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Research Article

**THE IMPACT OF HOSPITAL TEACHING STATUS ON  
COLONOSCOPY PERFORATION RISK: A SAMPLE STUDY****<sup>1</sup>Dr Sidra Kanwal, <sup>2</sup>Dr Javeria Kiran, <sup>3</sup>Dr Shawana Rehman.**<sup>1,2</sup>MBBS, Avicenna Medical College, Lahore.<sup>3</sup>MBBS, Islam Medical and Dental College, Sialkot.**Article Received:** June 2020**Accepted:** July 2020**Published:** August 2020**Abstract:**

*Colonoscopy has been used largely as a diagnostic tool for a number of conditions like colorectal cancer and inflammatory bowel disease. However, colonoscopy has multiple complications like perforation, abdominal pain, hemorrhage and anesthesia risk. But, among all these, perforation is the most dangerous complication which can occur in immediately after colonoscopy (post-colonoscopy period), its risk is 0.1%. Studies between teaching hospitals and non teaching hospitals on colonoscopy are scarce.*

*A study was conducted from January 2011 to December 2015 in teaching versus non teaching hospitals to study perforation rates. Almost 257,010 patients were included in the study. Univariate regression was carried out and multivariate regression module was used to analyze positive results. Teaching hospitals showed a higher perforation rate in comparison to non-teaching hospitals. These rates were higher in females who have dilatation of stricture and inflammatory bowel disease.*

*This review paper encompasses the perforation rate and on subject that more research is needed to mitigate the risks.*

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## INTRODUCTION:

Colonoscopy was introduced in the 1960s, and since then it is widely used in the medical field as a therapeutic and diagnostic tool for multiple conditions like polyps, cancer and other colorectal issues. However, this technique has its own complications as well, including perforation, hemorrhage, abdominal pain and anesthesia risk. Although, it is very rare, less than 0.1% chances, but perforation is the most dangerous complication among all other ones. <sup>1,2</sup>

The quality indicator targets as per the Gastrointestinal Endoscopy Task Force on Quality in endoscopy have recommended a target of the perforation rate of less than 1 per 500 colonoscopies. Teaching hospitals serve as an integral part of the health care system. <sup>3</sup> They provide advanced research and great specialized patient care and education for novice physicians. Even though they offer superior care in comparison to non teaching hospitals, but their rates are high. In the research field, studies are lagging in the section of colonoscopy perforation in teaching hospitals. So, the aim of this review paper is to examine the perforation rate in patients who undergo colonoscopy in teaching and in non teaching hospitals. <sup>4,5</sup>

## MATERIALS AND METHODS:

### • Data Source

NIS, the National Inpatient Sample, was availed. It was a part of the Healthcare Cost and Utilization Project. NIS is very expensive and publicly available inpatient healthcare database. Unweighted, it contains data of above 5 million hospitalized patients stay per year. It's estimated more than 36 million hospitalizations nationally gathered from more than 4000 participating HCUP hospitals. <sup>6</sup>

The database provides information on hospitalization characteristics including, location and type, which then divides the hospitals in teaching and non teaching categories. The NIS uses ICD-9-CM coding system to gather 25 discharge diagnosis and 15 procedures from each hospitalization. This study was of retrospective nature, so formal consent wasn't required. <sup>7</sup>

### • Study Population

A retrospective analysis of NIS discharge was performed from January 2011 to December 2015. ICD-9-CM codes were used to identify adult patients, above 18 years, who had undergone colonoscopy. Patients with colon cancer were excluded from the study. Post colonoscopy perforation was identified using specific diagnosis code for intestinal perforation and accidental puncture or laceration during the process.

Comparison was made between colonoscopies done in urban teaching hospitals and in urban non teaching hospitals.

### • Study Variables

In the analysis, the baseline characteristics of cohort study which were added, included, age, sex, race and insurance type. Ulcerative colitis ICD-CM diagnosis code from 556.0 to 556.9 and Crohn's disease ICD-9-CM codes CD 555.1, 555.2, and 555.9 were added to account for IBD as a possible primary outcome of post-colonoscopy perforation. The dilation of stricture and polypectomy rates in both cohorts were also studied. Elixhauser comorbidity index as a method was utilized for patients based on ICD diagnosis codes.

### • Outcome Analysis

The primary outcome of the study showed the rate of perforation in post-colonoscopy period.

### • Statistical Representation

Data was analyzed using statistical software. Statistical hypothesis were tested using  $P < 0.05$  as the statistical significance level for univariate and multivariate analyses. Continuous and categorical variables were stated in percentages and mean  $\pm$  standard deviation (SD), correspondingly. Demographics were compared by bivariate analysis, covariate and outcomes of focus between control groups and study. 95% confidence intervals (CIs) were estimated by discharge weights for gaining estimate data nationwide during the period of study.

Hence, multiple logistic regression model were conducted to adjust for variables that were statistically important in univariate analysis.

## RESULTS:

The population which was included in the study consisted of 257,010 patients from the NIS registry. These patients underwent colonoscopy from 2011 to 2015. Upon the application of discharge weights, 1,273,045 discharged patients were presented by the population study. When a comparison was built, it was found that non teaching hospitals had more patients than teaching hospitals.

The mean age of patients at teaching hospitals was 66 years, females representing 53% of the population, while the non teaching hospitals had a mean age of 68 years with 55% female population. In teaching hospitals, better and more care was provided to ulcerative colitis and Crohn's disease patients (9% and 1.6%, respectively  $P < 0.0001$ ). The polypectomy rates between two cohorts were statistically similar  $P = 0.17$ , in contrast to the stricture dilatation rates which were higher in the teaching hospitals  $P = 0.002$ . More comorbidities were in patients in the teaching facilities with 70% of them having Elixhauser score 4 and more when

it was compared to 67% in the comparison cohort ( $P < 0.0001$ ).

### DISCUSSION:

In the study, statistically increased risk of post period colonoscopy perforation was found in the teaching facilities in comparison to non teaching ones. After multivariate analysis, factors responsible for the increased risk of perforation were found, including female gender, dilation of stricture and IBD. It is essential to inform the patients about their increased risk of complications by keeping the increased number of colonoscopy procedures under consideration.<sup>8</sup>

A possible explanation of this higher perforation rate at teaching hospitals included the admission of patients with complex conditions. It is observed that referred patients are usually intensive care unit patients who are prone to more complex issues, high mortality rate and lengthy stay.<sup>9</sup> However, complex colonoscopy issues were also found linked with less experience of the physicians. A senior told that colonoscopy skills demand time, which requires more than 100 procedures to become proficient in it, higher than the number required for graduation.

Foregoing studies depicted that a higher risk of perforation exists with colonoscopy intervention in comparison to screening. The commonly proposed mechanism includes trauma from the scope and air insufflations, removal of polyps larger than 2 cm, endoscopic submucosal dissection of colorectal tumors and colon stricture dilation.<sup>9,10</sup>

When electrocautery is used for polypectomy then it increases the risk of perforation via thermal injury to the wall of colon. That's why it is safer to establish cold snare when is used for polyps of size less than 1 cm or larger than it. Cold snaring also aids in reducing the bleeding risk in patients on aspirin or anticoagulation. It is also advised to change angles and practice a lot to reduce perforation risks and better control snare tip. However, in this study where 2 groups were added, no significant high risk level was found linked with removal of polyps and perforation. The patient who underwent stricture dilation followed by the presence of IBD, highest risk of perforation was found in her. So, this might be owing to presence of a greater number of IBD and stricture dilatation patients in the teaching facilities in comparison to the non teaching ones.

Patients with IBD, colonoscopy is essential for them. It is done for diagnosis, grading of severity, assessment of response and screening of neoplasia. IBD patients and especially Crohn's disease are notorious for the development of stricture

complications. The explanation point out the prolonged inflammation, hypertrophy of stem cells, and hyperplasia of smooth muscles as the leading cause of fibrosing reaction. In IBD patients, perforation is significantly high owing to excessive pressure from the air used in the colonoscopy procedure and direct damage to the wall from the scope. Other risk factors associated with perforation include anatomical complications like strictures, biological agents, use of steroids and history of abdominopelvic surgical interventions. Minimum air insufflations can be applied in order to decrease damage from air pressure, and by carefully observing abdominal distension, gradual dilation of IBD linked stricture and dilating to maximum diameter less than 25 mm.

Gender, female, is another risk factor in perforation damage. It is complicated may be due to reduced abdomen cavity size in females, less resistance from lower abdomen muscle mass and high depth of pelvic, these all contribute to increase angulation and colon looping. The risk of perforation can be decreased by frequent repositioning and applying pressure to the abdominal wall and use of small sized colonoscope.<sup>11,12,13</sup>

### CONCLUSION:

The colonoscopy perforation rate is higher in teaching hospitals in comparison to non teaching hospitals. The reason lies in the fact that the admittance of patients in the teaching hospitals usually belongs to the intensive care unit. They have more complicated issues and their colonoscopy brings more complications owing to the pre-existing issues. Moreover, female patients are more prone to perforation due to less flexibility in their pelvic muscles, pre-existing abdominal issues and smaller abdomen region in comparison to men.

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