

Incidence of Sigmoid Volvulus in Northern Uganda. An Observational Study**Richard Wismayer^{1,2}**¹Department of Surgery, Faculty of Medicine, University of Edinburgh, United Kingdom²Faculty of Medicine, Gulu University, Gulu, Uganda**Correspondence to:** Dr. Richard Wismayer, Email: richardwismayer@rcsi.ie

Background: Sigmoid volvulus (SV) has a considerable geographical variation in its incidence. The purpose of this study was to determine the incidence of SV in Northern Uganda. **Methods:** A two year retrospective and one year prospective study in 19 hospitals in Northern Uganda from January 2010 to December 2012 was conducted to determine the incidence of sigmoid volvulus. All patients' records with a diagnosis of sigmoid volvulus were included in the study. Ethical approval was obtained from the IRB Gulu University and Uganda National Council for Science and Technology (UNCS&T). Data analysis was conducted using STATA/IC version 12.1. **Results:** The incidence of SV in Northern Uganda was 251.8 per 100,000 surgical population in 2 years. Cases were least observed from May to November and most cases were seen in the dry season from December to April.

Conclusions: The incidence of SV in Northern Uganda was 251.8 per 100,000 surgical population in 2 years. The proportion of bowel obstructions due to sigmoid volvulus in Northern Uganda was 23.4% and similarly comparable with the proportion found in other African countries and higher than those undeveloped countries.

Keywords: Sigmoid volvulus, incidence**DOI:** <http://dx.doi.org/10.4314/ecajs.v21i3.12>**Introduction**

Sigmoid volvulus has a considerable geographical variation in its incidence¹ and is a comparatively rare disease in the United Kingdom, Western Europe and North America¹. However it is one of the commonest causes of acute intestinal obstruction in Eastern Europe, India, West Indies and the Negro population of Africa¹. In the developed world, sigmoid volvulus is uncommon accounting for about 5% of all cases of large bowel obstructions⁹. In the developing world, sigmoid volvulus constitutes 50% of large bowel obstructions^{4,5,6}.

A multi-factorial aetiology has been implicated mainly food containing a high fibre diet and pre-existing redundant sigmoid colon^{10,11}. In Uganda the basic foods include cassava, rice, millet, porridge, peas, soya, beans, oranges and mangoes which have all been implicated in the aetiology of sigmoid volvulus⁸. It is postulated that this high fibre diet leads to a shortened intestinal transit time leading to a redundant sigmoid colon to undergo volvulus¹². Studies conducted in Central and Eastern Uganda found that sigmoid volvulus affects mostly the Baganda, Basoga and Bagisu tribes however, Nilotics where this study was conducted, it was believed that they least often suffered from sigmoid volvulus¹³.

Very little is known about sigmoid volvulus in Northern Uganda where in the last 20 years civil war ruined the economy with most of the populace displaced into internally displaced peoples' camp¹⁴. In this post conflict Northern Uganda, there is speculation that the patients' poor socio-economic status makes them unable to meet the costs of an elective operation resulting in a low registered incidence of sigmoid volvulus. This prolonged civil war, poverty, lack of specialist care and patients' unawareness may have contributed to the delay in reporting to hospital with acute sigmoid volvulus with the result that more advanced stages of bowel obstruction are seen¹⁴. The obstructed bowel may become gangrenous as a result of strangulation, and this may lead to intestinal perforation, peritonitis and sepsis which were observations made in the respective hospitals^{14,15}. The purpose of this one year prospective and two year retrospective study design was to determine the incidence of sigmoid volvulus in Northern Uganda,

Patients and Methods

A two year retrospective study conducted between January 2010 to December 2011 and a one year prospective study from January 2012 to December 2012 was done to determine the incidence of sigmoid volvulus in Northern Uganda. Nineteen out of 20 Hospitals which serve 95% of the population of Northern

Uganda recruited sigmoid volvulus patients consecutively. Of these hospitals three were Regional Referral Hospitals. These were Arua, Gulu and Lira Regional Referral Hospitals. The remaining 16 Hospitals were Missionary and Government Hospitals including St. Mary's Lacor Hospital which is the largest Missionary Hospital with 482 beds. The other Hospitals were: St. Joseph's Hospital Maracha, Kuluva, Yumbe, Nebbi, Moyo, Adjumani, Kalongo, St. Joseph's Kitgum, Kitgum General, Angal, Nyapea, Apac, Matany, Aber, and Anaka Hospitals respectively. The location of all the hospitals was in the Northwest (West Nile), Northern Region and North eastern region (Karamoja region) of Uganda in East Africa. Included in the study were patients aged 13 years and above with a peri-operative diagnosis of sigmoid volvulus who had consented to the study. Exclusion criteria included patients treated non-operatively and those who were not followed up to the 30th postoperative day.

Data collection

In the retrospective study, data was collected from the Hospital records using research assistants. The total number of new patients that had been operated with a diagnosis of sigmoid volvulus in the nineteen Hospitals over the 2 year period and the total number of bowel obstructions seen in the same Hospitals were counted and recorded. The proportion of bowel obstructions due to sigmoid volvulus out of the total number of all bowel obstructions seen in each Hospital during the study period was determined. This was done by manually checking and counting the number of sigmoid volvulus patients through the Hospital admission records and further counterchecking with the list of operations conducted in the record books of each of the operating theatres.

The same procedure was also observed to determine the surgical inpatient population as the defined surgical population in each Hospital in order to determine the incidence of sigmoid volvulus over the study period. The data collected was stored in a safe place to avoid unauthorized access to the research information and backup copy was also kept safely. Regular meetings with the surgeons to cross-check for completeness of the proforma were made and any problems that were encountered during data collection were addressed to ensure quality assurance of the information. In the prospective study, those patients with a proven diagnosis of sigmoid volvulus were recorded in a questionnaire designed for this study.

Ethical approval for this study was obtained from the Institutional Review Board of Gulu University, Institutional Review Board St. Mary's Lacor Hospital and Uganda National Council for Science and Technology (UNCS&T). Informed consent/Assent was obtained from each individual patient taking into consideration the principles of good clinical practice for those participating in the study.

Statistical analysis

Data analysis and interpretation was carried out using STATA/IC version 12.1. On the univariate data analysis, the summary statistics were displayed for categorical variables into bar graphs, tables, and pie charts for general descriptions. Continuous variables were summarized into ranges, mean, median and standard deviation.

Results

There were a total of 77,844 surgical admissions and 196 new cases of sigmoid volvulus over the 2 years. This gave an incidence of 251.8 (217.8, 289.6) per 100,000 surgical population in 2 years in Northern Uganda. Table 1 shows the incidence of sigmoid volvulus in Northern Uganda as a proportion of the total surgical inpatient population in 19 hospitals. The hospitals in the North Western region of Uganda included: Maracha, Moyo, Kuluva, Arua, Yumbe, Adjumani, Nyapea, Angal and Nebbi. The total number of cases of sigmoid volvulus in these Hospitals over 2 years was 50 patients and the total number of surgical inpatients in these Hospitals over 2 years was 25,803 patients. The incidence of sigmoid volvulus in the North Western region (West Nile region) was found to be 193.7 per 100,000 surgical population compared to the rest of Northern Uganda which is at 251.8 per 100,000 surgical population over the same time period.

Table 1. The Incidence of Sigmoid Volvulus in 19 Hospitals in Northern Uganda in 2 Years

Hospital	Sigmoid volvulus cases	Surgical Inpatient population	Incidence per 100,000 population
	2010 to 2011	2010 to 2011	
Maracha	7	1,468	476.8
Moyo	5	683	732.1
Kuluva	8	2,580	310.0
Arua	17	4,803	353.9
Yumbe	6	684	877.2
Adjumani	1	1,380	72.5
Aber	13	1,577	824.4
Lira	36	11,849	303.8
Apac	9	1,233	729.9
Nyapea	2	11,367	17.6
Angal	1	2,197	45.5
Nebbi	3	641	468.0
Kalongo	4	2,952	135.5
Anaka	5	104	4807.7
Kitgum General	33	2,010	1641.8
Kitgum St. Joseph's	13	17,794	73.1
Matany	6	2,683	223.6
Gulu	2	2,029	98.6
Lacor	25	9,810	254.8
Total	196	77,844	251.8

In the North Eastern region of Uganda, Matany Hospital was the major Referral Hospital and there were 6 cases of sigmoid volvulus. The total number of surgical inpatients in this Hospital was 2,683 patients in the same time period. The incidence in the North Eastern region of Uganda was found to be 223.6 per 100,000 surgical population.

As can be seen in table 1 the highest incidence recorded in the Northern region was from Anaka Hospital which was found to be 4807.7 per 100,000 surgical population. The second highest incidence was recorded in Kitgum which accounted for 1,641.8 per 100,000 surgical population. Whilst the third highest was in Yumbe which accounted for 877.2 per 100,000 surgical population.

Finally, the district with the lowest incidence recorded was in the West Nile district of Nebbi in Nyapea Hospital at 17.6 per 100,000 surgical population in the same time period.

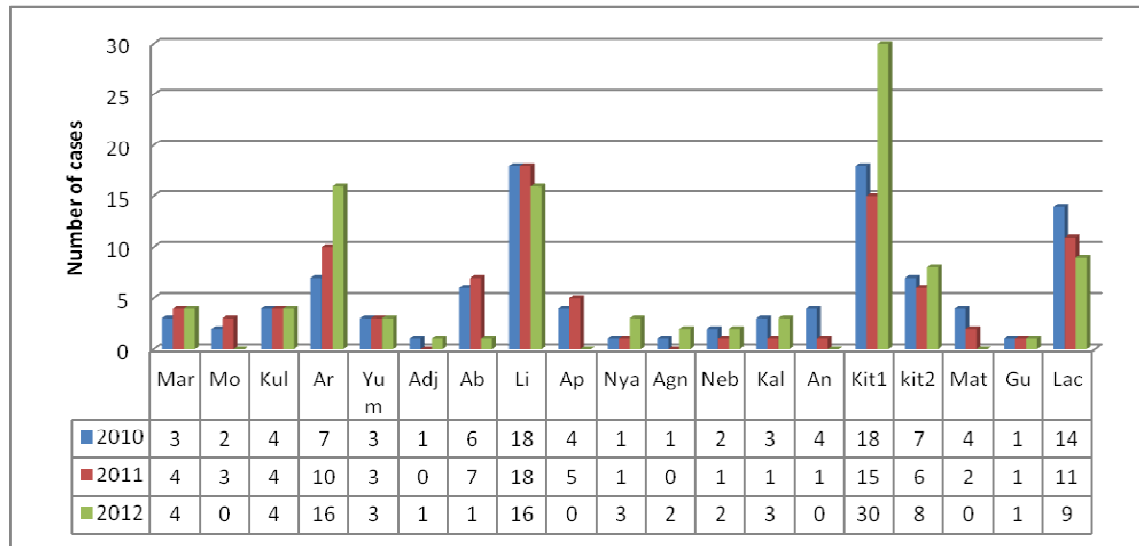


Figure 1. The Number of New Cases of Sigmoid Volvulus in The Different Hospitals in Northern Uganda

Mar = Maracha Hospital; Mo = Moyo Hospital; Kul = Kuluva Hospital; Ar = Arua Referral Hospital; Yum = Yumbe Hospital; Adj = Adjumani Hospital; Ab = Aber Hospital; Li = Lira Hospital; Ap = Apac Hospital; Nya = Nyapea Hospital; Agn = Angal Hospital; Neb = Nebbi Hospital; Kal = Kalongo Hospital; An = Anaka Hospital; Kit1 = Kitgum General Hospital; Kit2 = Kitgum St. Joseph's Hospital; Mat = Matany Hospital; Gu = Gulu Regional Referral Hospital; Lac = St. Mary's Lacor Hospital

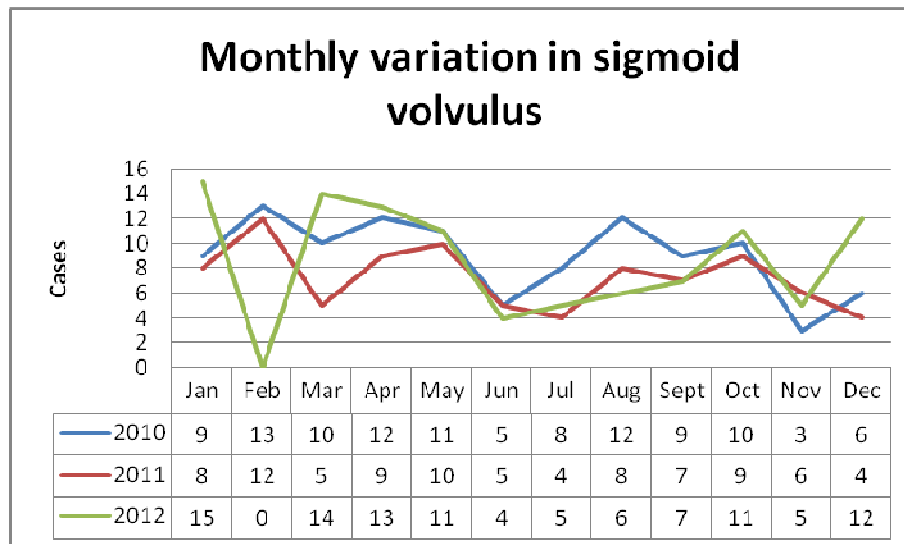


Figure 2. Monthly variation in the incidence of sigmoid volvulus

Jan = January; Feb = February; Mar = March; Jun = June; Jul = July; Aug = August; Sept = September; Oct = October; Nov = November; Dec = December. Cases = number of new patients presenting with sigmoid volvulus

The total number of new cases of sigmoid volvulus was recorded for three consecutive years. Figure 1 shows that the largest number of cases of sigmoid volvulus in 3 years was seen in Kitgum District which included 84 cases. Lira District recorded the second highest at 52 cases and Gulu was the third highest at 37 cases and the West Nile district of Adjumani recorded only 2 cases which is the lowest number of cases recorded.

Figure 2 shows the variation in the monthly incidence of sigmoid volvulus in Northern Uganda. The months of December to April recorded the highest number of cases with one hundred and forty two (142) cases over 3 years. However the months of May to September recorded a lower number at one hundred and twelve (112) cases over 3 years. The month of April recorded the highest number of cases, thirty four (34) cases, whilst the month of September registered the lowest number of cases, twenty four (24) cases of sigmoid volvulus over 3 years.

Table 2. Proportion of cases of bowel obstruction that are due to sigmoid volvulus in 19 hospitals in Northern Uganda

Hospital	Sigmoid volvulus cases	Bowel obstruction cases	% Sigmoid volvulus
	2010 to 2011	2010 to 2011	
Maracha	7	41	17.07
Moyo	5	10	50
Kuluva	8	55	14.54
Arua	17	90	18.88
Yumbe	6	7	85.71
Adjumani	1	81	1.23
Aber	13	22	59.09
Lira	36	72	50
Apac	9	15	60
Nyapea	2	9	22.22
Angal	1	23	4.34
Nebbi	3	11	27.27
Kalongo	4	44	9.09
Anaka	5	21	23.8
Kitgum General	33	77	42.85
Kitgum St. Joseph's	13	69	18.84
Matany	6	53	18.18
Gulu	2	15	13.33
Lacor	25	119	21
Total	196	834	23.5

Table 2 shows the proportion of bowel obstructions that were due to sigmoid volvulus in the different Hospitals in Northern Uganda. There were a total of 834 bowel obstructions in 2 years in all the Hospitals. Therefore the proportion of bowel obstructions that were due to sigmoid volvulus in Northern Uganda was 23.5%.

In the West Nile region the proportion of bowel obstructions that were due to sigmoid volvulus was found to be lower at 17.2% compared to the rest of Northern Uganda. The North Eastern region registered an even lower proportion at 8.6% compared to West Nile and the rest of Northern Uganda. The West Nile district of Yumbe revealed the highest proportion at 85.71%. The second highest was from Kitgum district at 61.69%. The third highest was from Apac district at 60%. Finally, the lowest proportion of cases was seen from the West Nile district of Adjumani at 1.23%.

Outcome of management

A total of 196 new patients with sigmoid volvulus were observed in the region over 2 years. 165(84.38%) had a resection ad primary anastomosis; 15(7.8%) had a Hartman's procedure, 8(3.9%) had a double barrel colostomy, 8(4.08%) had nonoperative management with supportive treatment or enema. 8(4.08%) of patients died.

Discussion

Observation from previous studies has shown, that the incidence of sigmoid volvulus has distinct geographical predilections and high frequencies have been reported from Africa, Asia, Latin America and Eastern Europe¹⁶. This study determined the incidence of sigmoid volvulus in Northern Uganda which was 251.8 per 100,000 surgical population in 2 years which is similar to that seen in other African countries^{4,12}. The proportion of bowel obstructions that were sigmoid volvulus in Northern Uganda was found to be 23.5% of all bowel obstructions. This figure compares well with the proportion of cases due to sigmoid volvulus in other East African countries in particular Kenya (22%)¹⁶. The incidence was higher than that seen in developed countries where it only accounts for 3-5% of all bowel obstructions¹⁷. Furthermore, the proportion of bowel obstructions that are caused by sigmoid volvulus in this study also compares similarly with another study conducted by Shepherd *et al* in Central Uganda at Mulago Hospital¹⁸.

Table 3. Proportion of Sigmoid Volvulus Relative to All Cases of Intestinal Obstruction in Different Countries

Country	% Sigmoid Volvulus	Source
USA	1-3	Polivka, 1966
UK	2.5	Poritt, 1950
Eastern Europe	30-50	Bruusgaard, 1947
Bolivia	79	Asbun, 1992
India	29.7	Sinha, 1967
Nigeria	1.0	Solanke, 1968
Ethiopia	50	Johnson, 1966
Eritrea	37.6	Polivka, 2002
Uganda	20.0	Shepherd, 1967
Northern Uganda	23.5	Wismayer, 2013*
Kenya	22.0	Miller, 1964

*=This study

Using the number of bowel obstructions that were observed to have sigmoid volvulus actually assumes that there are no geographical and racial differences in other types of bowel obstruction, for example obstruction due to inguinal hernia. Certain studies have shown that there is a large difference in the incidence of external hernia in Africa, especially of the direct inguinal hernia¹⁹. This fact together with the retrospective nature of this study pose limitations in determining the proportion of bowel obstructions that were due to sigmoid volvulus. Another limiting factor is that those cases of sigmoid volvulus that

were admitted and treated non-operatively were excluded from the study as the diagnosis had to be proven at operation and this could have underestimated the incidence in this study.

One should note that the population of Northern Uganda are mainly rural people and a large number of them are peasant farmers²⁰. These peasant farmers consume cereals and high fibre crops like maize, cassava, millet, mangos and beans¹⁷. In a study carried out by Tumusiime *et al* in Central Uganda, this diet was found to make them more susceptible to sigmoid volvulus⁸. The high consumption of these high fibre crops may lead to increased gas formation in the bowel, predisposing them to sigmoid volvulus²¹.

An observation made in this study is that sigmoid volvulus occurs predominantly in Northern Uganda during the dry season, between the months of December and April (Fig.2). Perhaps this period is related to a diet richer in cellulose and deficient in water which may be the contributing factor to the occurrence of sigmoid volvulus. This was an observation previously made by Polivka *et al*, 1966 in Eritrea. Furthermore, there are more holidays, feasts and ceremonies in this particular season than the rest of the year which were accompanied by heavy meals. This excess consumption of food probably explains the high incidence of bowel obstruction due to sigmoid volvulus. The month of April saw the largest number of cases which coincides with the dry season and festive season whilst the month of September saw the lowest number on record, with only twenty three cases recorded over 3 years however no convincing explanation can yet be given for this observation (Fig.2).

There were differences seen among the districts in Northern Uganda with more cases being reported in Kitgum, Lira and Gulu districts than in districts from West Nile. The incidence in the West Nile region was found to be lower at 193.7 per 100,000 surgical population compared to 278.6 per 100,000 population over 2 years in the rest of Northern Uganda. This study did not however examine the reasons for this difference but possibly dietary changes and difference in altitude may possibly be playing a part. Furthermore the districts of Kitgum, Lira and Gulu which are mainly occupied by the Acholi tribe have better access to health facilities which may be another reason why a higher number of cases were seen in this region of Northern Uganda.

An observation made by Shepherd *et al* in Central Uganda found that there were tribal differences in the occurrence of sigmoid volvulus with the Baganda tribe in Central Uganda having the greatest incidence of sigmoid volvulus at 50% compared with the Northern tribes (7%)¹⁸. In our study it was not possible to include tribe as a variant for comparison, as it was not part of the objective of this study.

In South America a study has shown that the incidence of sigmoid volvulus also tends to vary with altitude²². It has been observed that a decrease in atmospheric pressure with increasing altitude initiates the production of methane and carbon dioxide in the bowel causing distention in a redundant sigmoid colon to undergo volvulus²². Evidence comes from studies from South America in the Andes also suggested that high altitude increases the incidence of sigmoid volvulus²². However, in Northern Uganda one may not conclude that a high altitude is a contributory factor for sigmoid volvulus. The explanation is that the altitude of the highlands in Northern Uganda are much lower at 1,200 metres above sea level than that of the Andes Mountains which lie at 6,962 metres above sea level. The altitude recorded in Anaka district where the highest incidence of 4,807.7 per 100,000 surgical population over 2 years was recorded is 909m above sea level and is lower than Arua district in West Nile which lies at 1,200 metres above sea level where a lower incidence of 193.7 per 100,000 surgical population over 2 years was recorded. Therefore one may conclude that variation in altitude in Northern Uganda does not contribute to the high incidence of sigmoid volvulus seen in this part of the world.

In this study the mean duration of symptoms was 2.8 days and the majority of patients presented themselves to hospital more than 48 hours from the onset of their symptoms. The reasons partly are that the transportation links from the countryside to the nearby hospital are very underdeveloped. The other reason is that there is a tendency among rural communities of using local medicines by traditional healers before seeking the help of the professional health worker. These patients often do not report to the Hospital until they are very sick and die at home. It is therefore probable that the actual incidence of sigmoid volvulus is higher than that determined from our study as this incidence was determined on hospital based data and not community based data.

Untwisting of the sigmoid volvulus from sigmoidoscopy and enema in the Hospitals in Northern Uganda might have been carried out more commonly and a significant number of patients may have been discharged before a confirmatory diagnosis of sigmoid volvulus was made leading to an underestimation in the incidence of sigmoid volvulus in this study.

Conclusions

In conclusion the incidence of sigmoid volvulus in Northern Uganda was found to be 251.8 per 100,000 surgical population in 2 years. The proportion of cases of bowel obstructions that were sigmoid volvulus in Northern Uganda was 23.4% and compares similarly with the proportion found in other African countries and remains higher than the incidence found in developed countries.

Ethical approval

This Master of Surgery Research Project was approved by the Ethics Committees of the Institutional Review Board of Gulu University, Institutional Review Board of St. Mary's Lacor Hospital and Uganda National Council for Science and Technology.

Consent

Written informed consent was obtained from all patients that participated in this Master of Surgery Research project.

Acknowledgements

I wish to express my sincere gratitude to Dr. David Lagoro Kitara MB ChB, MMedSurg, FCS(ECSA), Head, Department of Surgery, Gulu University for his supervisory contribution to my study

I wish to thank Dr. David Cairns MB Chir, FRCSEd, FRCSEng for having always encouraged me to continue to pursue my surgical career. Mr. Michael Okuga Tabu and family from West Nile, Uganda for having helped me to collect all the patients serum samples from all the Hospitals in Northern Uganda and bringing them to Gulu Regional Referral Hospital laboratory for analysis. Professor Makumbi from Makerere University for having helped in statistical data analysis and staff in all the 19 hospitals who were involved in data collection. Finally my parents for having supported me and helped me financially to carry out this Master of Surgery Research project.

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