Original Research

Epidemiology of acute Intestinal obstruction in Uasin Gishu County, Kenya

Jumbi G[1], Tenge RK[2], Khwa-Otsyula BO[2], Menya D[3], Bwombengi SO[2], Ombito BR[4]

[1]Kenyatta University, School of Medicine, Department of Surgery and Orthopaedics, P.O. Box 43844 – 00100, Nairobi, Kenya
[2]Moi University School of Medicine, Department of Surgery & Anaesthesiology, P.O. Box 3900 -30100, Eldoret, Kenya
[3]Moi University, School of Public Health, Department of Epidemiology, P.O. Box 3900 -30100, Eldoret, Kenya
[4]Consultant Specialist Surgeon, P.O. Box 3974 – 20100, Nakuru, Kenya

***Corresponding author**: Dr. Gathaiya Jumbi, P.O. Box 1059 - 00618. Nairobi, Kenya. Email:gathjumbi@gmail.com*

Abstract

Background: Acute Intestinal Obstruction (AIO) is a common life threatening emergency in all general hospitals all over the world. This study provides a population based incidence of acute intestinal obstruction derived from hospital data within a period of seven years preceding the year of the study (2008/9). Inpatient records can provide a fairly accurate data on the incidence of acute intestinal obstruction since almost all the cases are admitted in hospitals.
Objectives: This study aims at determining the incidence and other epidemiological characteristics of AIO in Uasin Gishu County based on the hospital records and the national population census.
Methods: The study was conducted in twelve hospitals (six within Uasin Gishu County) and six from the surrounding counties. Patient records for seven years preceding the period of study (2008) were retrieved and demographic information of the disease and treatment outcome (mortality) were analyzed against the projected population for the seven year period covered by the study (2001-2007). The population projections (the denominators) were based on Kenya population census and housing survey, 1999.
Results: There were 444 cases of AIO from Uasin Gishu County during the seven year period of the study (2001-2007). There were 319 males (71.8%) and 125 females (28.1%) (male/female ratio =2.6/1). The mean age was 31.4 years and the median age was 29 years. The population of Uasin Gishu County (1999 census) on which the population growth projections was based was 622,705. Mean annual incidence for the seven year period was 8.8 per 100,000 persons and this was significantly related to age and gender (p-values = 0.0001). Recovery (survival) rate was 93.5% and mortality (case fatality) rate was 6.5%. Mortality rate was not significantly related to age and gender (p-value>0.05).
Conclusion: The observed annual incidence of acute intestinal obstruction in Uasin Gishu County was very low compared to available global data. Our findings could be a pointer to the general burden of AIO in Kenya (given the similarity of Uasin Gishu County and rest of the country in relation to demography, infrastructure and the state of health care services). The incidence increased exponentially with age. A prospective population based study on incidence could shed more light and confirm the low incidence found in this study.

Key words: Incidence, Intestinal obstruction, Epidemiology, Population-based

Introduction

Acute Intestinal Obstruction (AIO) is a common life threatening emergency in all general hospitals all over the world. Nearly all the cases seek inpatient hospital treatment because of its acute and emergency nature. Therefore, the hospital data provides a fairly good status of this particular disease in the community. Population based studies on incidence of AIO are scarce in the literature. In USA, it is estimated that about 300,000 cases of AIO due to adhesions are operated each year which suggests a population based incidence of over 150 per 100,000 persons [1]. Many other studies on AIO have been done but they are inappropriate for establishing the incidence in the population because they used the total hospital admissions or the sample size as the denominators without linking the occurrence to the population [2,3]. However, they are useful in comparisons of other epidemiological characteristics such as mortality (case fatality rate) and morbidity. The mortality rate reported in these studies ranges from 3 - 20% [4,5] and the morbidity (complications) is in the range of 8 – 18% [4,6]. The demographic structure, the infrastructure and the state of health care services of

Uasin Gishu County is almost similar to that of Kenya in general. Consequently, a study of epidemiological characteristics of AIO in this County could provide an insight on the burden of this disease not only in Uasin Gishu County but also in Kenya.

The objective of this study was to determine the incidence of AIO and the epidemiological characteristics associated with this condition in Uasin Gishu County using data obtained from hospitals and the national population census registry.

Materials and Methods

This was a cross sectional retrospective observation study based on hospital data and the national population census. Retrospective data covering seven years preceding the year of study 2008/9 was collected. The study population included all cases with confirmed diagnosis of acute intestinal obstruction admitted in 12 hospitals in and around Uasin Gishu County during the period of seven years (2001 to 2007 inclusive). The 12 hospitals included all hospitals with a capacity to admit and treat AIO in the catchment area. The cases of AIO were identified from the inpatient registers, discharge abstracts, theatre registers, the record offices and the inpatient files from all the 12 hospitals in the study. All files of all cases of AIO in each hospital were retrieved and those whose home county is Uasin Gishu were selected using the demographic data which specified the home county of every patient. The data collected included: the hospital attended, the home County, age, gender, and number of related deaths. Challenges were encountered in retrieval of files in some hospitals, mainly because of the manual system used to record and store the patient's data. Cases with missing files were excluded. Demographic data on population denominators for Uasin Gishu County was provided by the Uasin Gishu County Statistics Office based on the 1999 National Population and Housing Census [9]. The population data included: the total population of Uasin Gishu County in 1999, population distribution by age and gender, and population projections into the years 2001-2007. Appropriate consent to conduct the study was obtained from relevant national and local authorities (hospitals and national population registry). Patient permission was not required.

Data analysis: Data was analyzed using STATA version 10. Descriptive statistics were carried out for age, gender, incidence and mortality. The odds ratio was used to establish the relationship between the gender, age, incidence and mortality. The combined incidence for seven years and the projected population for 2004 were used to create the contingent tables for calculation of the odds ratio. Year 2004 was chosen because it was the midpoint year of the whole data (2001-2007) which is in keeping with the norm when data spans across several years. For comparison of incidence in different age groups, we used the age group 0-19 years as the reference group and compared its incidence to that of each of the other age groups. The z-test was used to calculate the p-value of the odds ratio (OR). P-value of 0.05 was considered significant.

Results

Analysis of hospital records for seven years showed that there were 444 cases of acute intestinal obstruction from Uasin Gishu County. Eighty four percent of the cases were admitted in the six hospitals within the Uasin Gishu County while 16% of the cases were admitted in the other six hospitals in the surrounding counties (Table 1).

Table 1: The distribution of AIO cases by hospitals and the catchment area

Hospitals in Uasin Gishu County (84%)		Cases
1.	Moi Teaching & Referral Hospital (MTRH)	331 (74.6%)
2.	Eldoret Hospital	10 (2.3 %)
3.	Memorial Hospital	11 (2.5%)
4.	Mediheal Hospital	11 (2.5%)
5.	Elgonview hospital	8 (1.8%)
6.	Imani Hospital	2 (0.5 %)
Hospitals in neighbouring counties (16%)		
1.	Kitale District Hospital (Trans Nzoia County)	17 (3.8%)
2.	Kapsabet District Hospital (Nandi County)	25 (5.6%)
3.	AIC Kapsowar Mission Hospital (Keiyo-Marakwet Ct)	2 (0.5%)
4.	Iten District Hospital (Keiyo-Marakwet County)	3 (0.6%)
5.	Nakuru Provincial Hospital (Nakuru County)	16 (3.6%)
6.	Webuye District Hospital (Bungoma County)	8 (1.8%)
Total		444

The mean annual incidence based on the projected population for the seven year period was 8.8 persons per 100,000 persons (Table 2).

Table 2: Annual incidence of acute intestinal obstruction in Uasin Gishu county for seven years

Year	*Projected Population	No. of cases N=444	Incidence (Per 100,000)
1999 census	622,705	-	-
2001	675,261	62	9.2
2002	692,454	54	7.8
2003	709,669	66	9.3
2004	726,885	73	10.4
2005	744,083	47	6.3
2006	760,587	61	8.0
2007	777,337	81	10.4

**Source-Kenya National population & Housing census 1999[7]*

Age and sex distribution: There were 319 males (71.8%) and 125 females (28.2%), ratio 2.6:1 (Figure 1). The mean age of the patients was 31.4 years, range 0 – 97 years. The inter quartile range was 29.4.

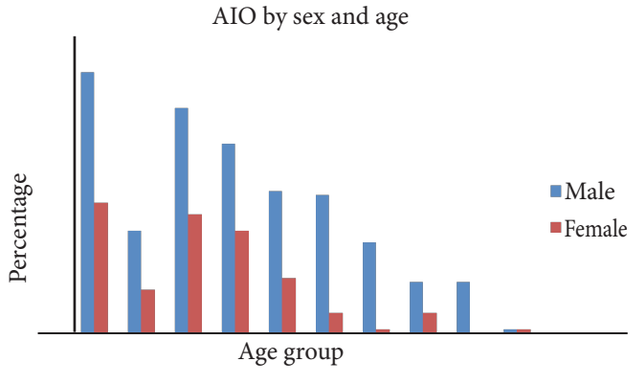

Figure 1: Distribution of acute intestinal obstruction based on age and gender of patient

The difference in the incidence between males and females and between the different age groups was significant (p-value=0.0001). The incidence in each age group was analyzed against the age group 0-19 years. There was an exponential increase of incidence with increasing age (the incidence in eighty year olds was nine times that of 0-19 years age group (Table 3).

Table 3: Incidence of acute intestinal obstruction (AIO) by gender and age

	Incidence of AIO (7 year incidence)		Total (Year 2004)	Odds Ratio (95% CI)	P-value
	Present	Absent			
Gender					
Male	319	368469	368788	2.4793 (2.0160-3.0491)*	0.0001*
Female	125	357972	358097		
Total	444	726,441	726,885		
Age group (years)					
0 – 19	136	402,738	402,874		
20 – 39	159	223,689	223,848	2.1049(1.6741-2.6466)*	0.0001*
40 – 59	90	67,996	68,086	3.8628 (2.9593-5.0422)*	0.0001*
60 – 79	42	21,131	21,173	5.8859 (4.1632-8.3214)*	0.0001*
>80	15	4,884	4,899	9.0949 (5.3320-15.5135*	0.0001*
Unspecified	2	6,003	6005	----------	---------
	-	-	-		
Total	444	726,441	726,885		

*Statistically significant

The survival rate in this study was 93.5% (6.5% mortality rate). In Table 4, we compared the mortality for each gender and the mortality of each age group using the age group 0-19 years as a reference group (mortality in age group 0-19 years was analyzed against each of the other age groups . The difference of outcome between males and females and between the different age groups was not significant (p-value>0.05). Survival rate was highest in age group 20-39 years while mortality was highest in age group 0-19 years but these were not statistically significant (Table 4).

Table 4: Outcome (mortality) of acute intestinal obstruction by gender and age-group

	Outcome		Total	Odds Ratio (95% CI)	P-value
	Died	Recovered			
Gender					
Females	9	116	125	1.1599 (0.5132-2.615)	P=0.7214
Males	20	299	319		
Total	29	315	444		
Age group (years)					
0 – 19	11	125	136	……	……
20-39	5	154	159	0.3689 (0.1249-1.0899)	0.0712
40-59	5	85	90	0.6684 (0.2242-1.9931)	0.4699
60-79	7	35	42	2.2727 (0.8203-6.2989)	0.1143
80+	1	14	15	0.8117 (0.8974-6.7648)	0.8471
Unspecified	-	2	2	…….	…….
Total	29	315	444		

Discussion

This was a pioneering population based study on the incidence of AIO in Kenya. The average annual incidence of 8.8 persons per 100,000 in the population was derived from the data collected from hospital records covering a period of seven years which was analyzed against population projection based on the immediate last national population census in Kenya in 1999 [7]. The population of Uasin Gishu County in 1999 was 622,705 and the projected population at the middle of the data period (year 2004) was 726, 885. Population based data from USA suggests a much higher incidence of AIO [1]. Compared with this data from USA, our incidence was very low. Data from other studies dwelt on incidence of the various individual causes of AIO such as adhesions, hernias, volvulus, colorectal cancer and intussusception but their denominators were not population based findings could not be comparable to ours. Limitations in our study which could affect the outcome of incidence were the missing files (due to poor record keeping) and possible missed cases of unconfirmed diagnoses which calls for improvements in the record keeping in the public health care systems in the region.

The male/female ratio of 2.6:1 recorded in our study was in concordance with global ratios of between 1.5:1 and 3:1[4]. The higher incidence in males was statistically significant (P=0.0001) which means males are at a higher risk of getting AIO than females [3]. One of the possible reasons for the higher male preponderance is that the main causes of AIO (adhesions, sigmoid volvulus, and inguinal hernias) are commoner in males [8]. For example, occurrence of inguinal hernias which are a common cause of AIO is ten times higher in males [8]. Similarly, local studies have shown that the two commonest local causes of adhesions and sigmoid volvulus are also more common in males than in females [9, 10]. The reasons why males are more affected in these individual causes of AIO are outside the scope of this paper and has been investigated in other studies.

The mean age in our study of 31.4 years was lower than in other studies which reported means between 39 and 64.5 years [11,12]. This is probably a reflection of our relatively younger population. The odds ratio statistics indicated significant difference in the incidence by age groups (p-value=0.0001). The age specific incidence increased exponentially with increasing age. This is because the incidence of many individual causes of AIO such as hernias, adhesions, colorectal cancer, and volvulus also increase with age and their effects are confounding in this study. There is need for further studies to establish whether age is an independent risk factor in AIO by controlling for co-morbidities.

The treatment outcome in this study (mortality) was in keeping with global figures. There was no significant difference in mortality from AIO between males and females (p-value = 0.7214). The results also showed that there was no difference in mortality for the different age groups (p-value>0.05). This was not expected. One would have expected the mortality from AIO to increase progressively with age because deaths are associated with co-morbidities such as diabetes, cardiovascular diseases and colorectal cancer which are more common in the older age groups [13]. This finding calls for further investigation.

Conclusion

The observed annual incidence of acute intestinal obstruction (8.8 per 100,000 persons) in Uasin Gishu county was low compared to available global data. A prospective population based study on incidence in the region is needed to confirm the low incidence reported in this study. Our findings could be a pointer to the general burden of AIO in Kenya (given the similarity of Uasin Gishu County and rest of the country in relation to demography, infrastructure and the state of health care services). Migration to electronic record system in the local public health care system is essential in order to ensure accurate outcomes in similar incidence studies.

Acknowledgements

Prof. H.N.A. Mengech, Director, Moi Teaching & Referral Hospital; Dr. B.T. Osore, Provincial Director of Medical Services, Nakuru; Dr. S.O. Bwombengi, Director, Elgon View Hospital; Dr. P.V. Lodhia, Director, Eldoret Hospital; Dr. S. R. Mishra, Director, Pacifica/Medheal Hospital; Dr. C.S. Jakait, Director, Imani Hospital; Dr. J. K. Lactabai, Medical Superintendent, Webuye District Hospital; Dr. E. M. Manuthu, Medical Superintendent, Kitale Distict Hospital; Dr. A. K. Korir, Medical Superintendent, Iten District Hospital; Dr. E. K. Serem, Medical Superintendent, Kapsabet District Hospital; Dr. B. W. Rhodes, Surgeon, Kapsowar Mission Hospital; Mr. L. Munene Riungu, District Statistics Officer, Uasin Gishu County; Dr. K. Phillipe (data collection); Dr. A. W. Mwangi, biostatistics (data analysis); Mr. H. R. Mwangi (data collection, data entry and data analysis). Our gratitude goes to Moi University for financing the study.

References

1. Lilian Bourdianou. Epidemiology, clinical features, and diagnosis of mechanical small bowel obstruction. 2016. *www uptodate.com*
2. Adhikari S, Muhammed ZH, Amitabha D, Nilanjan M and Udipta R. Aetiology and outcome of acute intestinal obstruction: A review of 367 patients in Eastern India. *Saudi J. Gastroenterology.* 2010; **16**(4): 285 – 287 (ISSN 1998-4049).
3. Chen XZ, Wei T, Jiang K, Yang K, Zang B, Chen JP and Hu JK. Etiology factors in mortality of acute intestinal obstruction. A review of 705 cases (Absract). *Zhong Xi Yi Jie He Xue Bao*. 2008; **6** (10): 1010 6(1SSN:1672-1977).
4. Duran JJ, du Monticel ST, Berger A, Muscari F, Hennet H, Vevurieres M and Hay JM. Prevalence and risk factors of mortality and morbidity after operation of adhesive post operative small bowel obstruction. *Am J Surg*. 2008; **195**(6): 726-734.
5. Oladede AO, Akinkivolie AA and Agbakwuru EA. Pattern of intestinal obstruction in a semi-urban Nigerian Hospital. *Nigerian J Clin Pract*. 2008; **11** (4): 347-350.
6. Floorlje C van Eijek, Rene MH Wijnen and Harry van Goor. The incidence and mortality of adhesions after treatment of neonates with gastroschisis and ompalocoele - a 30 year review. *J Paediat Surg*. 2008; **43**:474-483.
7. Kenya population and housing survey, 1999. Uasin Gishu District Statistics Office, Eldoret, Kenya.
8. Clare C and Andrew K. Inguinal and femoral hernias in Oxford Text Book of Surgery. 2nd. Edition 2000 vol.2 pp 1867-1876. Edited by Peter J. Morris and William C Wood.
9. Kuremu RT and Jumbi G. Adhesive intestinal obstruction. *East Afr Med J*. 2006; **83** (6): 333-336.
10. Jumbi G and Kuremu RT. Emergency resection of sigmoid volvulus. *East Afr Med J.* 2008; **85**(8): 398-405.
11. Malik AM, Shah M, Pathan R and Sufi K. Pattern of acute intestinal obstruction. Is there a change in underlying aetiology? *Saudi J Gastro Enterology*. 2010; **16**(4): 272-274 (ISSN 1998-4049).
12. Lo OS, Law WL, Choi HK, Lee YM, Ho JW and Seto CL. Early outcomes of surgery for small bowel obstruction. Analysis of risk factors. *Langenbecks Annals Surg*. 2007; **392**(2): 173-2 (ISSN 1435-2443).
13. Bjorg TF, Jonas F, Lodve S, Odd S, Knut S and Asqaut V. Complications and death after surgical treatment of small bowel obstruction. *Annals Surg*. 2000; **331**(4):529-537.