

Research Article

Prevalence of Inguinal Hernia and Its Risk Factors in Adult Males Admitted to Surgical Wards of Wolaita Sodo Comprehensive Specialized Hospital, Wolaita Sodo, Ethiopia

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Abstract

Background: An inguinal hernia is defined as the protrusion or passage of a peritoneal sac, with or without abdominal contents, through a weakened part of the abdominal wall in the groin. There are two types of inguinal hernias. The exact incidence/prevalence of inguinal hernia in Africa is unknown. Age, sex, and factors increasing intra-abdominal pressure are among major determinants of inguinal hernia.

Objective: The aim this study is to assess the prevalence and identify risk factors of inguinal hernia among adult male patients admitted to surgical wards in Wolaita Sodo comprehensive specialized Hospital Wolaita Sodo, Ethiopia.

Methods: Institution-based cross-sectional study design was conducted among adult males admitted to surgical wards in Wolaita Sodo teaching and referral hospital. The study was conducted from June 1, 2021 to February 1, 2022. Data was collected by reviewing 3 years of medical records of adult male patients admitted to surgical wards and analyzed using SPSS version 25. Bi-variate analysis and multiple logistic regression were conducted.

Result: A total of 415 adult male patients' medical records were reviewed. The patients' age ranged from 18 to 90 years, with a mean and standard deviation of 43.78 and 16.504 respectively. The prevalence of inguinal hernia was 8.2%. Of these, 97.1% had primary inguinal hernia. Indirect inguinal hernias were seen in 91.2% of patients. The right side was the most common side of inguinal hernia. In this study, it was found that the significantly associated risk factors for the development of inguinal hernia were strenuous work activity and chronic cough. The odds of having an inguinal hernia among those who had strenuous exercise was 4.083 (95% CI=1.984, 8.403, P=0.001) times higher compared with those who hadn't experienced strenuous exercise. The odds of having an inguinal hernia among those with chronic cough was 3.619 times when compared with those who didn't have chronic cough (95% CI=1.053, 12.441, P=0.041).

Conclusion: The prevalence of inguinal hernia was high compared to reported data in the literatures. Strenuous work activity and chronic cough were found to be significant risk factors for the development of inguinal hernia. Long-term morbidity from this disease condition was found to be common in the study population.

Keywords: Hernia; Prevalence; Risk factors; Wolaita Sodo Teaching and Referral Hospital; Wolaita Sodo; Ethiopia

Introduction

Any viscera that protrude from its normal cavity are called hernia. The protrusion or passage of a peritoneal sac, with or without abdominal contents, through a weakening section of the abdominal wall in the groin is known as an inguinal hernia. A sac-like structure developed from an external inguinal diverticulum of the peritoneum covers the protruded content [1].

Inguinal hernias can be of two forms: Direct and indirect inguinal hernias. A direct inguinal hernia protrudes through the inguinal canal's weak posterior abdominal wall, medial to inferior epigastric vessels. An indirect inguinal hernia protrudes through the internal

inguinal ring. The hernia sac could extend from the external inguinal ring to the level of the testicles, or it could be contained within the inguinal canal [2].

Presentation of inguinal hernia is swelling in the groin region with or without groin pain, and change in bowel habit [3]. The prevalence of abdominal wall hernia is estimated to be 1.7% including all age group and among those, approximately 75% of abdominal hernias occur in the groin with a lifetime risk of 27% in males and 3% in females. The higher incidence rate in male is due to larger opening of inguinal canal in men than women [4]. Research from the US shows the cumulative incidence of hospitalization with an inguinal hernia is 6.3% and much more in male (13.9%) than female 2.1% [5].

The exact incidence or prevalence of inguinal hernia in Africa is unknown. A review article on an inguinal hernia in Africa shows the estimated incidence of inguinal hernia in rural hospitals in Kenya, Ethiopia, Tanzania, Southern Sudan is 175 per 100,000 [6].

One of the most common surgical procedures is the correction of an inguinal hernia [6]. Around 20 million hernia repairs are performed each year, and herniorrhaphy is one of the most popular surgical procedures [7].

The development of primary and recurrent inguinal hernias is

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influenced by a number of risk factors [8]. Patient risk variables such as age, sex, and Patent Processus Vaginalis (PPV) as well as external risk factors such as smoking and physically demanding work can all contribute to the development of inguinal hernia [9]. Inguinal hernia development is aided by a positive family history of the condition as well as rigorous occupational activities. Intra-abdominal pressure is caused by straining during defecation and urination, which can lead to the formation of an inguinal hernia [8]. According to a survey of articles conducted in Africa, one out of every five inguinal hernias occur in males aged four years or younger and the incidence increase sharply after age 20 years [6].

Methods and Materials

Study area

The study was conducted at Wolaita Sodo university teaching and referral Hospital/WSUTRH, which is located in the Wolaita Zone, 154 km from Hawassa, the capital of the Southern Nations, Nationalities, and Peoples Region, and 329 km from Addis Ababa, the capital of Ethiopia. The hospital offers medical, surgical, pediatric, psychiatric, ophthalmic, emergency, gynecology, and obstetric care as well as general outpatient and inpatient services. The hospital gives service to approximately 5 million patients annually. During the study period there were 1735 staff members, including 94 general medical practitioners, 44 senior doctors, 522 nurses, 89 laboratory technicians, 46 anesthetist's, 80 pharmacists, 17 radiographers, 70 supporting staff, 760 administrative workers at WSUTRH. This hospital provides teaching services besides giving medical health care services. The total number of beds in the hospital was 270 out of which 67 beds were in the general surgery department.

Study design

Institution-based cross-sectional study design was conducted among adult males admitted to surgical wards in Wolaita Sodo comprehensive specialized hospital.

Study period

The study was conducted from June 1, 2021 to December 1, 2021. Data were collected by reviewing 3 years of medical records of adult male patients admitted to surgical wards at Wolaita Sodo comprehensive specialized hospital.

Population of study

The source population was all male patients who were admitted to surgical wards in Wolaita Sodo comprehensive specialized hospital from June 2018 to May 2021.

Inclusion criteria: Medical charts of adult male patients admitted to surgical wards in Wolaita Sodo comprehensive specialized hospital during the study period.

Exclusion criteria: Medical chart of patients which had more than 10% missed variables, medical charts lost from the record office at the time of data collection, charts which lacks evidence on essential variables such as date of admission or date of discharge were excluded.

Sampling unit: The sampling unit was inguinal hernia patients.

Study unit: The study unit was inguinal hernia among adult male patients.

Sample size calculation and sampling procedure

Sample size: The sample size was determined by using a single proportion for a finite population with assumptions of CI=95%,

marginal error (d)=5% and prevalence (p)=0.5 and q=1-p=0.5. Therefore, this proportion was used to determine the sample size.

$$n = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2} = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = 384$$

Where:

n =required sample size

$Z_{\alpha/2}$ =confidence level at 95% (standard value of 1.96)

P =prevalence 50%

$q=1-p$

d^2 =margin of error at 5%

The final sample size was 422 after adding 10% non-respondents (missed chart and variables).

Sampling procedure: The Medical Records Number (MRN) of all adult male patients was collected from the surgical wards Health Management Information System (HMIS) registration book of Wolaita Sodo comprehensive specialized Hospital within the study period. Then cards were selected using a simple random sampling technique (by using MRN). Then by using MRN, the cards were searched from patients' chart room by data clerks.

Dependent variables

Hernia

Independent variables

Age, Smoking, Family history, Strenuous activities, Chronic cough, Constipation, Straining during urination are independent variables

Operational Definition

- Adult: age of eighteen years and above.
- Chronic cough: cough which persists more than eight weeks.
- Constipation: clinical condition with persistent, difficult and infrequent defecation with a complaint of excessive straining, hard stools and a sense of incomplete evacuation.
- Direct inguinal hernia: The protruding of peritoneal sac outward and forward and is medial to the internal inguinal ring OR as it is labeled on the operation note
- Indirect inguinal hernia: The protruding peritoneal sac passes from the internal inguinal ring lateral to the deep inferior epigastric vessels.
- Obliquely toward the external inguinal ring and ultimately into the scrotum or as it is labeled on the operation note.
- Primary inguinal hernia: inguinal hernia appears to patient in first time in anatomical site.
- Recurrent inguinal hernia: inguinal hernia re appear after hernia repair was done.
- Strenuous activities: activities that needs medium and high efforts according to effort category.

Data collection tools and procedures

Data was collected by using a structured checklist which is

adapted from previous literature. In the beginning, MRN was taken from the HMIS registration book. Then patient medical cards were obtained from the patients' chart room. From this necessary data were searched as age, address and diagnosis (inguinal hernia, and its site (right or left), type (direct or indirect and primary or recurrent). Then all variables were collected from patient history in medical card based on inclusion and exclusion criteria.

Data quality control

A Checklist was prepared and pretested on 5% of sample size population and data collection was conducted with this pretested and modified questionnaire.

Data was checked for completeness and cross checked for accuracy. Defective questioner containing inadequate data was rechecked with the chart and if still inadequate, was rejected. All the questioner and documents were kept properly for rechecking.

Data analysis procedure

After data collection, each checklist was checked for its completeness. Data was entered into Epi-data version 4.4 and then exported to SPSS version 25 for analysis. The prevalence of inguinal hernia was calculated. Descriptive statistics, frequency distribution, and percentage were computed for categorical data and were presented by a bar graph, pie chart, and tables. The continuous variable was summarized using the mean and standard deviation. Bi variant analysis using binary logistic regression was done to see the effect of each independent variable on the development of inguinal hernia. Variables with a $P < 0.25$ in the bivariate analysis was included in the multivariate analysis. The CI was calculated in the multivariate analysis using multiple logistic regressions adjusted OR with a 95% confidence interval $P < 0.05$ is interpreted as a significant factor in the development of inguinal hernia.

Ethical Consideration

Ethical clearance was obtained from the college of medicine and health sciences institutional review board and written permission was obtained from the hospital administrators. The data was kept confidential and used for research purposes only.

Result

Socio-demographic characteristics of study participants

The study was conducted on 415 male adult patients from Wolaita Sodo, comprehensive specialized hospital. The patient's age range was from 18 to 90 years with the mean and standard deviation of 43.78 and 16.504 respectively. Majority of patients in this study were in the age group of 46 and above 169 (40.7%). More than ninety percent of the study participants 394 (94.9%) came from SNNP and the remaining 21 (5.1%) were from outside SNNP. Majority of participants were Famer 215 (51.8%). More than half of the study participants 210(50.6%) where cannot read and write (Table 1).

The prevalence of inguinal hernia

From 415 operated patients 34 were done for inguinal hernia making the prevalence of 8.2% (Figure 1). Out of the total 34 inguinal hernia, 33 patients (97.1%) had primary inguinal hernia. Indirect inguinal hernias were seen in 31 (91.2%) of patients. Right side was the most common side. Right-sided inguinal hernias reported were 19 (55.9%) followed by left side with 12 (35.3%). Bilateral hernias were seen in the patients accounting for 8.8% (Table 2 and 3). Duration of illness was one to two years for the majority of patients (44.1%) (Figure 2).

Table 1: Socio-demographic characteristics of adult males admitted to surgical ward at Wolaita Sodo, a comprehensive specialized hospital, 2022.

Number	Variables	Categories	Number of cases	Percentage
1	Age	18-30	123	29.6
		31-45	123	29.6
		>45	169	40.7
2	address	SNNPR	394	94.9
		Outside SNNPR	21	5.1
3	Occupation	Farmer	218	52.5
		Daily laborer	34	8.2
		Merchant	50	12
		Government employee	45	10.8
		Self-employee	44	10.6
		Others	11	2.7
		Missing	13	3.1
4	Level of education	Cannot read and write	211	50.8
		Primary school	79	19
		secondary	43	10.4
		Higher education	79	19
		Missing	3	0.7

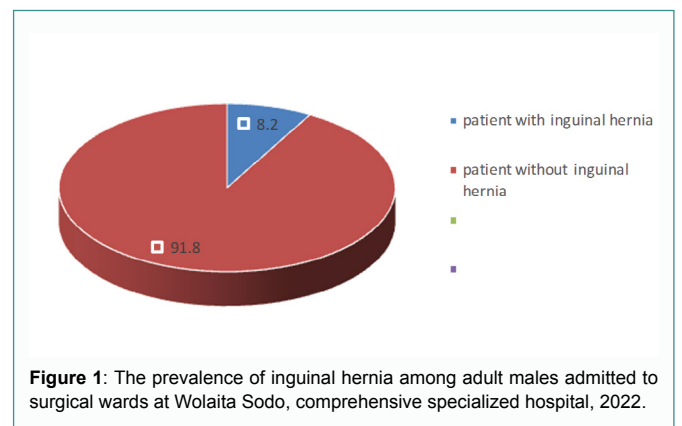


Figure 1: The prevalence of inguinal hernia among adult males admitted to surgical wards at Wolaita Sodo, comprehensive specialized hospital, 2022.

Description of risk factors for inguinal hernia

Distribution of assessed risk factors for inguinal hernia is shown in Table 4 and 5. Many patients possessed more than one risk factor that ultimately led to the development of inguinal hernia. The most common risk factor seen was strenuous activity 23 (67.6%) followed by Straining during urination which accounts 6 (17.6%) and both history of chronic cough and history of constipation which accounts the same 4 (11.8%). both family history of inguinal hernia and smoking had no contribution.

Factors associated with occurrences of inguinal hernia

Bivariate analysis: Simple binary logistic regression was used to look for important factors for the development of inguinal hernia. Variables missed more than 30% were excluded from the analysis. Variables having a p-value less than 0.25 were selected to be included in multivariable analysis. These were age, occupation, educational status, chronic cough, and strenuous activities (Table 6).

Multivariable analysis: As shown in the table below, of the five variables included in the multivariable analysis, two of them remain significant at a p-value of 0.05. This was due to the chronic cough $P (0.041)$ and strenuous activity $P (0.031)$ of the patients. After controlling for age, occupation, and educational status, the odds of having an inguinal hernia were 3.3 and 3.6 times higher among those with strenuous exercise and chronic cough, respectively, than those without strenuous activity and chronic cough. That means the risk of developing inguinal hernia in those experiencing strenuous activity and chronic cough was 3.3 and 3.6 times higher compared with those who didn't experience strenuous activity and chronic cough,

Table 2: Prevalence of a specific type of inguinal hernia among adult males at Wolaita Sodo, comprehensive specialized hospital, 2022.

Number	Type of hernia	Primary inguinal hernia		Recurrent inguinal hernia		Inguinal hernia	
		Number of cases	percentage	Number of cases	percentage	Number of cases	percentage
1	Indirect	30	90.9	1	100	31	91.2
2	Direct	3	9.1	0	0	3	8.8
	Total	33	100	1	100	34	100

Table 3: Side-wise distribution of inguinal hernia among adult males at WSUTRH, 2022.

Number	Site of hernia	Type of hernia		Total
		Direct hernia	Indirect hernia	
1	Right	2 (66.7%)	17 (54.8%)	19 (55.9%)
2	Left	1 (33.3%)	11 (35.5%)	12 (35.3%)
3	Bilateral	0	3 (9.7%)	3 (8.8%)
	Total	3 (100%)	31 (100%)	34 (100%)

Table 4: Age-wise distribution of inguinal hernia among adult males at WSUTRH, 2022.

Number	Age	Type of hernia		Total
		Direct	Indirect	
1	18-30	1 (33.3%)	12 (38.7%)	13 (38.2%)
2	31-45	1 (33.3%)	9 (29%)	10 (29.4%)
3	>45	1 (33.3%)	10 (32.3%)	11 (32.4%)
	Total	3 (100%)	31 (100%)	34 (100%)

Table 5: Distribution of risk factors of inguinal hernia among adult male patients at Wolaita Sodo, comprehensive specialized hospital, 2022.

Number	Risk factors	No of case	Percentage
1	Family history of inguinal hernia		
	Present	0	0
2	history of Smoking		
	Present	0	0
3	History of chronic cough		
	Present	4	11.8
4	History of constipation		
	Present	4	11.8
5	Straining during urination		
	Present	6	17.6
6	Strenuous physical activity		
	Present	23	67.6

respectively. But age, occupation, and educational status didn't show a statistically significant effect on the occurrence of inguinal hernia (Table 7).

Discussions

This institution-based study investigated the prevalence of inguinal hernia and associated risk factors at Wolaita Sodo comprehensive specialized hospital. The study revealed the prevalence of inguinal hernia among admitted adult men at teaching hospitals is 8.2%. This prevalence value doesn't correlate with findings from hospital-based study in Kenya where prevalence of inguinal hernia surgery is 3% [10]. The study conducted in northern Saudi Arabia indicated the overall prevalence was 11.7% [11]. The difference seen between the above result and current study was probably due to hospitals settings, sample size, and exclusion of patients at the age group of fewer than eighteen years. The prevalence from this study is higher than globally estimated prevalence of inguinal hernia. According to a study on the Worldwide Magnitude of Inguinal Hernia published in Nov 2022, Asia ranked highest on the prevalence of Inguinal Hernia at 12.72% compared to America with 4.73% [12,13]. The unpublished study in Addis Ababa, Ethiopia, showed that prevalence of inguinal hernia was 6.5%, which is lower than the current study [14].

In this study, the most affected age group was 18 to 30 years.

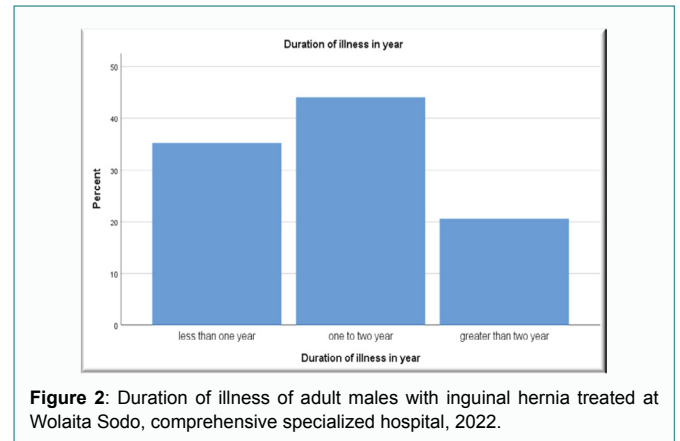


Figure 2: Duration of illness of adult males with inguinal hernia treated at Wolaita Sodo, comprehensive specialized hospital, 2022.

This doesn't correlate with a study in which the 45 to 54 age group was the most commonly affected age group in eastern Uganda [15]. The reason for the higher incidence in this age group can be due to involvements of the populations in high effort activities.

In the present study, almost all hernias are primary inguinal hernia. Prevalence of indirect inguinal hernia was higher than a direct hernia. Majority of hernias were seen on right side. The bilateral hernia was seen in the least number of cases. This result is in agreement with other literatures [9,10,16,17]. The higher percentage of indirect hernia and predominance of right-side hernia seemed to be due to late descent down of testis and more frequent failure of closure of right Processus vaginalis.

Fifteen (44.1%) patients who had inguinal hernia lived with the disease for one to two years. This is because in most cases, a hernia is reducible, return to the abdomen when lying down. Therefore, the patient does not seek medical attention until it limits their daily activities or till complication occur. In contrast to this study, majority of patients had history of swelling less than one year before they came to the surgery in India [17]. The difference between these findings may due to the difference in number of cases and place of residency.

In this study, strenuous work activity was reported in the majority of the patients with inguinal hernia (67.6%), Followed by straining during urination (17.6%), chronic cough (11.8%) and constipation (11.8%). Strenuous exercise among hernia cases was the most common [10], 52.4% of patients had a history of lifting heavy objects with bowel disturbance and COPD being other common risk factors. These factors increase cumulative intra-abdominal pressure causing weakness of abdominal wall and end up with herniation of abdominal content. Study in USA reported that the commonest risk factors for the development of inguinal hernia were older age and chronic cough (5). The disagreement between these studies might be due to the difference in the involvements of the populations in high effort activities.

Results from a multivariate analysis were found that a significantly associated risk factor for the development of inguinal hernia was strenuous activity and chronic cough. The odds of having inguinal hernia among those with strenuous exercise was 3.346 times when

Table 6: Distribution of risk factors among patients with and without inguinal hernia and results of bivariate analysis at Wolaita Sodo, comprehensive specialized hospital, 2022.

variables		Patients with inguinal hernia	Patients without inguinal hernia	Bivariate analysis	
		N=34 NO (%)	N=381 NO (%)	OR (CI=95%)	P value
Age	18-30	13 (38.2)	110 (28.9)	1.69 (0.734, 3.928)	0.216
	31-45	10 (29.4)	113 (29.7)		
	>45	11 (32.4)	158 (41.5)		
Occupation	Farmer	19 (55.9)	199 (54.1)	0.167 (0.45,0.623)	0.008
	merchant	3 (8.8)	47 (12.8)		
	Government employer	0 (0)	45 (12.2)		
	Private employer	4 (11.8)	40 (10.9)		
	Daily laborer	4 (11.8)	30 (8.2)		
	Other (student...)	4 (11.8)	7 (1.9)		
Educational	Cannot read and write	18 (52.9)	193 (51.1)	1.38 (0.495,3.852)	0.538
	Elementary	5 (14.7)	74 (19.6)		
Status	secondary and prep	6 (17.6)	37 (9.8)	2.40 (0.687,8.383)	0.17
	Higher education	5 (14.7)	74 (19.6)		

Table 7: Results of multivariate analysis of risk factors for inguinal hernia at WSUTRH 2022.

	AOR	95% C. I		P value
		lower	upper	
Age	1.25	0.479	3.262	0.648
Chronic Cough	0.82	0.311	2.171	0.692
Strenuous Activities	3.62	1.053	12.44	0.041
	3.35	1.119	10.01	0.031

compared with those didn't experience strenuous exercise at (95% CI=1.119,10.005 8.403, P=0.031), The odds of having inguinal hernia among those with chronic cough was 3.619 times when compared with those didn't had chronic cough (95% CI=1.053,12.441, P=0.041). This current finding is consistent with a case-control study conducted in Nigeria in 2012 which showed that strenuous activity significantly associated with the occurrence of inguinal hernia at AOR=5.769, (95% CI=3.548, 9.380) [18]. The study conducted by Veen et al. [19] indicated that the chance of developing an inguinal hernia is four times higher in the group with Patent processus vaginalis in the adult.

It is believed that lifting heavy objects and doing other strenuous exercise increase intra-abdominal pressure leading breakage in fibers of transversalis fascia [18]. It is reported that even a single incident, usually a lifting strain, can precipitate the development of hernia, moreover, indirect inguinal hernia [20]. The study conducted by Lau et.al indicated that family history of hernia was the most important determinant factor for developing inguinal hernia in adult males [8,18,21]. The study conducted by Öberg et al. [9] indicated that inguinal hernias have a hereditary component with a complex inheritance pattern. According to the study conducted in United States of America Incidence of inguinal hernia was higher among men (13.9%) than among women (2.1%) [22].

In contrary to this study finding, a case-control study by Lau et al. showed that strenuous activity is not significantly associated with inguinal hernia [8]. This disagreement likely occurs in differences in exercise categorization.

Limitations

Since data were collected retrospectively by reviewing medical records, some variables were missed in some patients and couldn't measure variables in terms of time of exposure.

Conclusions

The prevalence of inguinal hernia was high compared to reported

data in the literature. Strenuous work activity and chronic cough were found to be significant risk factors for the development of inguinal hernia. Long-time morbidity from this disease condition was found to be common in the study population.

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