

# Prevalence of Colonic Diverticulosis among Adult patients with Obesity and metabolic syndrome conditions, a Retrospective Study at a University Hospital in Saudi Arabia

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## Abstract

**Background:** Obesity is a common health problem that restricts people's daily activities. Many observational studies found that diverticulosis is a common complication for obesity and the prevalence of diverticulosis is increasing. However, the correlation between obesity and diverticulosis remains controversial.

**Aim:** The primary aim of our study was to assess the prevalence and the association between overweight or obesity and the rate of diverticulitis (as diagnosed by CT scans).

**Methods:** Our study was based on reviewing the medical records in a single medical center in Saudi Arabia over a period of 3 years. 342 patients diagnosed with diverticulosis and confirmed by colonoscopy and CT scan were included, with those ages above 18 years old receiving a health examination, measurement of percentage of body fat, blood test and colonoscopy at King Abdulaziz University.

**Results:** Women with body mass index (BMI  $\geq 30$ ) had a greater risk of developing diverticulosis (PR, 1.58; 95% CI, 1.05–2.06) when compared to women with normal BMI. By gender, in patients less than fifty-one, occurrence of colonic diverticulosis was less in female patients compared to males (29% vs 45%,  $P=.06$ ). However, in older ages there wasn't clear difference among male and female patients in the prevalence of diverticulosis.

**Conclusion:** 342 patients who underwent screening colonoscopies for diverticulosis, were included in our analysis. We found that the risk of colonic diverticulosis has an obvious correlation to obesity especially in women with BMI  $\geq 30$ . When comparing by age, colonic diverticulosis was less predominant in premenopausal-age women compared with similar-age men. These findings may be due to female sex hormones that enhance diverticulosis development.

**Key words:** colonic diverticulosis, obesity, metabolic syndrome, Saudi Arabia

## Introduction

Diverticula are structural alterations within the colonic wall. Diverticulosis are structural alterations within the colonic wall that form "pockets". Diverticulosis forms from herniation of the colonic mucosa and sub-mucosa through defects in the circular muscle layers within the colonic wall, often at the sites of penetrating blood vessels in the colon(1). Diverticulosis is common in older adults, occurring in 50% of individuals aged 60 years. The prevalence of diverticulosis in Western and industrialized countries (eg, United States, Europe) is higher than countries such as Africa and Asia, which have prevalence rates of less than 0.5% (2, 3). The prevalence has reached seventy five percent among patients aged above eighty years old (4, 5). Although most cases of diverticulosis have no symptoms, some may proceed to significant consequences that include acute diverticulitis, colonic bleeding, and perforation(6).

Many modifiable risk factors may predispose to diverticulosis such as, decreased intake of fibers and vegetables, increased intake of fat and meat, decreased physical exercise, and smoking. The prevalence of diverticulosis is higher in old age than in young age, which is thought to be the most effective risk factor (7, 8). One quarter of symptomatic cases develop diverticular bleeding or diverticulitis, and a small minority will become complicated by bowel obstruction or abscess formation. The majority of symptomatic cases appear with colicky stomach pain without inflammation(9). Obesity is defined when BMI is equal to or above 30 kg/m<sup>2</sup> and it is clearly increasing all over the world(10). Obesity is linked to several disabling comorbid conditions, such as cancer, metabolic syndrome, osteoarthritis, ischemic heart disease, hypertension, diabetes mellitus, gastro-esophageal reflux, obstructive sleep apnea and certain cancers (11).

It's known that understanding adaptable risk factors for colonic diverticulosis may help avoid diverticular illness and advance our knowledge of the biology of the condition. However, information is limited addressing any potential links between overweight and diverticulitis and its severity as well as obesity along with the severity of developing diverticulosis in males and females. We aim in our study to assess the relation between obesity and the risk of colonic diverticulosis using data from a department of internal medicine at King Abdulaziz University, Jeddah, of cohorts seeking to do screening colonoscopy and thorough checkup for diverticulosis.

## Methods

In our study, we depended on a retrospective review of saved medical records between January 2015 until December 2019 at the Department of Internal Medicine at King Abdulaziz University, Jeddah. Ethical approval was taken from the University of King Abdulaziz. Adult cohorts whose age was more than 18 years old and who had a confirmed diagnosis of diverticulosis were included. On the other hand, patients with colorectal cancer, presence of inflammatory bowel illness, a history of previous colorectal surgery, and the absence of a confirmation colonoscopy after diverticulitis were excluded.

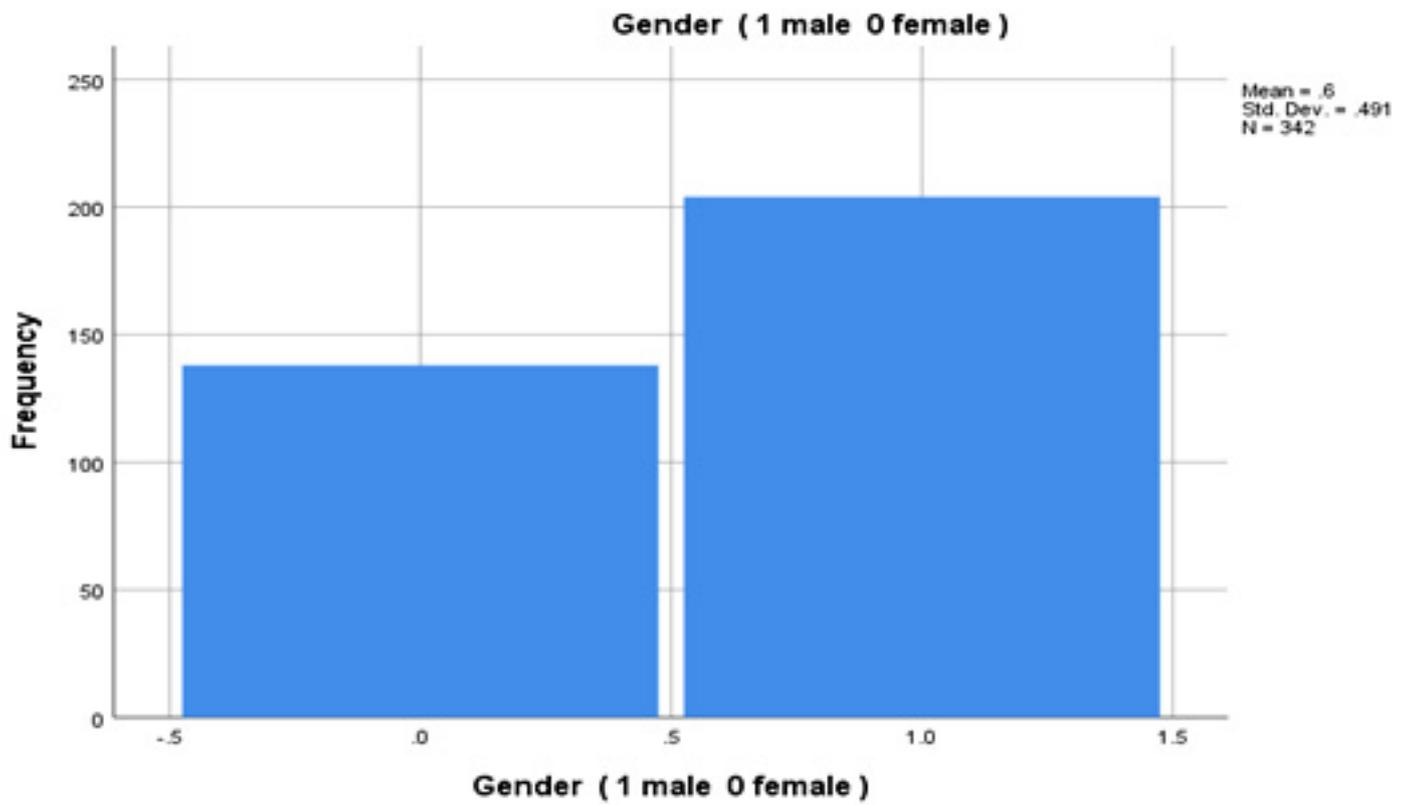
To confirm clinical presentation and complaints, all patient data, including demographic information, height, and weight upon admission, was checked. Additionally, if present, any additional comorbidities were noted (such as diabetes, hypertension, or dyslipidemia). The WHO formula (BMI equals mass in kilograms divided by the square of height in meters) was used to calculate BMI for each case. We used the WHO classification for obesity in each case. In patients whose BMI ranged from 18.5 to 24.9 kg/m<sup>2</sup> it was defined as normal, and overweight where their BMI ranged from 25 to 29.9 kg/m<sup>2</sup>, and obese if their BMI was equal or above 30 kg/m<sup>2</sup>(12). Colonoscopy and radiological findings were recorded.

Statistical analysis was defined using one way analysis of variable quantity testing. A p-value when less than 0.05 was thought to be significant. We used logistic regression to find the relation between total body fat and diverticulosis. Descriptive statistics and Student's t test were used with alpha set at  $p < .05$ . We performed multivariate analyses through modified Poisson regression to measure the prevalence ratios and 95% CIs. All analyses were stratified by gender.

## Results

We included 342 patients in our analysis of whom, 40.35% were women and 59.65% were men (Figure 1).

**Figure 1**



The mean age was 63.46 and SD (12.784) (Table 1). It was noticed that the incidence of diverticulosis increases with age as seen in Figure 3. In patients aged less than 51 we found that the prevalence of diverticulosis was more in men compared to women. Right colonic diverticulosis was more prevalent in women (17%) compared to men (7%) while left and bilateral colonic diverticulosis was more prevalent in male patients (57.2%) compared to women (53.9%). On the other hand, in patients whose age ranged from 51 to 60, the occurrence of diverticulosis was more in females than males (37% and in men 43%). For patients over the age of 60 the incidence was equal in both genders as follows, (females 55% and males 57%). Comparing female patients with and without diverticulosis, diverticulosis was more prominent in older patients. The majority of the patients weren't from Saudi (66.08%) as seen in Table 1, Figure 2.

Table 1: Main indication for colonoscopy among male patients with diverticulosis

	Male		Female	
	No. of cases (% of total)	Total (201)	No. of cases (% of total)	Total (201)
Age	56.3 ± 6.8		54.7 ± 7.4	
Abdominal pain	23(11.4%)	201	33(16.3%)	141
Anemia	22(10.9%)	201	22(15.6%)	141
Hematochezia	32(15.9%)	201	16(11.3%)	141
Constipation	8(4%)	201	3(2.1%)	141
Diarrhea	2(1%)	201	4(2.8%)	141
Weight loss	3(1.5%)	201	2(1.4%)	141
Crohn's disease	2(1%)	201	1(0.7%)	141
Ulcerative colitis	3(1.5%)	201	1(0.7%)	141
Screening	78(38.8%)	201	65(46.1%)	141
Surveillance	14(7%)	201	6(4.3%)	141
Abnormal imaging	7(3.5%)	201	2(1.4%)	141
Right sided diverticulosis	14 (7%)	201	24(17%)	141
Left sided diverticulosis	115(57.2%)	201	76(53.9%)	141
Bilateral diverticulosis	54(26.9%)	201	32(22.7%)	141
Diabetes	87(43.3%)	201	61(43.3%)	141
Dyslipidemia	36(17.9%)	201	33(23.4%)	141
HTN	99(49.3%)	201	80(56.7%)	141
Saudi	131(65.2%)	201	95(67.4%)	141

Figure 2

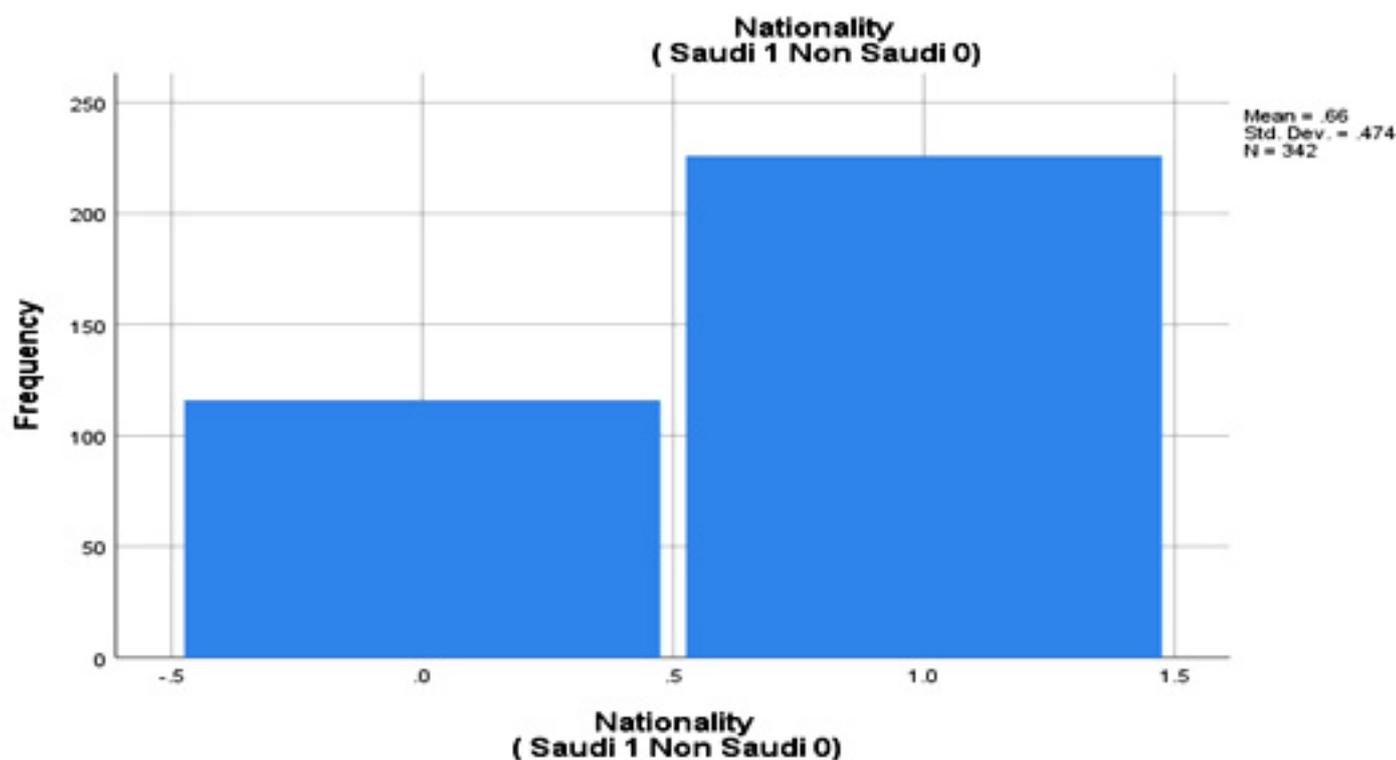
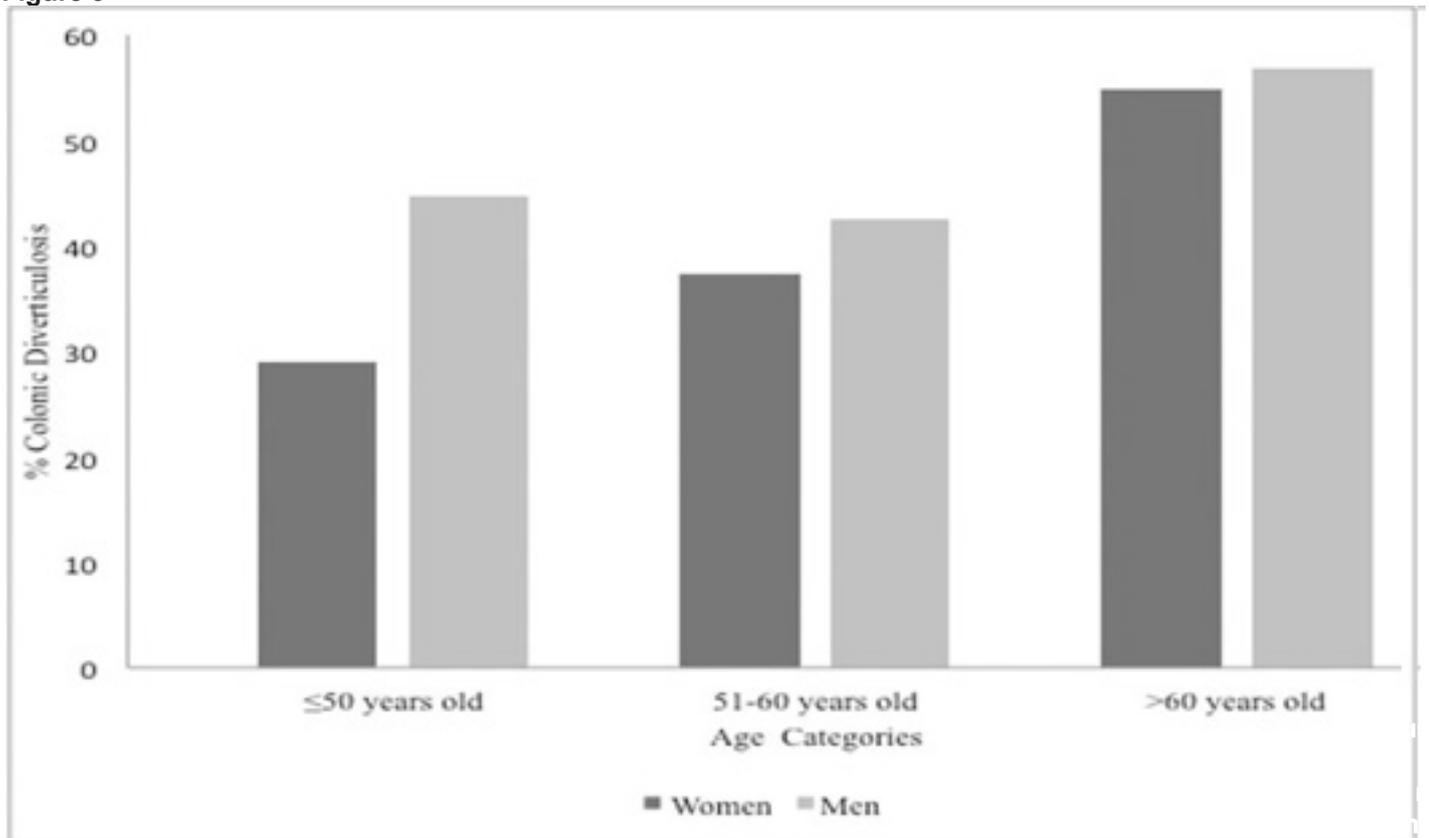


Figure 3



After taking confounding variables into consideration, diverticulosis was more prevalent in obese women (BMI  $\geq 30$ ) compared to women with normal BMI as following, (PR 1.48; 95% CI 1.08–2.04) (Table 2). There was no link between BMI and risk of diverticulosis among patients more than fifty years old.

Table 2

	Body mass index, kg/m <sup>2</sup>			P-value
	18–25	25–30	>30	
Cases (n)	36	33	63	
Prevalence ratios (95% CI)	1.0	1.28 (0.84, 2.00)	1.59 (1.12, 2.18)	0.005
Adjusted prevalence ratios (95% CI)	1.0	1.23 (0.58, 1.55)	1.46 (1.05, 2.02)	0.02

## Discussion

In our retrospective cohort study, we found that premenopausal women appear to be more resistant to diverticulosis than men of the same age, and that there was no difference in diverticulosis rates between the sexes after the age of fifty. Obesity, as determined solely by body mass index, has previously been established to be a risk factor for diverticulosis in Western populations(13-15). In contrast to earlier research, the current study used colonoscopy to ascertain if participants had colonic diverticulosis, investigated the relationship between diverticulosis and a number of obesity-related measures, and considered the impact of sex on these relationships. Similar to our findings, a German and Lithuanian genetic investigation of colonic diverticulosis discovered that obesity was linked to a higher incidence of diverticulosis in females than in males (16).

Women compared to men were considerably more at risk for colonic diverticulosis due to general obesity, not central obesity. Only younger-aged women were at a greater risk. Premenopausal women who are obese have greater levels of free testosterone and lower levels of total estrogen and sex hormone-binding globulin (17). We propose that premenopausal ovarian hormones containing steroids may guard against diverticulosis in females. Obesity during premenopause may raise the risk by raising free testosterone and lowering circulating estrogen. Although changes in the gut microbiome are linked to obesity, a previous study revealed little correlation among colonic diverticulosis and the makeup of the mucosal adherent microbial species (18). Other evidence opposing the idea that constipation is the main factor contributing to diverticulosis is the fact that men are more likely than women to report having looser and more frequent bowel movements (19). Colonic diverticulosis is more common in women than in males, which would be expected if the notion that it develops from constipation and increased intraluminal pressures is accurate (20, 21) although the link between sex and diverticulosis is still unclear in past studies(22). A study done on Japanese patients found that there was a major association between male patients and diverticulosis in multi-variate assessments(23). Though, in a study on Korean cohorts, reported that there was no link between sex and diverticulosis. In keeping with earlier research in Taiwan, we also discovered that participants who were elder were more probable than younger subjects to have diverticulosis(24, 25).

This study has many limitations. We would anticipate uniform changes in waist measures because each participant was prepared for the treatment. This would be a bias in measurement away from the null that is non-differential. Colonic diverticulosis may have been missed despite a thorough colonoscopy done by a qualified gastroenterologist with a trained research assistant present to record anthropometric measurements before the colonoscopy. Therefore, we were unable to determine whether obesity during infancy or weight gain over time is related to diverticulosis. Furthermore, as this was a cross-

sectional study, relationships were investigated rather than causality.

To conclude, women who were obese had a considerably higher chance of developing colonic diverticulosis. Diverticulosis in men did not correlate with any measure of obesity. Compared to males of similar ages, women in the premenopausal stage of life had a lower prevalence of diverticulosis. These gender disparities might have repercussions that help us understand the pathophysiology of diverticulosis.

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