Magnitude and Clinical characteristics of Sigmoid Volvulus

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Abstract

Background: Sigmoid volvulus is a major cause of mechanical large bowel obstruction in volvulus belt countries. The objective of this study to explore the magnitude and clinical characteristics of Sigmoid Volvulus

Methods: Hospital-based retrospective cross-sectional study employed in Debre Tabor general hospital Northcentral Ethiopia. A medical review conducted on the medical chart from Jan1, 2016 to Dec31, 2019. The collected data checked manually for completeness and consistency. The final data coded and entered to SPSS version 23 for data processing and analysis. Binary logistic regression used to measure the association of each covariate with the outcome variable. In addition, factors that have $p=0.25$ with the outcome variables were taken into a multivariable logistic regression analysis to control the potential confounders. The result of the final model expressed in terms of adjusted Odd Ratios (AOR) and 95% CI and statistical significance declared if the P-value is less than 0.05.

Result: There were 124 patients with sigmoid volvulus admitted within four years of the study. During the study period, 408 patients with bowel obstructions were admitted, among Mechanical large bowel obstruction (MLBO) 135 (33.1%), Mechanical small bowel obstruction (MSBO) 251(61.5%), and Ileosigmoid knotting 22(5.4%). Our study showed that sigmoid volvulus accounted for 91.9% and 30.4% of Mechanical Large bowel obstruction and Bowel obstruction respectively. Most of the patients were male 97.6 % (N=121) and rural residents 91.1 % (N=113). The peak age was 56-65 years accounted for 29 % and 65.3 % (N=81) of patients were above age 50years. The age ranged from 19-88 years. The mean and median ages were $56.52 \pm (SD=14.4)$ and $58.5 \pm (IQR=17.75)$ respectively. The mean of hospital stay for elective admission was $10.98(SD \pm 4.33)$ days and the median was 11 (IQR ± 5) days. The mean of hospital stay for emergency admission excluding death and leave against medical advice was $8.4(SD \pm 4.1)$ days and median was 8 (IQR ± 2) days

Conclusion: Primary resection and anastomosis was the common procedure for management of sigmoid volvulus. Mortality rate was 6.45% and higher in gangrenous sigmoid volvulus (14.6 % vs. 2.4%)

Background

The word “volvulus” derived from the Latin “volvere or twist” [1]. Sigmoid volvulus is the abnormal twisting of the bowel loop around the axis of its own mesentery more than 1800[2]. The name of the sigmoid volvulus was given for the first time by Von Rokitsansky in 1836[3]. Sigmoid volvulus is the most common anatomical site of colonic volvulus which is accounting for 60-75% of all cases [4]. The incidence of sigmoid volvulus is unknown worldwide but it varies widely accordingly to population and geography [5]. Sigmoid volvulus has multifactorial predisposing factors [3]. Anatomical factors include long loop and narrow base attachment to pelvic mesocolon, overload colon, advanced age, higher fiber diet, neurologic or psychiatry disease, chronic constipation, and previous surgery [4, 6-7]. Sigmoid volvulus has been contributed to a low portion of large bowel obstruction in developed countries. It is the

third cause of large bowel obstruction in the USA (accounting only 4%) following colorectal cancer and diverticular disease [8]. The prevalence of sigmoid volvulus is higher in volvulus belt countries which are extending from South Asia, Africa, and South America [5]. It is accounting for 50-85% of large bowel obstruction in Volvulus Belt countries [5]. Imaging findings from Plain x-rays and Gastrografin enema helps to differentiated sigmoid volvulus from cecal and transverse colon volvulus. Sigmoid volvulus produces a typical sign of bent inner tube or coffee appearance in plain abdominal X-ray. Gastrografin enema shows a narrowing at the site of the volvulus and a pathognomonic bird's beak [8, 9]

Methods

Study area and period

The study conducted in Debre Tabor General Hospital Northcentral Ethiopia. Debre Tabor General Hospital is one of the oldest public hospitals in the country. Geographically, it is located in Debre Tabor city, South Gondar, Amhara regional state, North West Ethiopia which is 666km and 103 km from Addis Abeba and Bahir Dar respectively. It provides service for approximately 900 inpatient and 80,000 outpatients in a year that comes from the catchment area of the population around 3.5 million. Data collected from January 1, 2016 - December 31, 2019.

Study Design

A hospital-based retrospective cross-sectional study conducted in Debre Tabor General Hospital in all patients that presented with clinical or/ and radiological sigmoid volvulus January 1, 2016 - December 31, 2019. Parameters included demography, clinical presentation, and duration of illness, diagnosis, causes, procedures and intraoperative finding, postoperative complications, and management outcome. All patients from age 15 years and above with clinical or/and radiological diagnosis of sigmoid volvulus which managed with conservatively and /or operatively or died due to confirmed sigmoid volvulus was included while paralytic Ileus (functional obstruction) and age below 15 years were excluded from the study

Data collection and analysis

All daily medical records of patients' progress note, radiology report, operation note, pathology reports reviewed. Data collected with a structured questionnaire that is developed by the English language and contains information about demography, clinical presentation and duration of illness, causes, diagnosis, intraoperative finding, procedures, postop complications, and outcome of bowel obstruction. The collected data checked for any inconsistency, code, and enter SPSS version 23 for data processing and analysis.

Normal distribution was evaluated with the Q-Q plot test and histogram diagram. Quantitative values were represented as mean $\pm$ standard deviation for normal distribution and Median $\pm$ Interquartile range for skewed data. Binary logistic regression used to measure the association of each covariate with the

outcome variable. In addition, factors that have $p=0.25$ with the outcome variables were taken into a multivariable logistic regression analysis to control the potential confounders. The result of the final model expressed in terms of Adjusted Odd Ratios (AOR) and 95% CI and statistical significance declared if the P-value is less than 0.05.

Ethical consideration

Ethical clearance obtained from the Ethical Review Committee of Debretabor University and collection started after approval of the proposal. The confidentiality and privacy of patients maintained during data collection. The data collected retrospectively from medical chart and consent from patients is not needed.

Results

There were 124 patients with sigmoid volvulus admitted within four years of the study. During the study period, 408 patients with bowel obstructions were admitted, among mechanical large bowel obstruction (MLBO) 135 (33.1%), mechanical small bowel obstruction (MSBO) 251 (61.5%) and Ileosigmoid knotting 22 (5.4%). Our study showed that sigmoid volvulus accounted for 91.9% and 30.4% of Mechanical Large bowel obstruction and Bowel obstruction respectively. Most of the patients were male 97.6 % (N=121) and rural residents 91.1 % (N=113). The peak age was 56-65 years accounted for 29 % and 65.3 % (N=81) of patients were above age 50 years. The age ranged from 19-88 years. The mean and median ages were $56.52 \pm (SD=14.4)$ and $58.5 \pm (IQR=17.75)$ respectively (Table 1)

The mean of hospital stay for elective admission was $10.98 (SD \pm 4.33)$ days and the median was 11 (IQR ± 5) days. The mean of hospital stay for emergency admission excluding death and leave against medical advice was $8.4 (SD \pm 4.1)$ days and median was 8 (IQR ± 2) days

The clinical presentations were abdominal pain 100%, constipation 97.6%, abdominal distention, and 85.5%. The most prominent clinical findings were abdominal tenderness 91.9% and visible peristalses 67.7%. Our study found that 66.9% was simple sigmoid volvulus and 33.1% was gangrenous sigmoid volvulus. Primary resection and anastomosis was the most common procedure for sigmoid volvulus for 77.4 % (N=96) and stomas 13.4 % (N=17) (Table 2 & 3)

Bivariable logistic cross tabulation analysis showed that mortality rate more common in men 6.6% vs. 0%, $\chi^2 (1, N=124)$ fisher's exact test $P=0.817$), urban 9.1 % vs. 6.2%, $\chi^2 (1, N=124)$ fisher's exact test

P=0.534, OR of rural=0.666), Gangrenous SV 14.6 % vs. 2.4%, χ^2 (1, N=124) fisher's exact test P=0.016, OR Simple SBO=0.144) and hospital stay less than 7days 14% v1.4, χ^2 (1, N=124) fisher's exact test P =0.007,OR of Hospital stay less than 7days=11.88),Stomas 29.4%v3.1%, χ^2 (1,N=124)=12.2, df 2, p=0.002).Multiple logistic regression was done for hospital stay, bowel viability and procedure. Hospital stay less than 7days (AOR 10.799(95%CI=1.180- 98.866)) and simple SV (AOR.166 (95%CI=0.029-0.962)) were statistical significant (p=0.035 and 0.045 respectively)

Bivariable logistic cross tabulation analysis showed that morbidity rate more common in females 33.1% vs19.8 %, χ^2 (1, N=124) fisher's exact test P=0.494,OR male=0.495), urban 36.4 % vs. 18.6%, χ^2 (1, N=124) fisher's exact test P=0.155, OR of rural=0.399), Gangrenous SV 34.1 % vs. 13.3 %, χ^2 (1,N=124)=7.07 ,P=0.008, OR Simple SBO=0.295) and hospital stay greater than 7days 20.1% v20%, χ^2 (1, N=124) fisher's exact test P =0.007,OR of Hospital stay less than 7days=0.983), and Stomas than primary anastomosis 47.1%v17.7 %, χ^2 (1,N=124)=0.001,df 1, p=0.971). Multiple logistic regressions were done for hospital stay, bowel viability and residency. Simple SV (AOR.0.299 (95%CI=0. 118-0.760, P=.011)) was statistical significant

Discussion

Sigmoid has been contributed to a significant burden on emergency surgical admission in volvulus belt countries. However, it is uncommon to cause of bowel obstruction in the USA [8]. The prevalence of sigmoid volvulus represented 4% in the USA [8], 9.2% in Jordan [5], and 40% in India [11]. Our study showed that sigmoid volvulus accounted for 91.9% and 30.4% of mechanical large bowel obstruction and bowel obstruction respectively. Similar findings noted that sigmoid volvulus accounted for 58.6-73% in Ethiopia [2, 10] and 76% in Iran [16] for large bowel obstruction. The exact etiology of sigmoid volvulus is unknown but different research noted that possible cause will be anatomical factors include long loop and narrow base attachment to pelvic mesocolon, overload colon, advanced age, higher fiber diet and chronic constipation[4, 6-7].

The prevalence of sigmoid volvulus occurred more in male; our finding was 40.3:1 which was very high male dominance with compared in the previous finding noted in different studies done in Turkey 5.6:1, West Africa 14.3:1, Ethiopia 4.7-13.5:1, Uganda 5.25:1, Iran 5.25:1, Pakistan 11.5:1 and India 3.5:1[2-3, 10-14,16]. The exact cause of sex discrepancy is not well-illustrated but possible reasons suggested that spacious female pelvic area allowed a greater possibility of spontaneous reduction of volvulus and wider mesocolon in females [3].

Sigmoid volvulus occurred at a young age in developing countries but it is more common in elder age in developed countries. The mean age of sigmoid volvulus in our study found $56.52 \pm (SD=14.4)$. The Mean age of sigmoid in the different study estimated in Turkey $60.61 \pm (SD=14.81)$ [3], in Ethiopia 69years [2], in Pakistan 60years [12] and in Uganda $52.2 \pm (SD=15.98)$ [14]. The Mean age is between 60-70 years in developed countries [3]. The most clinical presentations were abdominal pain constipation and abdominal distention. The most prominent clinical findings were abdominal tenderness and visible peristalses. Sigmoid volvulus has a significant role in morbidity and mortality especially when the obstructed bowel becomes gangrenous [2]. We found a high prevalence of gangrenous sigmoid volvulus (33.1%), this may due to the majority of our patients were rural residents (91. %). Another study done in Ethiopia noted that 26% of patients were gangrenous sigmoid volvulus [2]. The different options of treatment modalities were employed for sigmoid volvulus. Accordingly, research conducted in Ethiopia, Uganda and Pakistan, the primary resection and anastomosis was the most common mode of treatment for 78%, 75%, and 52-100% of their patients respectively[2,12,14-15]. In our research, 77.4% of patients were managed with primary resection and anastomosis which was comparable with previous studies.

The mortality rate of sigmoid volvulus was varied from country to country. Accordingly, research reported in Ethiopia, Uganda, and Pakistan, the mortality rates were 4.5%, 15.9% and 8% respectively [2, 12, 14]. We found that the mortality rate was 6.45% which was comparable with previous studies in Ethiopia and Pakistan [2, 12] and two times lowed in Uganda [14]. The mortality rate had statistical significance with bowel viability and hospital stay.

Conclusion

The prevalence of sigmoid volvulus was 91.9% and 30.4% of mechanical large bowel obstruction and bowel obstruction respectively. The males were forty fold affected in sigmoid volvulus than females. Primary resection and anastomosis was the common procedure for management of sigmoid volvulus. Overall mortality rate was 6.45% and higher in gangrenous sigmoid volvulus (14.6 % vs. 2.4%).

Abbreviations

AOR: Adjusted Odd Ratio

IQR: Inter Quartile Range

LBO: Large Bowel obstruction

OR: Odd Ratio

SBO: Small bowel obstruction

SD: Standard deviation

SPSS: Statistical package for Social Science

SV: Sigmoid volvulus

USA: united States of America

Declarations

Ethical approval and consent to participate

Ethical Review Committee of Debre Tabor University approved the ethical issue of this study and official permission to undertake the study obtained from Debre Tabor General Hospital. The confidentiality and privacy of patients maintained during data collection. The data collected retrospectively from medical chart and consent from patients is not needed.

Consent to publication

Not applicable

Availability of data source

The datasets used and/or analyzed during the current study available from corresponding author on reasonable request.

Competing interest

Authors declare that they have no competing interests

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Authors' contributions

Conceptualization: AF

Data collection and Methodology development: AF BT WB DZ

Software: AF BT

Data analysis: AF

Manuscript Draft: AF

Manuscript review and editing; AF BT WB DZ

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Tables

Table1. The Demographic and Characteristics of the Patients Sigmoid volvulus in Debre Tabor Hospital, Northcentral Ethiopia, 2020

Item		Frequency	Percent (%)
Age N=124	15-25	3	2.4
	26-35	8	6.5
	36-45	17	13.7
	46-55	29	23.4
	56-65	36	29.0
	>66	31	25.0
Sex N=124	M	121	97.6
	Female	3	2.4
Residence N=124	Rural	113	91.1
	Urban	11	8.9

Table2. The Clinical presentation of Patients with Sigmoid volvulus, Debre Tabor Hospital, Northcentral Ethiopia, 2020

Item		Frequency	Percent
Clinical Symptoms	Abdominal Pain	124	100
	Vomiting	58	46.6
	Abdominal Distention	106	85.5
	Constipation	121	97.6
Clinical Sign	Drainage Vital sign	21	16.9
	Abdominal Tenderness	114	91.9
	Hypo/Hyperactive bowel sound	83	66.9
	Visible peristalsis	84	67.7
Mode of presentation N=124	Elective	46	37.1
	Emergency	78	62.9
Procedure N=124	Primary resection and anastomosis	96	77.4
	Stomas	17	13.4
	Rectal tube deflation	11	8.9

Table3. The Pattern and outcomes of Patients with sigmoid volvulus in Debre Tabor Hospital, Northcentral Ethiopia, 2020

Item		Frequency	Percent
SV N=124	Simple LBO	83	66.9
	Gangrenous LBO	41	33.1
Outcome	Improved	93	75
	Morbidity	17	13.7
	Leave against medical advice	6	4.85
	Mortality	8	6.45
Morbidity (13.7%)	Wound Infection	8	6.5
	Anastomosis Leak	5	4.2
	Fistula	1	0.8
	Paralytic illness	1	0.8
	others	2	1.6