanics, African Americans, whites, and Asians. An estimate of the racial composition of the total population served by the hospital was required to calculate the incidence of acute appendicitis in each ethnic group. This could not be determined from an analysis of the ethnic composition of the local resident population since an appreciable proportion could be expected to seek treatment in other primarily municipal hospitals because of financial constraints and thus would not be reflected in our data. After careful evaluation, the number of people admitted to the surgical service through the emergency room was considered the most representative of our reference population.

## RESULTS

### Age and Sex

The average age of all patients in the study was 26.0±15.0 years (24.3±13.9 years for males and 27.6±16.1 years for females). There was a slight male predominance, three males to two females.

### Ethnic Groups

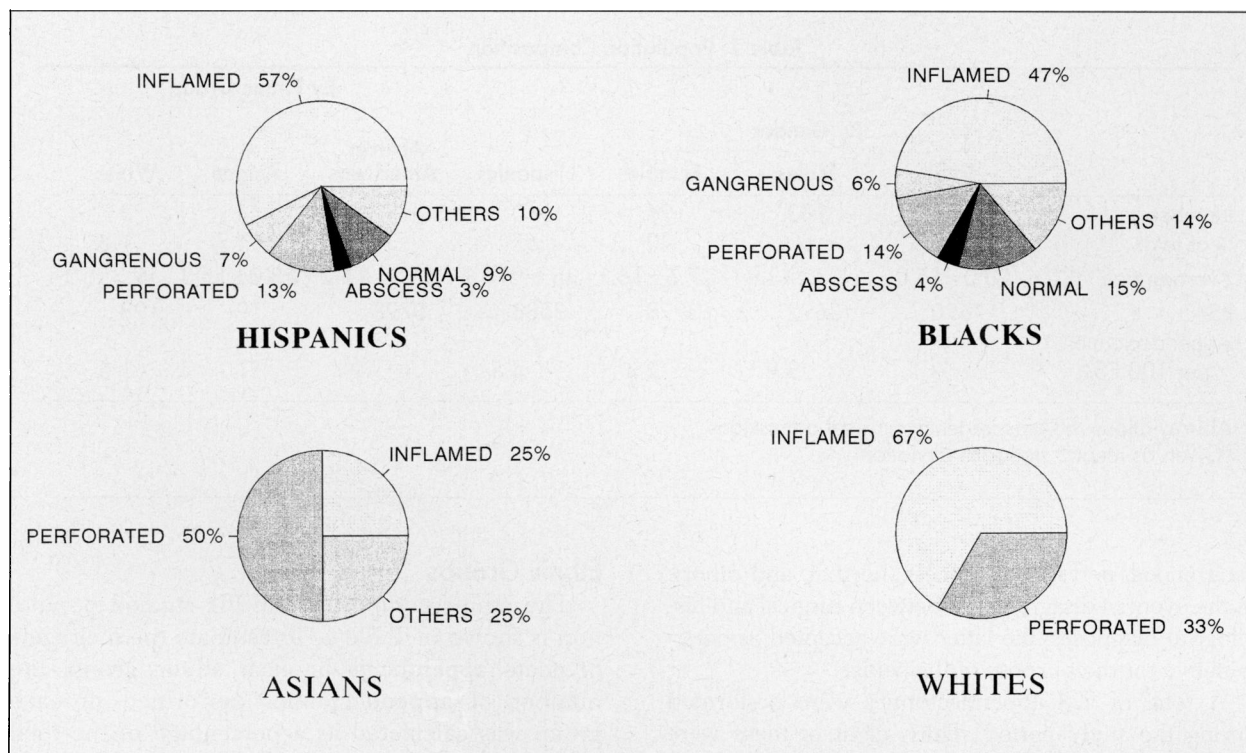
The ethnic composition of the studied population is shown in Table 1. To estimate the incidence of acute appendicitis in each ethnic group, the number of appendectomies performed in each group was calculated as a percentage of the total emergency surgical admissions for the same group. This figure was highest for Asians at 21% (Table 1).

Operative findings were studied in relation to the various ethnic groups. The following six categories of pathology were recognized: inflamed, gangrenous, perforated, appendicular abscess, normal appendix, and others (Figure). None of the ethnic groups showed any statistically significant predilection for any one type of pathology ( $P=.6765$ ).

An extension of Fisher's exact test for multiway contingency tables was used to assess the association between race and emergency appendectomies. A multiple comparison procedure was used between pairs of racial groups. The results indicated a statistically significant higher incidence of appendectomies in Hispanics versus African Americans (Table 2).

## DISCUSSION

The epidemiology of acute appendicitis has been studied extensively. Analyses of its incidence in various parts of the world have shown considerable variations in different ethnic groups, with a predominance in whites and urbanized communities. Nonwhite immigrants to Western countries have been found to have significantly higher incidences than their native counterparts in the countries of their



**Figure.**

Operative findings in different ethnic groups for appendectomies from January 1988 through December 1990.

origin. Most authors have ascribed these observations to differences in dietary habits. Although the low-fiber, refined, high-protein Western diet traditionally has been considered to be the key factor, this hypothesis has not been universally corroborated.

Morel<sup>1</sup> described anatomoclinical variations of ileocecal appendices with sex and race. Walker et al<sup>2</sup> studied the incidence of appendicitis in blacks, Euraficans, Indians, and whites in South Africa and found wide differences in appendectomy rates in these groups despite similar dietary habits. They suspected that unknown aspects of the bowel milieu were responsible. Hyman and Westring<sup>3</sup> found statistically significant lower white blood cell counts and neutrophil counts in black patients than in an identical group of whites with appendicitis.

Walker and Segal,<sup>4</sup> in a study of 18 and 20 year olds in South Africa, found that the prevalence of appendicitis was 0.5% in rural blacks, 1.2% in urban blacks, and 14% in urban whites. They pointed out that there were 7.6 appendectomies per 100,000 blacks in Soweto and Johannesburg in 1977 compared with 225 per 100,000 per year in the United Kingdom in 1961. Moore and Robbs<sup>5</sup> found a rising incidence of appen-

ditis among Zulu city dwellers (1.9 per 1,000 between 1950 and 1959; 5 per 1000 admissions in 1977 and 1978). They considered changing dietary habits to have been a possible etiological factor.

Lichtarowicz and Mayberry<sup>6</sup> found appendicitis to be more common in Polish migrants in Nottingham than among people in Poland. Walker and Walker<sup>7</sup> determined that the prevalence of appendicitis in a series of South African school students aged 16 to 18 years was 0.5% among rural blacks, 1% among urban blacks, 2.6% among Indians, and 2.2% in Eurafican-Malayi, but 13.4% in Afrikaan whites and 9.9% in English whites. Thus, appendectomy was infrequent in all except the white population. Factors other than diet were thought to be involved.

Attwood et al<sup>8</sup> reported in 1987 that the age-specific appendectomy rate in Ireland was substantially higher than that in Scotland, England, or Wales. Freud et al<sup>9</sup> found a higher incidence of acute appendicitis among Jewish children (4.44 per 10,000) than in Bedouin children (1.14 per 10,000) in Negev, Israel, over an 11-year period. This difference was significant at the  $P < .05$  level. They

hypothesized multifactorial causes such as diet, humidity, and bacterial and viral infections.

Matheson et al<sup>10</sup> in Glasgow found a significant increase in the incidence of acute appendicitis among Asian males between ages of 10 and 19.9 years, although the overall rate for all Glasgow children fell. This was thought to reflect dietary adaptation. Foster and Webb<sup>11</sup> found the incidence of appendicitis in the Melanesian population of North Solomon in Papua, New Guinea, to be 29 per 100,000, which was significantly less than in developed countries such as the United States (140 per 100,000) and Australia (210 per 100,000). Walker et al<sup>12</sup> found that appendicitis was almost absent among rural blacks in Africa. Addiss et al<sup>13</sup> in their analyses of the US National Hospital Discharge survey data for 1979 to 1984, found that appendicitis rates were 1.5 times higher for whites than for nonwhites. Luckmann and Davis<sup>14</sup> compared the age- and sex-specific appendicitis rates for whites, Hispanics, blacks, and Asians/others. The rates among blacks and Asians between the ages of 5 and 29 years were less than half that for whites and Hispanics.

Marrero et al<sup>15</sup> and others have reviewed the cases of 42 appendectomies in children younger than 12 years at two inner city hospitals in Nashville, Tennessee. Blacks (22 cases) and whites (20 cases) comprised equal portions of the patient population, but the mean white blood cell count was higher for white children (18,176±4682 versus 14,615±5459). Similarly, Chua and others<sup>16</sup> in their analysis of 120 appendectomies at Taiping District Hospital in Malaysia found an equal distribution among the major races. Close et al<sup>17</sup> studied the patterns of appendectomy among children aged 14 and younger in New South Wales. They found significant differences in appendectomy rates and perforated appendices between different geographic areas.

Our report is unique in its study of minority communities in an urban location. Hispanics appear to have a significantly higher incidence of acute appendicitis than other ethnic groups. The high incidence in Asians, although statistically significant, may not be meaningful because of the small sample size.

## CONCLUSION

In our population, consisting of a mixture of racial minorities, the incidence of acute appendicitis among whites admitted to the surgical service through the emergency room was 1.5%. The difference in the incidence between any two ethnic groups, except whites,

**Table 2. Incidence Variations in Different Ethnic Groups**

Groups Studied	P Value	Conclusion
Hispanics versus African Americans	<.05	Significant
Hispanics versus whites	.04	Just significant, possible trend
Hispanics versus Asians	<.05	Significant
African Americans versus whites	.91	Not significant
Whites versus Asians	<.05	Significant
African Americans versus Asians	<.05	Significant
Overall statistical significance	<.05	Significant

was statistically significant. Therefore, no conclusion could be drawn regarding whites. The data for Asians were not considered to be reliable because of the small number of Asians in the study. The overall mean age was similar in Hispanics and African Americans, slightly lower for Asians, and appreciably lower for whites (19.3). Males had a lower mean age than females. There were no significant differences in the pathological findings regarding the diseased appendix in different racial groups. The white blood cell counts of patients with histologically proven inflamed appendices were higher than those of patients without pathological evidence of inflammation, but had no predictive value for the type of pathology. The principal finding of this study was a much higher and statistically significant incidence of acute appendicitis in Hispanics than in African Americans in this population of urban minorities.

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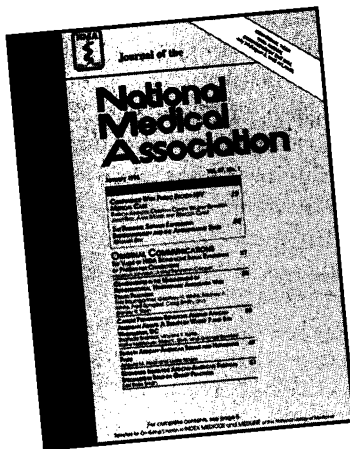
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