Original Article

Fourteen-year study of hospital admissions for diverticular disease in Ontario

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BACKGROUND: Diverticular disease is one of the most common gastrointestinal conditions affecting the Canadian population, yet very little is known about its epidemiology.

OBJECTIVE: The aim of the present study was to measure the rate of hospital admission for diverticular disease by age and sex over a 14-year period in the population of Ontario.

PATIENTS AND METHODS: The present study was a retrospective, population-based cohort study of all hospital admissions for diverticular disease from 1988 to 2002.

RESULTS: There were 133,875 hospital admissions during the period. Admission rates increased with age, and women were admitted at higher rates than men across all age groups.

CONCLUSION: Diverticular disease is an important cause of gastrointestinal morbidity. As the population ages, a rise in the incidence of diverticular disease can be anticipated. Future studies to explain sex difference in admissions are required.

Key Words: Diverticulitis; Diverticulosis; Epidemiology

In most industrialized countries, diverticulosis is believed to affect 30% to 50% of the population over 60 years of age, with 10% to 25% of cases developing complications such as diverticulitis and diverticular hemorrhage (1). Diverticulosis is thought to be caused by the combination of an increase in intraluminal pressure and weakening of the colonic wall (2), both of which are exacerbated by aging, and a low-fibre diet (3,4). Although not typically life-threatening if treated, diverticular disease causes significant pain and suffering for those afflicted, and places a substantial burden on the health care system.

Studies examining trends in diverticular disease hospitalizations are limited. A single study in England (5) found that hospitalization rates increased over the time period of 1989 to 2000, with male rates being higher for patients younger than 50 years of age, and female rates higher for patients older than 50 years of age. The study, however, did not examine seasonal variations in the complications of diverticular disease, a potentially important clue to its pathogenesis. Seasonality of occurrence is a conspicuous feature of many gastrointestinal diseases such as peptic ulcer disease. This may be related to the seasonal incidence of infectious agents or dietary habits. Therefore, we tested the hypothesis that seasonal variation for diverticulitis hospitalizations may exist. There have been no large-scale epidemiological studies of hospitalization patterns for diverticular disease in North America.

To address this gap, the present study examined hospitalization patterns for diverticular disease in Ontario by age and sex over a 14-year period to answer the following questions: Do hospitalization rates vary by age and sex? How do rates vary over the 14-year period? Are there seasonal patterns to these hospitalizations?

METHODS

A retrospective population-based cohort study design was used to examine temporal patterns of hospital admissions for diverticular disease between April 1, 1988, and March 31, 2002, in Ontario. Admission data were obtained from the Canadian Institute for Health Information – Discharge Abstract Database for the principal diagnosis of diverticular disease (World Health Organization’s International Classification of Diseases – Ninth Revision code 562). This database records discharges from all acute care hospitals in Canada, documenting a scrambled patient identifier; date of admission and discharge; up to 16 diagnoses as coded by the International Classification of Diseases – Ninth Revision – Clinical Modification; and up to 10 procedures.
Research has shown that the diagnoses in this database have a high degree of accuracy, with less than 1% of the basic information missing (6).

All hospital discharges for diverticular disease were extracted by age and sex for each month over the study period. Annual census data for each age group for residents of Ontario were obtained from Statistics Canada. Monthly population estimates were derived through linear interpolation. These data were then used to calculate monthly hospitalization rates for patients older than 40 years of age, standardized for month length. Transfers from one acute care hospital to another within this study group were not included in the analysis.

Several time series analysis techniques were used. First, spectral analysis, which detects periodicity in time series, was conducted (7). The data were detrended before conducting spectral analysis using moving averages. Two tests – the Fisher’s Kappa (FK) test and the Bartlett Kolmogorov Smirnov (BKS) test – were conducted for the null hypotheses that the series was strictly white noise. The FK test is designed to detect one major sinusoidal component buried in white noise, while the BKS test accumulates departures from the white noise hypotheses over all frequencies (8). Following this, the autocorrelation function was used to measure the correlation between observations at different time lags (9). A strong correlation between the observations at 12 time lags indicates a strong seasonality of the period 12. Finally, $R^2$ autoregression coefficients ($R^2_{Autoreg}$) were calculated to quantify the strength of the seasonality (10). The $R^2_{Autoreg}$ is interpreted the same way as the coefficient of determination in classic regression: values from 0 to less than 0.4 represent nonexistent to weak seasonality, 0.4 to less than 0.7 represent moderate to strong seasonality, and 0.7 to 1 represent strong to perfect seasonality. All statistical analyses were performed using SAS version 8.2 (SAS Institute Inc, USA).
The rate increase observed in our study between 1988 and 1992 is similar to the upward trends reported during this time period in Ontario for other health conditions including myocardial infarction, chronic obstructive pulmonary disease and congestive heart failure, and overall hospitalizations. Further research is required to explain these findings.

Because seasonality is well-documented in peptic ulcer disease, which has a bacterial etiology, it would be conceivable that seasonal variation for diverticulitis may exist as well; particularly if seasonal dietary patterns or infectious agents were implicated in triggering illness sufficient to warrant hospitalization. To the best of our knowledge, no previous study of diverticular disease has checked for such variation. However, we found no evidence of seasonality in our study. Over the past 20 years, abundant fruits and vegetables have been available year round to Canadian consumers. The absence of seasonality in the present study does not rule out the possibility that diet plays an important role in the complication rate of diverticular disease.

The chief limitation in the present study is the inability to separate out distinct types of diverticular disease. We aggregated codes to examine the overall impact of diverticular disease. Another limitation of our study is that changes in the rates of usage of other health services for diverticular disease, such as outpatient physician visits, could not be assessed. Also, surgery rates and mortality statistics were not included. The strength of the present study lies in its longitudinal base and large population size, combined with the use of a comprehensive time-series analysis approach applied to age and sex. With Ontario’s aging population, hospitals will almost certainly experience an increase in diverticular disease rates. The present study increases our understanding of the pattern of this illness and can be expected to inform the development of age- and sex-targeted preventive strategies, as well as more effective allocation of health care resources.

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