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Outcomes of Laparoscopic Nissen Fundoplication

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Abstract

Background: Anti-reflux surgery has been shown to give superior quality of life compared to PPIs. Laparoscopic Nissen Fundoplication (LNF) is the most common surgical treatment for GERD and Hiatus hernia with good patient satisfaction rates. However, some complications following this intervention have been reported in various studies but these have not been studied in sub-Saharan Africa.

Methods: Cross sectional study that utilized secondary data of 70 patients who underwent LNF at St. Francis Hospital Nsambya from September 2020 to September 2022. The study determined the demographic characteristics, pre-operative symptoms, endoscopic findings and outcomes of these patients during a follow up period of 2months post-surgery.

Results: 62.9% of the patients in this study were females, the mean age was 39.7 years and 68.6% were from central region. The mean BMI was 25.9kg/m^2, 90% had a BMI of<30 and only 10% were obese. The most common GERD symptoms were epigastric pain (35.3%) and heart burn (19.6%). Major endoscopic findings included Hiatus hernia (45.1%) and GERD (28.8%). The mean length of hospital stay was 2 days (SD 1 day), patients were able to return to work after a mean duration of 3.1 weeks, 90% of patients had improvement in GERD symptoms with 35.7% completely resolved symptoms and 54.3% partially resolved symptoms. Only 10% had no change in GERD symptoms and there was no case of re-operation.

Conclusion: The outcomes of LNF in our study were good and comparable in terms of recovery, return to work, with low complication rates.

Keywords: Laparoscopic nissen fundoplication (LNF) • Hiatus hernia • Gastroesophageal reflux disease (GERD)

Introduction

Gastroesophageal reflux disease (GERD) is a common diagnosis for all age groups and both sexes, with estimated prevalence up to 33% worldwide [1]. The risk factors include obesity, hiatus hernia, analgesics, caffeinated beverages, smoking, psychological distress and old age [2]. Estimated prevalence of GERD in Africa and Middle East (AME) ranges between 7.6–61.8% [2]. GERD is characterized by bothersome symptoms such as heartburn, globus sensation, belching, bloating, water brash or sour taste in the mouth, epigastric pain, retrosternal chest pain, dyspepsia, dysphagia, regurgitation and extra-esophageal symptoms of asthma, laryngitis and chronic cough [3]. GERD can be complicated by reflux esophagitis, erosive esophagitis, Schatzki ring formation, Barrett's esophagus and adenocarcinoma [4]. GERD is diagnosed by a combination of symptoms, objective endoscopy, Esophageal PH monitoring, esophageal manometry and response to antisecretory therapy [5]. The use of anti-secretory drugs, mainly proton pump inhibitors (PPIs) can relieve symptoms temporarily; however anti-reflux surgery is becoming the standard treatment for GERD [6]. Anti-reflux surgery gives superior short-term and medium term quality of life compared to PPIs [7]. Laparoscopic Nissen Fundoplication (LNF) through (360°) wrap is the most common surgical treatment for GERD [8], with a satisfaction rate of 78.4% [9] Despite Laparoscopic anti-reflux surgery being the standard surgical treatment for GERD; it has been associated with complications such as disruption of the fundoplication, post-fundoplication dysphagia, in some cases leading to reoperation [10]. Persistent dysphagia probably due to a tight hiatus or slipped fundoplication or preoperative oesophageal motility disorders, is reported in up to 24% of patients who undergo laparoscopic fundoplication making it one of the leading causes of procedure failure [11]. Non-surgical factors such as pre-existing anxiety or depressive disorders can affect postoperative satisfaction and symptom relief compared to patients without concurrent psychological disorders [12,13]. According to the WHO Global Heath report of 2008 in Europe, 50% of adults are overweight and 20% are obese. A meta-analysis of 12 studies in USA, Europe, Australia, Asia, Canada and Brazil about the effect of obesity on recurrence after laparoscopic anti-reflux surgery showed a 53% recurrence of GERD symptoms in obese patients compared to non-obese patients [14]. In Uganda, the prevalence of overweight is 16% & obesity 6% [15]. We therefore aimed at assessing the outcomes after Laparoscopic Nissen Fundoplication in a ugandan setting. Since September 2020, LNF has been done for patients with Symptomatic Hiatus hernia and GERD at St. Francis hospital Nsambya. Considering the population differences we set out to evaluate out the outcomes of this surgical intervention in our setting.

The variables considered in the study included. Demographics like age, sex, BMI, occupation, Address/region. Pre-operative symptoms: Epigastric

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pain, heart burn, regurgitation, acid taste in the mouth. Pre-operative endoscopy: Hiatus hernia, esophagitis, GERD, Barret's esophagus. Laparoscopic Nissen Fundoplication (LNF) and its outcomes including Length of hospital stay, return to work, resolution of GERD symptoms (Figure 1), Persistent dysphagia (Figure 2), need for chronic PPIs (Figure 3) after surgery as well as re-operation rates.

Methods

This was a Cross sectional study that utilized secondary data collected from September 2020 to September 2022. The study was carried out in the Gastrointestinal Surgery Unit of St. Francis hospital Nsambya, all Patients who underwent Laparoscopic Nissen Fundoplication for GERD & Hiatus hernia from 2020 to 2022 were included in the study. The data was abstracted from the records of patients who underwent LNF at SFHN from 2020 to September 2022 using a validated questionnaire, Modified GERD-IS (IMPACT SCORE). The data collected was from participants entered the hospital via the Gastrointestinal Endoscopy unit where their symptoms had earlier been recorded prior to endoscopy being performed. Endoscopic findings and diagnosis of GERD are also recorded. Operative management was discussed. When ready, the patients were admitted for elective LNF which was carried out in main theatre. Post-operative follow up was done on ward and then after discharge as out-patients for 2months. The follow up

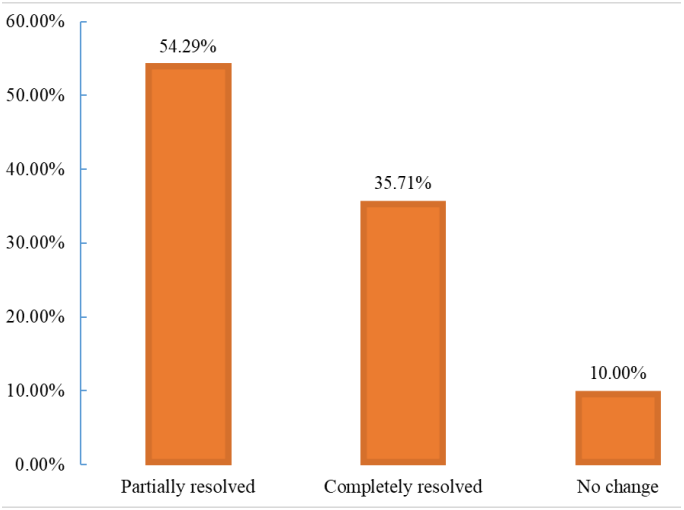

Figure 1. Resolution of GERD symptoms.

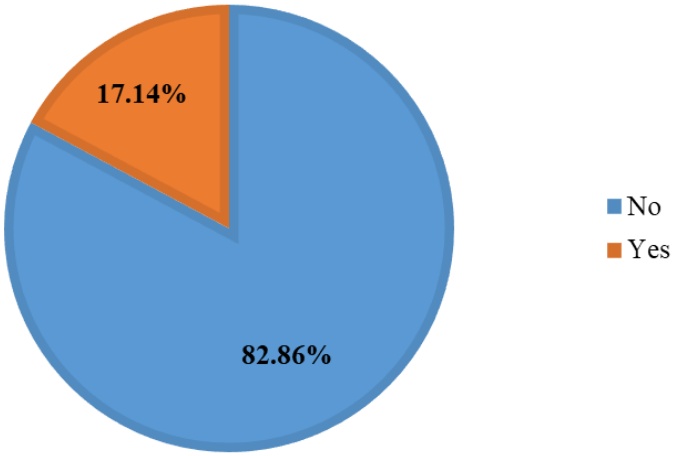

Figure 2. Persistent dysphagia.

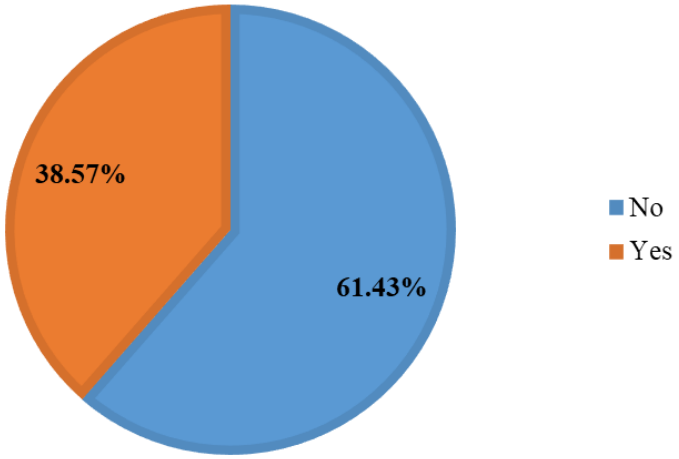

Figure 3. Need for chronic PPIs after surgery.

Table 1. Demographic characteristics of patients undergoing LNF.

Variable		Frequency (n=70)	Percentage
Sex	Male	26	37.1
	Female	44	62.9
Age	Mean (SD); Min-Max	39.7 (12.7); 18-68	
Age category	18-25	6	8.6
	26-35	28	40.0
	36-45	14	20.0
	Over 45	22	31.4
Occupation	Formal	29	41.4
	Self employed	19	27.1
	House wife	8	11.4
	Informal	8	11.4
	Student	6	8.6
BMI	Mean (SD)	25.9 (3.6)	
BMI category	≤25	34	48.6
	25.0-<30	26	37.1
	≥30.0	10	14.3
Location/region in Uganda	Central	48	68.6
	Western	11	15.7
	Northern	6	8.6
	Eastern	3	4.3
	International	2	2.9

findings and interventions are recorded, therefore, for this study, data was collected by review of records at theatre, gastrointestinal endoscopy unit and Hospital records department. Research assistants were trained prior to data collection.

Standardization: Same operative procedure. Questionnaire was pretested on 10 charts prior to main data collection. Data from the data abstraction tool was entered into Epi-data software; continuous numerical. Responses were entered as absolute values while categorical responses were coded Data was analyzed using STATA version 15.0.

Results

Demographic characteristics of patients undergoing LNF (Table 1)

Demographic characteristics of patients undergoing LNF: The mean age of participants was 39.7 years with standard deviation of 12.7 years, ranging from 18 years to 68 years. Over half of the respondents were females (n=44, 62.9%). Most of the participants were aged 26 to 35 years (n=28, 40.0%), with formal education taking higher proportion (n=29, 41.1%). The mean BMI was 25.9 with standard deviation of 3.6. Most of the participants had BMI of less than 25 (n=34, 48.6%) and majority were from central region (n=48, 68.6%).

Pre-operative symptoms of patients undergoing LNF (Table 2)

Pre-operative symptoms of patients undergoing LNF

Whereas some patients presented with more than one symptom, the common symptoms included epigastric pain (35.3%) and heart burn (19.6%).

Endoscopic findings of patients undergoing LNF

The endoscopic findings of patients undergoing LNF were presented in Table 3. It is worth noting that some patients had more than one endoscopic findings, however, the major findings included Hiatus hernia (45.1%) and GERD (28.8%) (Table 3).

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The mean length of hospital stay was 2 days with standard deviation of 1 day, ranging from 1 to 7 days. The mean duration of return to work was 5.2 weeks with standard deviation of 4.7 weeks, ranging from 1 week to 24 weeks. Over half of the patients had GERD symptoms partially resolved (n=38, 54.3%), 35.7% were completely resolved while only 10% had no change. Majority of the patients (n=58, 82.9%) had no persistent dysphagia, only 17.1% had persistent dysphagia. The need for chronic PPIs after surgery was reported in 38.6% of the patients. The was no re-operation reported in all the patients.

Comparison of outcomes of LNF and demographic characteristics (Table 5)

Independent sample T-Test was used to compare the mean length of hospital stay between males and females. The findings revealed no significant difference in LOS between males and females (F=1.08, P=0.3016). The mean length of hospital stay was compared across age groups using Analysis of Variance (ANOVA) test. The findings showed no significant difference in LOS across the age categories (F=1.09, P=0.967). The mean length of hospital stay was compared across patients' occupation using Analysis of Variance (ANOVA) test and the results showed no significant difference in LOS across their occupations (F=2.265, P=0.113). The mean length of hospital stay was compared across patients' BMI categories using Analysis of Variance (ANOVA) test and the results showed no significant difference in LOS across their BMI (F=1.11, P=0.528). There was also no difference in LOS across patients' location (F=1.971, P=0.744).

Persistent dysphagia (Table 6)

Persistent dysphagia was compared to demographic characteristics of patients using Pearson Chi-square test. The results showed a significant relationship between persistent dysphagia and BMI categories (Chi-2=6.876, p=0.0035). Specifically, the proportion of persistent dysphagia among patients with BMI of 30 and above was high at 33.3% as compared to those of 25-30 (7.7%) and those of 25 and below (20.0%). There was no significant

Table 2. Pre-operative symptoms of patients undergoing LNF.

Pre-operative symptoms	Frequency	Percentage
Epigastric pain	53	35.3
Heart burn	30	19.6
Bloating	12	7.8
Regurgitation	10	6.5
Belching	6	3.9
Nausea	5	3.3
Dysphagia	5	3.3
Retrosternal chest pain	5	3.3
Dyspepsia	5	3.3
Cough	5	3.3
Acid taste in the mouth	4	2.6
Early satiety	3	2.0
Vomiting	2	1.3
Flatulence	2	1.3
Reflux	2	1.3
Epigastric discomfort	1	0.7
Hiccups	1	0.7
Sore throat	1	0.7

Table 3. Endoscopic findings of patients undergoing LNF.

Endoscopic findings	Frequency	Percentage
Hiatus hernia	69	45.1
GERD	44	28.8
Gastro-duodenitis	12	7.8
Esophageal candidiasis	8	5.2
Esophagitis	7	4.6
Gastristis	5	3.3
PUD	4	2.6
Bleeding	1	0.7
Duodenal ulcer	1	0.7
Esophagitis	1	0.7
Barret's esophagus	0	0.0

Table 4. The outcomes of LNF.

Outcomes of LNF		Frequency/Mean (SD)	Percentage
Length of hospital stay (days)	Mean (SD); Min-Max	2 (1); 1-7	
Return to work after what duration (weeks)	Mean (SD); Min-Max	5.2 (4.7); 1-24	
Re-operation	Yes	70	100.0
	No	0	0.0

Table 5. Comparison of length of hospital stay and demographic characteristics of patients.

Variable		LOS		F-statistic	P-Value
		Mean	SD		
Sex	Male	2.0	1.0	1.08	0.3016
	Female	1.8	0.6		
Age category	18-25	2.0	0.63	1.09	0.967
	26-35	1.9	1.13		
	36-45	2.0	0.78		
	Over 45	1.9	0.71		
Occupation	Formal	1.8	0.6	2.265	0.113
	Self-employed	1.6	0.7		
	House wife	2.9	1.7		
	Informal	1.9	0.6		
	Student	2.2	0.8		
BMI category	≤25	2.0	1.0	1.11	0.528
	25.0-<30	1.8	0.7		
	≥30.0	1.9	0.8		
Location/region in Uganda	Central	2.0	1.0	1.971	0.744
	Western	1.8	0.4		
	Northern	2.2	0.4		
	Eastern	1.3	0.6		
	International	1.0	0.02		

Table 6. Comparison of persistent dysphagia and demographic characteristics of patients.

Variable		Persistent dysphagia		Chi-square	P-Value
		No	Yes		
Sex	Male	38 (86.4%)	6 (13.6%)	1.176	0.213
	Female	20 (76.9%)	6 (23.1%)		
Age category	18-25	6 (100%)	0 (0.0%)		
	26-35	22 (78.6%)	6 (21.4%)		
	36-45	13 (92.9%)	1 (7.1%)		
	Over 45	17 (77.3%)	5 (22.7%)		
Occupation	Formal	21 (72.4%)	8 (27.6%)	2.298	0.0816
	Self-employed	15 (78.9%)	4 (21.1%)		
	House wife	8 (100%)	0 (0.0%)		
	Informal	8 (100%)	0 (0.0%)		
	Student	6 (100%)	0 (0.0%)		
BMI category	≤25	28 (80.0%)	7 (20.0%)	6.876	0.0035
	25.0-<30	24 (92.3%)	2 (7.7%)		
	≥30.0	6 (66.7%)	3 (33.3%)		
Location/region in Uganda	Central	41 (85.4%)	7 (14.6%)	1.198	0.381
	Western	10 (90.9%)	1 (9.1%)		
	Northern	4 (66.7%)	2 (33.3%)		
	Eastern	1 (33.3%)	2 (66.7%)		
	International	2 (100%)	0 (0.0%)		

association between persistent dysphagia and sex, age category, occupation and location of patients.

Need for chronic PPIs after surgery (Table 7)

The need for chronic PPIs after surgery was high among females (43.2%) as compared to males (30.8%) and the association between Need for chronic PPIs after surgery and sex was statistically significant (Chi-2=4.652, p=0.028). There was a significant association between Need for chronic PPIs after surgery where the proportion of those with BMI of 30 and above was high (88.9%) as compared to those below 25 and those between 25 and 30. The association between BMI and Need for chronic PPIs after surgery was statistically significant (Chi-2=6.913, p=0.0016)

Unresolved GERD in relation to demographic characteristics

Out of seven (7) patients who had unresolved GERD, 28.6% (2/7) were aged 18-25 years, 42.9% (3/7) and 28.6 (2/7) were aged over 45 years. In regard to sex, 71.4% (5/7) were males and 28.6% (2/7) were females. In regard to BMI, 71.4% (5/7) had BMI of 25kg/m^2 and below and 28.6% (2/7) had BMI between 25 to 30 kg/m^2. There was no obese patient with unresolved GERD (Table 8).

Discussion

The aim of this study was to determine the Outcomes of Laparoscopic Nissen Fundoplication at St. Francis hospital Nsambya (SFHN). Specifically, the study intended to determine the demographic characteristics, pre-operative symptoms, endoscopic findings and outcomes (after 2months follow up) of patients undergoing LNF at SFHN from 2020 to 2022. This study was initiated by the fact that many patients have undergone LNF at the hospital and their outcomes are not known. There are no published studies in

Table 7. Comparison of need for chronic ppis after surgery and demographic characteristics.

Variable		Need for chronic PPIs after surgery		Chi-square	P-Value
		No	Yes		
Sex	Female	25 (56.8%)	19 (43.2%)	4.652	0.028
	Male	17 (65.4%)	8 (30.8%)		
Age category	18-25	4 (80%)	1 (20%)	1.965	0.274
	26-35	16 (57.1%)	12 (42.9%)		
	36-45	9 (64.3%)	5 (35.7%)		
	Over 45	13 (59.1%)	9 (40.9%)		
Occupation	Formal	19 (65.5%)	10 (34.5%)	2.164	0.116
	Self-employed	12 (63.2%)	7 (36.8%)		
	House wife	4 (50%)	4 (50%)		
	Informal	3 (37.5%)	5 (62.5%)		
	Student	4 (80%)	1 (20%)		
BMI category	≤25	23 (67.6%)	11 (32.4%)	6.913	0.0016
	25.0-<30	18 (69.2%)	8 (30.8%)		
	≥30.0	1 (11.1%)	8 (88.9%)		
Location/region in Uganda	Central	31 (64.6%)	17 (35.4%)	0.976	0.713
	Western	6 (54.5%)	5 (45.5%)		
	Northern	3 (50%)	3 (50%)		
	Eastern	2 (66.7%)	1 (33.3%)		
	International	1 (50%)	1 (50%)		

Table 8. Unresolved GERD in relation to demographic characteristics.

Variable		Frequency (n=7)	Percentage
Age category	18-25	2	28.6
	26-35	3	42.9
	36-45	0	0.0
	Over 45	2	28.6
Sex	Female	5	71.4
	Male	2	28.6
BMI category (Kg/m^2)	≤25	5	71.4
	25.0-<30	2	28.6
	≥30.0	0	0.0

Uganda and the rest of Africa about the outcomes of this surgical intervention and yet studies in Europe and USA have reported varying outcomes, with persistent dysphagia being observed more in the obese compared to the Non-obese patients. We intended find out whether there are any differences in the outcomes since this is a different setting with population differences in terms of obesity.

Demographic characteristics, pre-operative symptoms and endoscopic findings of patients who underwent LNF

The mean age of patients in this study was 39.7 years, ranging from 18 years to 68 years. Over half of the patients were females. Most of the patients were aged 26 to 35 years, implying that majority of the patients were young [16]. The mean age of the patients in this study was lower than that of a similar study conducted by Martin L, et al. where the mean age was 47.5 years ranging from 19 to 79 years [17]. This was also lower than the mean age of 54 years reported by a similar study [16]. Another similar study also reported a higher mean age of 50.2 ranging from 18 to 80 year [9]. This may be due to the fact that this study was conducted in sub-Saharan Africa with the majority of the polpulatation being young as compared to Asia. In this study, the mean BMI was 25.9kg/m^2 and most of the patients had a BMI of less than 25. These findings were consistent with the findings reported by a similar study that found a mean BMI of 23.8 kg/m^2 [16]. It was also consistent with the findings of Dowgiallo-Gornowicz N, et al. who reported a mean BMI of 25.9 kg/m^2 [9]. On the other hand, these findings were not in line with the findings of Martin L, et al. where 79% of patients were obese or overweight [17], this is consistent with what is known in our setting as regards overweight and obesity as still being very low in the general population in uganda [15]. The current study has showed that whereas some patients presented with more than one symptom, the common symptoms included epigastric pain (35.3%) and heart burn (19.6%). Other symptoms included bloating, regurgitation, belching, nausea, dysphagia among others. In line with these findings, other similar studies have identified dysphagia, increased bloating and flatulence and inability to belch or vomit as potential symptoms of LNF [18,19]. Another similar study conducted in Finland reported 11.5% of the patients who had heartburn, regurgitation, dysphagia [20]. Track & Pandolfino also reported that LNF was associated with disturbing symptoms such as heartburn, nausea, or epigastric pain. They also reported that patients may also suffer from extraesophageal symptoms such as a cough, which was in line with the findings of this study [3]. The findings of the current study showed that the major endoscopic findings included Hiatus hernia (45.1%) and GERD (28.8%). Other endoscopic findings included gastro-duodenitis, esophageal candidiasis, esophagitis, gastritis, PUD among others. This was consistent with the findings of a similar study where all patients experienced GERD symptoms with mean duration of symptoms of 36 months [16]. Their study findings further revealed that reflux esophagitis was observed in 62.1% of the patients and hiatal hernia was seen in 44.8% of the patients [16].

The outcomes of LNF

In this study, the mean length of hospital stay was 2 days with standard deviation of 1 day, ranging from 1 to 7 days. These findings were better than those of other similar studies. For instance, a study conducted by Hamdy E, et al. reported an average hospital stay of 3.3 days ranging from 2–6 days [21]. The study revealed that the mean duration of return to work was 5.2 weeks with standard deviation of 4.7 weeks, ranging from 1 week to 24 weeks [22-25]. However, a study by Hamdy E, et al. showed that patients were generally back to normal activities within two to three weeks [26-29]. Since laparoscopic procedures are fairly new in our setting, patients were still hesitant to return to work following normal reviews [30-36]. The study also found out that 90%of the patients had GERD symptoms partially or completely resolved after LNF while only 10% had no change [37-40]. This is comparable to a similar study by Park S, et al. who looked at dysphagia, heartburn and acid regurgitation as GERD symptoms and further established that at 3 months after surgery, heartburn was completely resolved in 87.9% patients and partially improved in 9.1%. Acid regurgitation was completely resolved in 82.9% and partially improved in 11.4% [10]. Majority of the patients (n=58, 82.9%) had no persistent dysphagia, only 17.1% had persistent dysphagia. This 17.1% study population with persistent dysphagia was low compared to a study by Moriais, et al. where they reported up to

24% of patients who underwent laparoscopic fundoplication had persistent dysphagia probably due to a tight hiatus or slipped fundoplication or preoperative esophageal motility disorders, making it one of the leading causes of procedure failure [41-44]. A study by Park S, et al. reported that dysphagia as a GERD symptom was seen only in 8 patients and symptoms were completely improved in all patients examined at 3 months follow-up [10]. The need for chronic PPIs after surgery was reported in 38.6% of the patients. There was no re-operation reported in all the patients [45-48]. This proportion was higher than the reported proportion in a similar study of 15.3% [9].

Limitations

The findings in this study population may not be representative of the general Ugandan population because the study was carried out in one health facility with catchment area of mainly central Uganda. Despite these limitations, this is the first study of its kind in the region and probably the first in Uganda to study the outcomes of LNF.

Conclusion

Persistent dysphagia and chronic PPI use following LNF for Hiatus hernia and GERD was less in our setting, attributed mainly to low obesity rates. However, obesity remains a challenge, contributing to poor out comes of this surgical intervention.

Recommendations

SFHN being a recent Centre for LNF with promising results and high potential for growth into a Centre of excellence in laparoscopic surgery, there is need for building a strong laparoscopic team through continued training and retaining of staff for sustainability purposes in order to deal with those patients that pose a challenge, thereby improve the overall outcomes and patient satisfaction. A large prospective study involving all laparoscopic centres in Uganda is recommended to comprehensively study short term, intermediate and long-term outcomes of LNF which can then be generalized.

References

1. El Serag, Hashem B, Stephen Sweet, Christopher C. Winchester and John Dent. "Update on the epidemiology of gastro-oesophageal reflux disease: A systematic review." *Gut* 63 (2014): 871-880.
2. Nwokediuko, Sylvester Chuks, Olusegun Adekanle, Adegboyega Akere and Abdulfatai Olokoba, et al. "Gastroesophageal reflux disease in a typical african population: A symptom-based multicenter study." *BMC Gastroenterol* 20 (2020): 1-8.
3. Bredenoord, Albert J, John E. Pandolfino and André JPM Smout. "Gastro-oesophageal reflux disease." *Lancet* 381 (2013): 1933-1942.
4. Parasa, Sravanthi, Sreekar Vennalaganti, Srinivas Gaddama and Prashanth Vennalaganti, et al. "Development and validation of a model to determine risk of progression of barrett's esophagus to neoplasia." *Gastroenterol* 154 (2018): 1282-1289.
5. Anand, Girish and Philip O. Katz. "Gastroesophageal reflux disease and obesity." *Rev Gastroenterol Dis* 8 (2008): 233-239.
6. Slater, Bethany J, Rebecca C. Dirks, Sophia K. McKinley and Mohammed T. Ansari, et al. "SAGES guidelines for the surgical treatment of gastroesophageal reflux (GERD)." *Surg Endosc* 35 (2021): 4903-4917.
7. McKinley, Sophia K, Rebecca C. Dirks, Danielle Walsh and Celeste Hollands, et al. "Surgical treatment of GERD: Systematic review and meta-analysis." *Surg Endosc* 35 (2021): 4095-4123.
8. Frazzoni, Marzio, Micaela Piccoli, Rita Conigliaro and Leonardo Frazzoni, et al. "Laparoscopic fundoplication for gastroesophageal reflux disease." *World J Gastroenterol* 20 (2014): 14272.
9. Dowgiałł Gornowicz, Natalia, Justyna Kacperczyk, Anna Masiewicz and Paweł Lech, et al. "Patient satisfaction after laparoscopic nissen fundoplication-long-term outcomes of single-center study." *J Clin Med* 10 (2021): 5924.
10. Park, Sungsoo, Joong Min Park, Jin Jo Kim and In Seob Lee, et al. "Multicenter prospective study of laparoscopic nissen fundoplication for gastroesophageal reflux disease in Korea." *J Neurogastroenterol Motil* 25 (2019): 394.
11. Morais, Drausio Jeferson, Luiz Roberto Lopes and Nelson Adami Andreollo. "Dysphagia after antireflux fundoplication: Endoscopic, radiological and manometric evaluation." *ABCD Arq Bras Cir Dig* 27 (2014): 251-255.
12. Broeders, J. A, I G Sportel, G G Jamieson and R S Nijjar, et al. "Impact of ineffective oesophageal motility and wrap type on dysphagia after laparoscopic fundoplication." *Br J Surg* 98 (2011): 1414-1421.
13. Velanovich, V and R. Karmy Jones. "Psychiatric disorders affect outcomes of antireflux operations for gastroesophageal reflux disease." *Surg Endosc* 15 (2001): 171-175.
14. Bashir, Yasir, Hazel Ni Chonchubhair, Sinead N. Duggan and Robert Memba, et al. "Systematic review and meta-analysis on the effect of obesity on recurrence after laparoscopic anti-reflux surgery." *Surgeon* 17 (2019): 107-118.
15. Yaya, S and B Ghose. "Trend in overweight and obesity among women of reproductive age in uganda: 1995-2016." *Obes Sci Pract* 5 (2019): 312-323.
16. Lee, Tae Gyun, In Seob Lee, Beom Su Kim and Hwoon Yong Jung, et al. "Surgical outcomes and over one-year follow-up results of laparoscopic nissen fundoplication for gastroesophageal reflux disease: Single-center experiences." *Asian J Surg* 42 (2019): 557-562.
17. Martin, L, M Stavrou, F El Madani and S. Gupta. "PTU-195 Six years of laparoscopic nissen's fundoplication, was it worth it? an audit of 100 patients." *Gut* 61 (2012): A265-A265.
18. Lundell, Lars. "Therapy of gastroesophageal reflux: Evidence-based approach to antireflux surgery." *Dig Dis* 25 (2007): 188-196.
19. Bredenoord, Albert J, Gerrit JM Hemmink and André JPM Smout. "Relationship between gastro-oesophageal reflux pattern and severity of mucosal damage." *Neurogastroenterol Motil* 21 (2009): 807-812.
20. Catarci, Marco, Paolo Gentileschi, Claudio Papi and Alessandro Carrara, et al. "Evidence-based appraisal of antireflux fundoplication." *Ann Surg* 239 (2004): 325-337.
21. Kellokumpu, Ilmo, Markku Voutilainen, Caj Haglund and Martti Färkkilä, et al. "Quality of life following laparoscopic nissen fundoplication: Assessing short-term and long-term outcomes." *World J Gastroenterol* 19 (2013): 3810.
22. Hamdy, Emad, Ahmed Abd El Raouf, Mohamed El Hemaly and Tarek Salah, et al. "Quality of life and patient satisfaction 3 months and 3 years after laparoscopic nissen's fundoplication." *Saudi J Gastroenterol Offic J Saudi Gastroenterol Ass* 14 (2008): 24.
23. Corley, Douglas A and Ai Kubo. "Body mass index and gastroesophageal reflux disease: A systematic review and meta-analysis." *Offic J Ame Colle Gastroenterol ACG* 101 (2006): 2619-2628.
24. Dallemagne, B, J Weerts, S Markiewicz and J M Dewandre, et al. "Clinical results of laparoscopic fundoplication at ten years after surgery." *Surg Endosc Intervent Tech* 20 (2006): 159-165.
25. Dowgiałło Gornowicz, Natalia, Justyna Kacperczyk, Anna Masiewicz and Paweł Lech, et al. "Patient satisfaction after laparoscopic nissen fundoplication-long-term outcomes of single-center study." *J Clin Med* 10 (2021): 5924.
26. Du, Xing, Ji Min Wu, Zhi Wei Hu and Feng Wang, et al. "Laparoscopic Nissen (total) *vs.* anterior 180 fundoplication for gastro-esophageal reflux disease: A meta-analysis and systematic review." *Medicine* 96 (2017).
27. Gharagozloo, Farid, Mark Meyer and Jay Redan. "Belsey mark IV repair for recurrent hiatal hernia and failed fundoplication: An analysis of outcomes in 206 patients." *World J Cardiovasc Surg* 12 (2022): 105-117.
28. Hampel, Howard, Neena S. Abraham and Hashem B. El-Serag. "Meta-analysis: Obesity and the risk for gastroesophageal reflux disease and its complications." *Ann Intern Med* 143 (2005): 199-211.
29. Al Hashmi, Al Warith, Guillaume Pineton de Chambrun, Regis Souche and Martin Bertrand, et al. "A retrospective multicenter analysis on redo-laparoscopic anti-reflux surgery: Conservative or conversion fundoplication?." *Surg Endosc* 33 (2019): 243-251.
30. Horvath, Karen D, Blair A Jobe, Daniel M Herron and Lee L. Swanstrom. "Laparoscopic toupet fundoplication is an inadequate procedure for patients with

severe reflux disease." *J Gastrointest Surg* 3 (1999): 583-591.

31. Huerta, C Theodore, Margaret Plymale, Peter Barrett and Daniel L Davenport, et al. "Long-term efficacy of laparoscopic nissen versus toupet fundoplication for the management of types iii and iv hiatal hernias." *Surg Endosc* 33 (2019): 2895-2900.
32. Jacobson, Brian C, Samuel C Somers, Charles S Fuchs and Ciarán P Kelly, et al. "Body-mass index and symptoms of gastroesophageal reflux in women." *N EnglJ Medi* 354 (2006): 2340-2348.
33. Kahrilas, Peter J, Nicholas J Shaheen and Michael F Vaezi. "American gastroenterological association medical position statement on the management of gastroesophageal reflux disease." *Gastroenterol* 135 (2008): 1383-1391.
34. Laan, Danuel V, John Agzarian, William S Harmsen and K Robert Shen, et al. "A comparison between Belsey mark IV and laparoscopic nissen fundoplication in patients with large paraesophageal hernia." *J T CVD Sx* 156 (2018): 418-428.
35. Green, Jesse A, Rafael Amaro and Jamie S. Barkin. "Symptomatic gastroesophageal reflux as a risk factor for esophageal adenocarcinoma." *Dig Dis Scie* 45 (2000): 2367-2368.
36. Lagergren, J, R Bergström and O Nyren. "No relation between body mass and gastro-oesophageal reflux symptoms in a swedish population based study." *Gut* 47 (2000): 26-29.
37. Lee, Yeong Yeh, Angela A Wirz, James GH Whiting and Elaine V. Robertson, et al. "Waist belt and central obesity cause partial hiatus hernia and short-segment acid reflux in asymptomatic volunteers." *Gut* 63 (2014): 1053-1060.
38. Locke III, G Richard, Nicholas J Talley, Sara L Fett and Alan R. Zinsmeister, et al. "Risk factors associated with symptoms of gastroesophageal reflux." *Ame J Medi* 106 (1999): 642-649.
39. Modlin, Irvin M, Richard H Hunt, Peter Malfertheiner and Paul Moayyedi, et al. "Non-erosive reflux disease-defining the entity and delineating the management." *Digestion* 78 (2008): 1-5.
40. Morais, Drausio Jeferson, Luiz Roberto Lopes and Nelson Adami Andreollo. "Dysphagia after antireflux fundoplication: Endoscopic, radiological and manometric evaluation." *ABCD. Arq Bras Cir Dig* 27 (2014): 251-255.
41. Park, Sungsoo, Joong Min Park, JinJo Kim and In Seob Lee, et al. "Multicenter prospective study of laparoscopic nissen fundoplication for gastroesophageal reflux disease in Korea." *J Neurogastroenterol Motil* 25 (2019): 394.
42. Patterson, Emma J, Daniel M Herron, Paul D Hansen and Najib Ramzi, et al. "Effect of an esophageal bougie on the incidence of dysphagia following nissen fundoplication: A prospective, blinded, randomized clinical trial." *Arch Surg* 135 (2000): 1055-1061.
43. Penagini, Roberto and Ivana Bravi. "The role of delayed gastric emptying and impaired oesophageal body motility." *Best Pract Res Clin Gastroenterol* 24 (2010): 831-845.
44. Robertson, Elaine V, Mohammad H Derakhshan, Angela A Wirz and Yeong Yeh Lee, et al. "Central obesity in asymptomatic volunteers is associated with increased intrasphincteric acid reflux and lengthening of the cardiac mucosa." *Gastroenterol* 145 (2013): 730-739.
45. Sloan, Sheldon and Peter J Kahrilas. "Impairment of esophageal emptying with hiatal hernia." *Gastroenterol* 100 (1991): 596-605.
46. Tack, Jan and John E Pandolfino. "Pathophysiology of gastroesophageal reflux disease." *Gastroenterol* 154 (2018): 277-288.
47. Walle, Kara Vande, Luke M Funk, Yiwei Xu and Kevin D. Davies, et al. "Persistent dysphagia rate after antireflux surgery is similar for nissen fundoplication and partial fundoplication." *J Surg Res* 235 (2019): 52-57.
48. Wildi, Stephan M, Radu Tutuian and Donald O. Castell. "The influence of rapid food intake on postprandial reflux: Studies in healthy volunteers." *Offi J Ame Coll Gastroenterol ACG* 99 (2004): 1645-1651.

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