

Diverticulosis among patients referred for barium enema studies at Dr George Mukhari Academic Hospital, Ga-Rankuwa, Pretoria, South Africa

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Abstract

Background: A possible increasing trend in the incidence of diverticulosis was observed in adult patients referred to the Diagnostic Radiology department of Dr George Mukhari Academic Hospital (DGMAH), Ga-Rankuwa, Pretoria, for barium enema studies. The study will be the first to document the magnitude of this condition at our hospital since its inception.

Objective: The aim of this study is to evaluate the current prevalence of diverticulosis at DGMAH Ga-Rankuwa whose patients are predominantly South Africans of African descent.

Materials and Methods: We reviewed the medical records of all adult patients referred to DGMAH for barium enema investigations for 1 year. Barium enema studies of 166 patients who met the inclusion criteria were systematically evaluated radiologically for the presence of diverticulosis. Data from the records were analyzed using the Statistical Package for Social Sciences (SPSS, version 22.0) software program.

Results: The patients' ages ranged between 18 and 95 years, with a mean age of 60.1 years. From the records analyzed, 77.7% were radiologically negative, whereas 22.3% were positive for diverticulosis. There was a female preponderance (23 cases [62.2%] among females versus 14 cases [37.8%] among males; $P < 0.0001$) and the diverticulosis had a diffused pattern. The increasing trend of diverticulosis observed at DGMAH did not reflect any statistically significant difference when compared with previous studies done in sub-Saharan Africa.

Conclusion: This study demonstrates a possible trend of diverticulosis previously unrecorded in barium enema studies at DGMAH, probably attributable to the effects of urbanization and higher consumption of refined carbohydrate with low fiber residue.

Keywords: Barium enema, diverticulosis, pretoria, South Africa,

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INTRODUCTION

Colonic diverticulosis is considered rare in developing nations but common in Western and industrialized societies,

accounting for approximately 130,000 hospitalizations yearly in the United States of America.^[1] The prevalence of diverticulosis is similar in men and women and increases

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with age, ranging from approximately 10% in adults younger than 40 years of age and between 50% and 70% among those 80 years of age or older.^[2]

Chris Hani Baragwanath Academic Hospital, Soweto, Johannesburg that serves mainly urbanized black South African population is the third largest hospital in the world with 3400 beds. From 1954 to 1956, no cases of diverticulosis was reported in 2367 autopsies, and no case of diverticulosis was recorded in 600 barium enemas performed over the same period at the same hospital.^[3] Diverticulosis is a disease of economically developed countries whose diet is high in refined carbohydrates.^[4,5] Assuming that this hypothesis is correct, then one will expect a rising incidence of diverticulosis in developing countries as a result of migration to urban areas and the people's diets transforming from fiber rich carbohydrate to fiber low carbohydrate as a result of refined carbohydrate.

In the 1970s, Walker and Segal,^[6] in their study of noninfective intestinal disease in various ethnic groups in South Africa, reported that the prevalence of bowel diseases (hemorrhoids, appendicitis, polyps, ulcerative colitis, irritable bowel syndrome, diverticulosis, and colon cancer) are similar in South African Whites and in populations of prosperous western countries. They also suggested that among rural South Africans of African descent, with a traditional eating life style, these diseases are very uncommon or almost unknown, while among the urban South African Blacks, with a partially westernized lifestyle, the diseases remain uncommon.

Segal and Walker, who reported on diverticulosis in urban Africans in South Africa, diagnosed this condition in only 42 black patients (16 men and 26 women) during a 3-year period from an urban population approaching 1.5 million.^[7] Patients presented mainly with rectal bleeding, abdominal mass or pain, with an average age of 62 years and all were among the more privileged. They further suggested that although a measure of westernization of diet among black population is ongoing, its extent and the period of exposure would seem to have been insufficient to evoke significant rises in the occurrence of diverticular disease.

Painter and Burkitt^[8] have reported that diverticulosis was believed to be a disease affecting the elderly, with prevalence as high as 65% by 85 years of age, as low as 5% in those of 40 years of age, and younger. In the USA, Etzioni *et al.*^[9] reported an increase in the incidence of diverticulosis among younger patients, with 25% of patients 40 years of age or younger and presenting with a more aggressive form

of disease requiring surgery, compared with older patients. In addition, they also found that diverticulosis is left-sided in the Western countries-likely acquired, while Wagner and Zollinger^[10] found that right-sided diverticulosis predominate in Asia, likely a true diverticulosis and therefore congenital in nature.

Objectives

The objectives of the study were to:

1. Document the baseline characteristics of patients radiologically diagnosed with diverticulosis after barium enema studies at DGMAH, Ga-Rankuwa, South Africa
2. Determine the prevalence of diverticulosis among these patients with respect To the population residing in the hospital's primary drainage areas.

Ethical clearance

1. Informed consent for the barium enema procedure was obtained routinely from Each patient using the standardized DGMAH patient consent form for procedures
2. The Chief Executive Officer, DGMAH Ga-Rankuwa, Gauteng Province gave permission to conduct the study
3. Ethical approval for the study was obtained from the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC). Clearance number: SMUREC/M/282/2015: IR
4. Confidentiality and anonymity of the patients' hospital medical records were Maintained during the study. Data were analyzed as group data, as no personal identifiers were reflected in the data collection sheet.

MATERIALS AND METHODS

A retrospective study of all barium enema studies and their corresponding medical records were reviewed, at DGMAH Diagnostic Radiology department, Ga-Rankuwa, South Africa, from June 1, 2014 to May 31, 2015. The radiological equipment in this study was the Multi Diagnost Eleva Philips Digital Fluoroscopy machine, which is routinely used for all barium enema studies. Standardized operational radiological procedures for barium enema studies were routinely followed for all patients, involving large bowel preparation, which includes a special diet the day before the studies (clear liquids, such as water, tea, or coffee without milk or cream, broth, and clear carbonated beverages); fasting after midnight; laxative the night before the examination to empty the colon; and the use of an enema kit for each patient.

Medical records of all adult patients above 18 years of age who underwent barium enema studies at DGMAH

during the 1-year period made up the samples for the study. Since diverticulosis is highly uncommon below 18 years of age, the data excluded any patient below that age who underwent the procedure. From the Diagnostic Radiology department of DGMAH medical records, one hundred and sixty-six files met the criteria and reviewed.

The radiological images and results of their interpretations for all patients referred for barium enema studies, which met the study inclusion criteria at DGMAH, were evaluated. Two independent radiologists, including the principal author, to eliminate intra-observer bias or error performed interpretation of the radiological images. We used a data collection sheet to extract baseline information about the patients and to document the radiological findings of the study. The fluoroscopic equipment used for the barium enemas has its own inherent storage facility; hence, the barium enema images were retrieved for evaluation. Data from the study were subjected to descriptive statistics, which described the characteristics of the patients, proportions and percentages of variables essential for the study objectives. The Statistical Package for Social Sciences IBM (SPSS, Version 22.0), new york, USA software program was used for data analyses.

RESULTS

The medical records of 166 referred to DGMAH, Garankuwa for barium enema studies, and who met the inclusion criteria were retrieved for this review. Table 1 shows the demographic characteristics of the patients. The ages of the patients ranged between 18 and 95 years with a mean ($\pm$ standard deviation) of 60.1 years ($\pm$ 15.6 years).

In terms of gender, there were slightly more females (97; 58.4%) than males (69; 41.6%) in the sample reviewed, and the vast majority of the patients were black Africans (164/166; 98.8%), and the remaining 1.2% (2/166) were classified as White South Africans. Almost all were recorded as Christians (161; 98.2%) and only three patients (1.8%) did not specify their religious affiliations.

One hundred and twenty-nine patients (77.7%) investigated for diverticulosis were negative. Out of the 37 patients who were positive, eleven (6.6%; Figure 3), had left-sided diverticulosis. Diverticulosis was right-sided in five patients (3.0%; Figure 5) and diffuse diverticulosis in 21 patients (12.7%; Figure 4).

The distribution pattern of diverticulosis among the 37 positive patients were left-sided (29.7%), right-sided (13.5%) and diffuse (56.8%) [Figure 1]. The prevalence

of diverticulosis in this series revealed that 37 out of 166 patients were radiologically diagnosed with the condition resulting in an overall prevalence rate of 22.3%.

Table 2 shows the variety of symptoms presented at the time of the patients were investigated for diverticulosis. Close to two-thirds (63.9%) presented with constipation, 15.1% were diagnosed with bleeding per rectum, and abdominal pain was recorded in 11.5% of the patients. Other clinical features at presentation were as follows: abdominal mass (4.2%), 2.4% presented with pile (hemorrhoids), and one case each (0.6%) of anal fistula, rectovaginal fistula, sigmoid volvulus, trauma, and vaginoplasty.

Table 1: Demographic characteristics of patients (n=166)

Demographic characteristics	Frequency (%)
Age, years (range)	18–95
Gender	
Females	97 (58.4)
Males	69 (41.6)
Racial group	
Blacks	164 (98.8)
Whites	2 (1.2)
Religion	
Christians	161 (98.2)
Unknown	3 (1.8)

Mean age: 60.1 years (SD=15.6 years). SD – Standard deviation

Table 2: Presenting symptoms of patients investigated for diverticulosis

Symptoms	n (%)
Constipation	106 (63.9)
Bleeding per rectum	25 (15.1)
Abdominal pain	19 (11.5)
Abdominal mass	7 (4.2)
Pile (hemorrhoid)	4 (2.4)
Anal fistula	1 (0.6)
Recto-vaginal fistula	1 (0.6)
Sig volvulus	1 (0.6)
Trauma	1 (0.6)
Vaginoplasty	1 (0.6)
Total	166 (100)

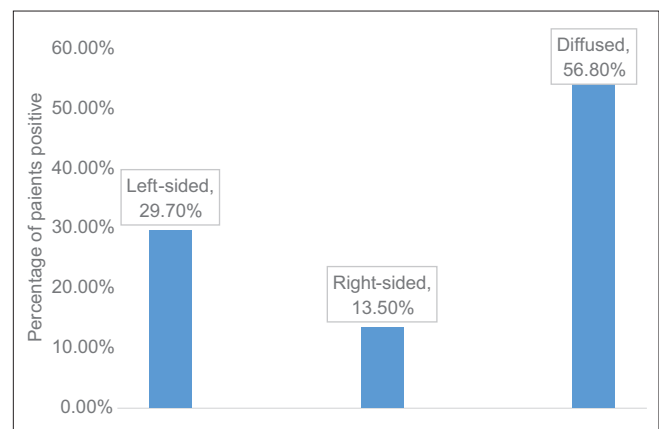


Figure 1: Distribution of diverticulosis by site

Stratification of the occurrence of diverticulosis by age and gender is shown in Table 3. Of the 37 cases of diverticulosis, 32 (86.5%) were aged 60 years and older, and only five (13.5%) were younger than 60 years – a difference in the occurrence of diverticulosis between these two age groups was statistically significant ($P = 0.0042$). In addition, the occurrence of diverticulosis was more common among females, with 23 cases (62.2%) and 14 cases (37.8%) among males, with the statistical difference reflected as $P < 0.0001$. The distribution of diverticulosis as left-sided, right-sided, or diffused was constantly greater among female patients in this study. In addition, prevalence rate of diverticulosis among females was 13.9% as compared with the incidence in males, which was 8.4%.

DISCUSSION

Barium enema results of 166 patients were reviewed for diverticulosis and 128 patients (77.7%) were negative, whereas 37 patients (22.3%) were positive. Majority of the patients (164; 98.8%) were Blacks, while the remaining 1.2% (2/166) were White South Africans. This reflects the demographic characteristics of the patients seen and managed at DGMH– an academic, teaching hospital located in the Garankuwa Black Township, which manages predominantly Black South Africans from the drainage areas of peri-urban Tshwane district of Gauteng province, North-West and Limpopo provinces of South Africa. The mean age of occurrence of diverticulosis in this study was 60.1 years, which is similar to the findings of Ferzoco *et al.*^[2] and Parks,^[5] who concluded that occurrence of diverticulosis increases with age. Most of the previous studies reported a higher incidence of diverticulosis in males than in females,^[5] although Ferzoco *et al.*^[2] found similar prevalence in both males and females. The study demonstrated a preponderance of the condition in females (62.2%) compared with males (37.8%), which is in keeping with changing sex prevalence reported in North America by Parks.^[5]

Etzioni *et al.*^[9] in their study found that their cases of diverticulosis were more located-left-sided colon in Western Countries whereas in Asia, it was reported to be mainly located-right-sided.^[10] The predominance of diffuse pattern of diverticulosis was demonstrated in our study, followed

by left-sided and right-sided patterns, respectively, which is different from previous studies. Rectal bleeding, abdominal mass, and pain were the main presenting symptoms from the previous diverticulosis studies carried out in South Africa,^[7] Ghana,^[11] and Nigeria.^[12] Constipation, followed by bleeding per rectum, abdominal pain, and abdominal mass were the main symptoms in our study. We are not sure of the reason(s) for the predominant differences in presentation, which may need endoscopic studies to confirm in future studies.

Figure 2 illustrates the reported occurrences of diverticulosis in the four decades between 1975 and 2015. The figure shows an increasing trend from 1975 when it was reported to be 4.8%^[13] and in 2011, which reported 9.4%,^[12] figures which showed an increasing trend when compared with the prevalence for 2015 (22.3%) obtained in our study. Although an increasing trend in diverticulosis was demonstrated [Figure 2], it was not statistically significant ($P > 0.05$), partly because it was difficult to transform the increasing trend observed into statistical significance due to the small numbers of occurrences of diverticulosis obtained relative to the large sample investigated.

Previous studies on diverticulosis in sub-Saharan Africa [Table 4] which showed an increasing trend as well as the number of patients positive for diverticulosis are as follows: Keeley^[3] reported no patient in a 1954–1956 study; Segal *et al.*^[13] reported 16 patients between 1974 and 1975; Archampong *et al.*^[14] documented 16 patients in a 3-year study in the 1970s; Madiba and Mokoena,^[15] reported 26 patients between 1989 and 1993; Baako,^[11] 37 patients in a study spanning 1997–2000; Alatise *et al.*,^[12] reported on 30 patients in 2011 while Ozoh and Ogunbanjo (present study) found 37 patients in 2015 (1 year).

The cause and effect of this condition could not be documented, as our study was a retrospective review of the radiological barium enema findings. However, previous studies have postulated that the increasing trend in diverticulosis among the Black South African population might be due to emergent patterns of feeding transforming from the traditional African diets (fibre rich carbohydrate) to the Western diet (fibre low carbohydrate). The study seems to support this postulation and there is an urgent need for similar multi-center studies in the continent to confirm or disapprove this postulation.

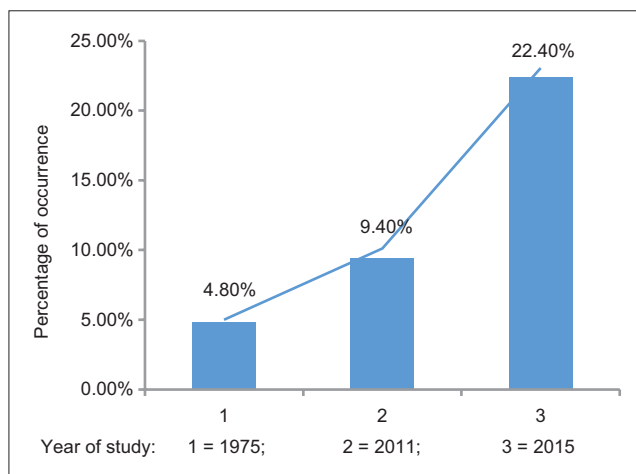
Table 3: Age- and gender-dependent distribution of diverticulosis

	Left-sided diverticulosis (n=11), n (%)	Right-sided diverticulosis (n=5), n (%)	Diffused diverticulosis (n=21), n (%)
Age groups (years)			
<60	2 (18.2)	1 (20.0)	2 (9.5)
≥60	9 (81.8)	4 (80.0)	19 (90.5)
Gender			
Females	7 (63.6)	4 (80.0)	12 (57.1)
Males	4 (36.4)	1 (20.0)	9 (42.9)

Table 4: Other studies reporting on incidence of diverticular disease in Africa

	Archampong <i>et al.</i> , 1978	Madiba and Mokoena, 1994	Kiguli-Malwadde and Kasozzi, 2002	Alatise <i>et al.</i> , 2013	Current study	
					Colonoscopy 2015	BE 2015
Country	Ghana	SA	Uganda	Nigeria	SA	SA
Pattern (%)						
Diffused	75	-	10	85	53.2	56.8
Left-sided	-	77	Majority	-	27.7	29.7
Right-sided	-	62	-	-	19.1	13.5
Gender (%)						
Male	81	39	52	72	43	38
Female	19	61	48	28	57	62
Age (years)						
Range	45-79	-	42-80	41-85	46-86	18-95
Median	54	-	60	64	68	63
Peak	-	51-64	-	-	-	-
Mean	-	-	-	-	57.4	67.4
Cases/years	14/3	26/5	33/5	40/5	47/1	37/1

BE – Barium enema

**Figure 2: Reported occurrences of diverticulosis****Figure 3: Left sided diverticulosis in a 63 year old female patient****Figure 4: Diffuse diverticulosis in a 72-year-old male patient****Figure 5: Right sided diverticulosis in a 74-year-old female patient**

Study limitations

This was a retrospective study, and the scope of information available in this medical record-based study is restricted. All information obtained in this study was due to extraction from the medical records without any personal interviews with the

patients, therefore any additional patient information could not be verified. The results presented, only reflected the prevalence of diverticulosis over a 1-year period. However, an extended evaluation of the study for 3–5 years might have resulted in a different prevalence rate.

CONCLUSION

The images of 166 patients who underwent barium enema studies at DGMH, Radiology department, were reviewed to ascertain the prevalence of diverticulosis. Of the patients evaluated, 77.7% were negative for diverticulosis, and 22.3% were positive. The mean age of the patients reviewed was 60.1 years. The study demonstrated that diverticulosis was more common among females than males in our study population and the main presenting symptoms were constipation (most common), bleeding per rectum, abdominal pain, and abdominal mass. Diffuse pattern of diverticulosis was the most common in our study, followed by left-sided and right-sided distribution patterns.

The findings in the present study were compared with other studies carried out in sub-Saharan Africa since 1954 and the results re-affirm the increasing trend of diverticulosis, which were previously reported from several studies. This is probably due to the increase in migration of the African Black population from rural to urban and peri-urban areas of cities with the associated change in dietary patterns from fiber rich carbohydrates to refined fiber low carbohydrates.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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