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Original Article

The Frequency of Gangrenous Infarction of Intestine in Patients Undergoing Intestinal Resection at Tertiary Care Hospital, Rawalpindi

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ABSTRACT

Gangrenous bowel or dead bowel most often occurs as a result of hernia, adhesions, and mesenteric insufficiency. Intestinal gangrene due to acute mesenteric vascular events requiring surgery is one of the most common surgical emergencies at tertiary care hospitals. **Objective:** To determine the frequency of gangrenous infarction in patients undergoing intestinal resection at a tertiary care hospital. **Methods:** This descriptive cross-sectional study was conducted in the Department of Surgery and Pathology, Rawalpindi, Pakistan. A total of 140 resected intestinal specimens were included in this study. Data were entered and analyzed using SPSS v. 23. o. Descriptive statistics were applied and a P-value <0.05 was taken as statistically significant. **Results:** Out of 140 samples, clinical specimens from 30(21.4%) patients were found to be gangrenous. The frequency of gangrene was slightly higher in females 16(53.3%) as compared to males 14(46.7%) with a peak of 19 patients(63.3%) in the age group of 31 to 60 years and mostly affecting the small intestine 21(70%). Among the total of 110(78.6%) non-gangrenous specimens; mild inflammatory changes, perforation, ulceration, tumors, mucosal and mural infarction, infection, reactive hyperplasia, and autolytic changes were noted. **Conclusions:** The frequency of intestinal gangrene is much higher in our population than in most regions of the world, slightly more common in females as compared to males with a peak in the age group of 31 to 60 years and mostly involving the small intestine, indicating negligence towards this important problem.

INTRODUCTION

Bowel infarction, also known as gangrenous bowel, is an irreparable lesion to the gut caused by insufficient blood supply. It is classified as an emergency because it has the potential to cause life-threatening illness and death [1]. The prevalence of gangrenous transformation has been reported to be high in the developing world [2, 3]. It is a fatal disorder, and despite all efforts to improve early detection and treatment, fatality rates in people with this syndrome remain high [4-6]. Many healthcare professionals now share the pessimistic view expressed over 70 years ago regarding this medical condition. Various factors, including the presence of coexisting conditions, advanced age, delayed presentation (beyond 24 hours), hypotension, tachypnea, hypoxia, multiple system failures, extensive resected gangrenous bowel (over three feet in length), 100 cm of remaining viable bowel, the need for a second-look surgery, surgical complications, and more than one mesenteric arterial involvement, have been identified as negative predictors of mortality [7]. Another factor contributing to the high mortality rate is the delay in seeking emergency care after the onset of symptoms, leading to a delayed start of treatment [8, 9]. Common causes of gangrenous infarction include hernias, adhesions, and mesenteric insufficiency [10]. Intestinal

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gangrene due to acute mesenteric vascular events, requiring emergency surgery, is frequently encountered in tertiary care teaching hospitals [7]. Acute mesenteric vascular events may be thrombotic, embolic, vasospastic, or related to venous thrombosis [11]. Conditions such as atrial fibrillation, rheumatic valvular heart disease, prosthetic valves, infective endocarditis, and Q fever endocarditis of the aortic valve are associated with embolic events [12]. Thrombotic events, more common than embolic events, result from generalized atherosclerosis, hyperlipidemia, diabetes mellitus, and hypertension [4]. Patients with these events often present with nonspecific signs that are disproportionate to symptoms, making early diagnosis challenging [13]. Unfortunately, mortality rates remain high, ranging from 50-70% [14]. In cases of advanced age, blood vessels undergo atherosclerosis, a common occurrence in the Western world. This condition can lead to sudden blood flow obstruction by an embolus in the superior mesenteric artery, potentially causing bowel infarction. If the ischemia is total or near-total, transmural infarction develops within 8–16 hours. This period is critical for diagnosing the condition and implementing appropriate measures to prevent bowel infarction. Beyond this timeframe, the only option is the surgical removal of dead bowel, and prognosis depends on the extent of bowel necrosis [15].

The study's objective is to determine the frequency of gangrenous infarction in patients undergoing intestinal resection at a tertiary care hospital.

METHODS

This descriptive, cross-sectional study was conducted in the Department of Surgery and Pathology, Rawalpindi, Pakistan from January 2016 to May 2018. This study was approved by the Ethical Review Board of Rawalpindi Medical University. The study was 1st approved by the departmental review board followed by the approval from the institutional review board. The reference number is SUR-82-46-23 dated 27-12-2015. A total of 140 resected intestinal specimens of patients were selected using the non-probability consecutive sampling technique and their records were reviewed. Sample size calculation was done through WHO sample size calculator by taking 95% confidence interval and 5% margin of error, a total of 140 sample size was calculated. All the patients who underwent surgery for intestinal resection were included in this study. Patients with age between 18-60 years were included in the study. All patients with the plan of laparotomy and intestinal resection for any acute or chronic abdominal pathologies were enrolled in our study. The patients who had surgery without intestinal resection were excluded. Patients with ages less than 18 years and more than 60 years were excluded. Patients who were not willing to participate were also excluded from the study. Histopathological examination of the specimens was conducted by the Department of Histopathology following appropriate staining (hematoxylin and eosin staining). Information regarding laboratory ID number, gender, age, and histopathological findings of patients were recorded on a proforma. Gangrenous infarction of the intestines and other findings were noted as per histopathology reports and also operative findings. Data were entered and analyzed using SPSS v. 23. 0. Descriptive statistics were applied and a P-value <0.05 was taken as statistically significant. For all the categorical variables, frequencies and percentages were calculated whereas for continuous variables, means and standard deviation (SD) were calculated.

RESULTS

A total of 140 samples, 66(47.1%) male and 74(52.9%) female patients were included in this study. The age of the patients ranged between 2 to 90 years with a mean age of 39±16.2 years. Anatomically, 69(49.3%) were small intestine resections, 53(37.9%) were large intestine resections and 18(12.8%) were both/ileocolectomy resections. Clinical specimens from 30(21.4%) patients were found to be gangrenous as shown in Figure 1.

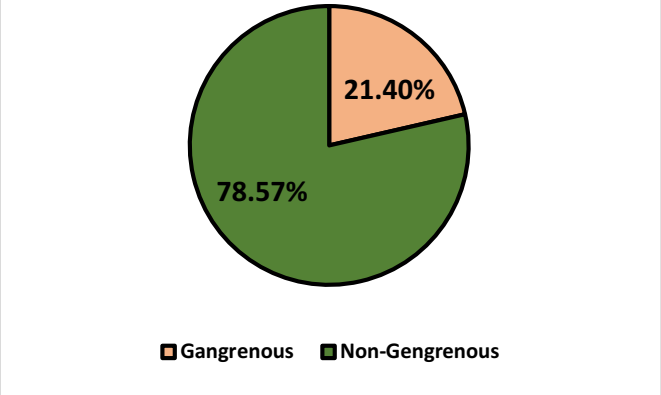

Figure 1: Showing the percentages of the patients with and without gangrenous intestines

The frequency of gangrene was higher in female patients 16(53.3%) as compared to male patients 14(46.7%) as shown in table 1. Among patients with intestinal gangrene, 6(20.0%) patients had ages ranging from 1 to 30 years, 19(63.3%) patients had ages ranging from 31 to 60 years while only 5(16.7%) patients had ages ranging from 61 to 90 years which are shown in table 1. 21(70%) patients had gangrene present in the small intestine while 5(16.7%) patients had gangrene affecting both the large and small intestine and 4(13.3%) patients had gangrene affecting the large intestine as shown in table 1.

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Table 1: Distribution of Gangrene by age groups, gender, and intestinal type/anatomical site in the resected intestinal specimen examined

Total (n=140)		Gangrenous (n=30)	Non-Gangrenous (n=110)
Age groups (In years)	1-30 (n=52)	6 (11.5%)	46 (88.5%)
	31-60 (n=66)	19 (28.8%)	47 (71.2%)
	61-90 (n=22)	5 (22.7%)	17 (77.3%)
Gender	Male (n=66)	14 (21.2%)	52 (78.8%)
	Female (n=74)	16 (21.6%)	58 (78.4%)
Type of intestine	Small intestine (n=69)	21 (30.4%)	48 (69.6%)
	Large intestine (n=53)	4 (7.5%)	49 (92.5%)
	Both/Ileocolectomy (n=18)	5 (27.7%)	13 (72.3%)

Among the total of 110(78.6%) non-gangrenous specimens, frequency of mild inflammatory changes, perforation, ulceration, tumors, mucosal and mural infarction /ischemic changes/ischemic infarction, infection, reactive hyperplasia and autolytic changes were 62(44.3%), 18(12.9%), 10(7.1%), 10(7.1%), 7(5%), 1(0.7%), 1(0.7%) and 1(0.7%) respectively as shown in Table 2.

Table 2: : Distribution of other pathologies besides gangrene in the resected intestinal specimen examined

Histopathological changes	Frequency (%)
Gangrene	30 (21.4)
Autolytic changes	1 (0.7)
Ulceration	10 (7.1)
Tumor	10 (7.1)
Reactive hyperplasia	1 (0.7)
Perforation	18 (12.9)
Presence of mucosal and mural infarction	7 (5.0)
Infection	1 (0.7)
Inflammation	62 (44.3)
Total	140 (100)

DISCUSSION

Our findings suggest that the frequency of gangrenous infarction is much higher in our population than in most regions of the world [16, 17], peaking at the age group of 31 to 60 years and most commonly involving the small intestine. Our study rendered the role of gender in the frequency of occurrence of gangrenous infarction as insignificant and subject to further research. Patients with intestinal gangrene due to acute mesenteric vascular event requiring surgery is one of the most common surgical emergencies [7] and despite all attempts towards early diagnosis and treatment mortality in such patients remains high [7]. Surgery for acute abdominal conditions in emergency wards is the most efficient cost-effective public health intervention [18]. With increasing awareness among physicians in the fields of gastroenterology as well as abdominal and vascular surgery, there has been a significant reduction in acute mesenteric ischemia-related mortality from 90 to 50% in the last 30 years [19]. In our study, 30/140 samples (21.4%), showed the presence of gangrenous infarction. We observed a higher number of cases of gangrenous infarction in our study as compared to previously completed local and international studies. In a local study carried out in Lahore, Yusuf et al., reported 9/120 (7.5%) cases of hemorrhagic infarction and gangrene [3]. In a study conducted in India, it was reported that 7/124 (5.6%) samples showed ischemic bowel disease with microscopic features of gangrene and perforations with ulceration, hemorrhage, and necrosis [16]. Another international study based in Turkey, Atamanalp et al., concluded that Sigmoid gangrene is a potentially catastrophic complication of Sigmoid Volvulus and develops in 6.1% to 30.2% of all such cases [17]. It is noted that the frequency of gangrenous infarction is much more common in developing countries, [3] and while our study should correspond more closely to the local study, the reason for the difference in results can be speculated to be due to the variation in duration of studies as well as the sample size. Such markedly increased frequency of gangrenous infarction in our setting can be indicative of late presentation of patients which could be on the grounds of paucity of specific signs, lack of awareness and understanding, as well as poor transportation facilities. Furthermore, in case of total or near total ischemia, it takes 8–16 hours to develop transmural infarction. This is, thus, the golden time during which the diagnosis must be made, and appropriate actions should be taken to prevent bowel infarction [15]. Since the symptoms mimic other similar conditions like appendicitis, this also leads to further difficulty in diagnosis. Hence, a delay in diagnosis or a lack of diagnostic surgical facilities in local health units, as well as a lack of understanding of pathophysiology amongst the doctors and pathologists can also be speculated as the cause for this increased occurrence of cases of gangrenous infarction in our tertiary care hospital. The incidence of gangrenous infarction increases with age [20, 21] and usually affects patients in higher age groups who have multiple comorbid conditions [22]. Following this, our study showed that gangrenous infarction is most common amongst the age group of 31-60 years with 63.3% cases. 20% of cases were seen in the age group of 0-30 years, and 16.67% amongst 61-90 years. These findings correlate with other studies regarding this topic. In an international study, carried out in India, out of the 7 patients with ischemic bowel disease, 5 were in their 4th-5th decade of life while the remaining 2 were in their 6th and 8th decade [16]. Another study, also based in India demonstrated that 5/9 patients with intestinal ischemia were aged more than 41 [20]. This increase in frequency during the age group of 31-60 can be because thromboembolic events are frequently seen in later decades [20] and a sudden obstruction of

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blood flow by an embolus in the superior mesenteric artery is likely to impair blood flow enough to cause bowel infarction [15]. Moreover, based on the World Bank census of 2016, life expectancy in Pakistan is 66.48 years, thus most of the elderly people fall in 31-60 years possibly exaggerating the findings. This, along with the fact that most of our specimens were from patients in this age group can be speculated to be the reason behind the increased frequency of cases in this age interval. In terms of the correlation between gender and cases of gangrenous infarction, our study showed 53% of cases to be female while 47% were males. One can hence deduce that the difference is not drastic, and can be because the majority of cases in our study were females. Our results complement a study carried out in Turkey, (Males: 61.8 vs. Females: 59%) in which it was concluded that there was no correlation between gender and bowel gangrene [16]. In a study conducted in India, Male to female ratio was 4:1 25, while a study based in Uganda also observed that more males (63.6%) had gangrene compared to females (36.4 %). This difference in result can be speculative of the fact that both India and Uganda are developing countries with a lack of gender equality and thus poor concern towards the health of women leading to a possible lack of presentation of female patients. However, it is imminent that further exploration is required in terms of the variable of gender and its relationship with the frequency of occurrence of gangrenous infarction. Moving onto the section of the intestine most affected by gangrene, it seems that the colon seems to be affected less often by ischemia than the small intestine [15]. In our study, 70% of cases with gangrene were found in the small intestine, 13.33% in the large intestine while 16.67% of cases involved both large and small intestines. This can be reasoned to the fact that the majority of specimens in our study were from the small intestine because a higher number of intestinal pathologies such as ischemia and perforation are found in the small bowel, leading to the high number of small intestine resection [20]. Another local study carried out in Lahore, correlates with our results by demonstrating 67% cases from the small intestine while 33% cases from the large intestine [3]. During our study, we came across several pathologies of the intestine with gangrene being the second most common (21.4%) after general inflammatory changes (44.3%). Other pathologies included Perforation (12.9%), Ulceration (7.1%), Tumor (7%), Mucosal and Mural infarction (5%), Autolytic changes (0.7%), Reactive hyperplasia (0.7%), and Infection (0.7%). Based on the results obtained from this study and other similar research, we would recommend that a detailed histopathological study of the intestinal specimens should be done in constant correlation with the clinical and radiological findings for an accurate diagnosis. Furthermore, more research needs to be carried out in regards to determining the various presenting symptoms of different intestinal pathologies, to help limit the development of gangrene. Moreover, both the physician and surgeons must increase their knowledge and awareness about this deadly complication besides keeping it as an important differential diagnosis of abdominal pain in mind to reduce the rate of misdiagnosis and save precious time as well as the lives of patients as suggested in recent studies as well [14].

CONCLUSIONS

The frequency of intestinal gangrene is much higher in our population than in most regions of the world, slightly more common in females as compared to males with a peak in the age group of 31 to 60 years and mostly involving the small intestine, indicating a lack of early diagnosis and appropriate interventions to avoid this complication. More study is required to be conducted in our region and adequate measures are to be taken to eradicate this serious problem.

Authors Contribution

Conceptualization: MR, KW, MM, AN
Methodology: MR, KW, MM, AN, AM
Formal analysis: AM, MSH, AH, AA, AR, SA
Writing-review and editing: MR, KW, MM, AN, AM, MSH, AH, AA, AR, SA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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