ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF HUMAN ANATOMY

Prevalence of Inguinal Hernia and its Risk factors in adult males admitted to surgical wards of Teaching Hospitals, in Addis Ababa, Ethiopia.

A Thesis submitted to Department of Human Anatomy, School of Medicine, College of Health Sciences, Addis Ababa University for partial fulfillment of the requirement for Degree of Masters (MSc) in Human Anatomy.

By: Abera Nesru

November , 2019

Addis Ababa, Ethiopia

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Declaration

I Abera Nesru /ID Number GSR/3248/10 do hereby declare that this thesis is my original work and that is it has not been submitted partially or in full by any other person for an award of Master's degree in any other university inistitutions.

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ACRONYMS AND ABBREVIATION

AAU: Addis Ababa University

CI: confidence Interval

COPD: Chronic Obstructive Pulmonary Disease

CSA: Central Statistical Agency of Ethiopia

DRERC: Department Research Ethics Review Committee

HMIS: Health Management Information System

IRB: Institutional Review Board

MRN: Medical Record Number

OPV: Obliterated Processus vaginalis

OR: Odd Ratio

PPV: Patent Processus Vaginalis

RR: Relative Risk

SPSS: Statistical Package for Social Science

US: United States

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ABSTRACT

Introduction: 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. In today's world, the inguinal hernia has a prevalence that is age-related and raise from 12% at group age 25-34 to 30%-40% above 60 years old. Age, sex, and factors increasing intra-abdominal pressure are among major determinants of inguinal hernia.

Objective: To assess the prevalence and identify risk factors of inguinal hernia among adult males admitted to the surgical ward at teaching hospitals, in Addis Ababa, Ethiopia.

Methods: Institution based cross-sectional study was conducted through a retrospective record review of patients admitted in government teaching hospitals in Addis Ababa. Randomly selected records of 589 adult male patients admitted to surgical wards in the period of March 2017-February 2019 were included in the study. Medical charts of all adult male patients admitted to surgical wards at the three hospitals were included in the study. Medical chart of patients, which had more than 10% missed variables, lost from record office during data collection, and lacks evidence on essential variables such as date of admission were excluded from the study. Data were analyzed using SPSS version 25. Bivariate analysis and multiple logistic regression were carried out to determine the effect of independent factors on the development of inguinal hernia.

Result: A total of 589 adult male patients' medical records were reviewed. The patient s' age range was from 18 to 91 years with the mean and standard deviation of 49.05 and 17.8, respectively. The prevalence of inguinal hernia was 6.5%. Of this, 94.7% of the hernias were primary inguinal hernia. Indirect inguinal hernia was seen in 23 (60.5%) of patients. In this study, it was found that the significantly associated risk factor for the development of inguinal hernia was strenuous work activity. The odds of having inguinal hernia among those with strenuous exercise was 4.083 (95%CI =1.984, 8.403, P<0.001) times higher compared with those who didn't experience strenuous exercise.

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

Keywords: Hernia, prevalence, risk factors, Addis Ababa, Ethiopia, 2019

CHAPTER 1. INTRODUCTION

1.1 Background

A hernia is protrusion of any viscera from its proper cavity. 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. The content which is protruded is covered by a sac-like structure formed from an external inguinal diverticulum of the peritoneum. (1).

There are two types of inguinal hernia. A Direct inguinal hernia protrudes through the weak posterior abdominal wall of inguinal canal medial to inferior epigastric vessels. And the other one is indirect inguinal hernia protrudes through the internal inguinal ring. The hernia sac maybe exists from the external inguinal ring and descend to the level of testicles or it may contain 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 cannel 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/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 need of repair in rural hospitals in Kenya, Ethiopia, Tanzania, Southern Sudan is 175 per 100,000. 16% to 30% of the population in Tanzania, East Africa, has an inguinal hernia and 7.7% of the adult population in southern Ghana, West Africa, have an inguinal hernia (6).

Inguinal hernia repair is one among the most frequently performed surgical procedure(6). In each year approximately 20 million hernia repairs are performed, and herniorrhaphy is one of the most commonly performed surgical procedure (7).

There are certain risk factors which have a contribution to the development of primary and recurrent inguinal hernia (8). Risk factors contributing for the development of inguinal hernia can

be patient risk factors such as age, sex, patent Processus vaginalis(PPV) and external risk factor such as smoking, physically demanding work (9). Positive family history of inguinal hernia and strenuous work activity have great contribution for development of inguinal hernia. Straining during defecation and urination causes intra-abdominal pressure which exposes to development of inguinal hernia (8). Articles review done in Africa reveals one in five inguinal hernias occur in males aged four years or less and the incidence increase sharply after age 20 years (6).

1.2: Statement of problems

Everyone from infancy to the elderly is at risk of developing hernia, so it becomes a leading cause to lose work and change lifestyle and is sometimes lethal(10). Of inguinal hernia repair, 90% are performed in males and 10% in women. The incidence of inguinal hernia in males has a bimodal distribution with peaks before the first year of age and after age 40. The lifetime incidence rate of inguinal hernia is 15%, 19%, 47% in the age group 25-34, 35-44 and age above 75 respectively(3).

In Africa, there is a large disease burden associated with morbidity and mortality. Studies on disease mortality especially in Africa is sparse, but it is a fact that many men die in Africa due to complicated or strangulated hernia. Study in Nigeria shows among complicated inguinal hernias admitted to hospitals 20% died with or without surgery. A hospital-based prospective descriptive study of groin hernia in Kampala 106(54.5%) out of 195 inguinal hernia were strangulated at the time of admission with 87(41.7%) of cases having significant complications (6).

The other major clinical problem is recurrence after treatment even if the rate of recurrence is variable in different surgical techniques and contributing etiologies are multifactorial (11). A retrospective review of all adult hernia patient at St. Paul Hospital Millennium Medical College(SPHMCC), Ethiopia documented among hernia treated with mesh repair technique recurrent inguinal hernia is the most common form 16(43.2) among all 37 recurrent hernia (12). But meshes are expensive in developing countries including Ethiopia. The identification of risk factor for inguinal hernia is essential to reduce recur rate (13).

Recurrence of inguinal hernia with the advancement of time is not only causing morbidity of the patient but also adding a long hospital stay, more bed occupancy in hospital, and extra burden of taxation on behalf of the patient and government.

In many cases the patient notices reducible swelling lasting up to a year before coming to health facility till the pain or discomfort limit their daily activity, this affect quality of patient's life for a long period of time. And in some patients irreducible hernia occur causing complication like strangulation, obstruction, incarceration. In contrast to other cause of bowel obstruction, hernia causing this complication are almost always associated with complete obstruction (14). Inguinal hernia may compress adjacent nerves, leading to generalized pressure, localized sharp pain, and referred pain(3).

1.3: Significance of the study

Despite the fact that inguinal hernia is among the disease with high prevalence in the population and the commonest operation performed in hospitals, literature published on inguinal hernia prevalence and risk factors for the development of it is limited in Africa. Most of the limited current literature done in Africa are population-based studies. Only a few are hospital-based and focus on prevalence. No study has been conducted in this area neither population-based nor hospital based in Ethiopia.

This study will determine the prevalence of inguinal hernia among adult males surgical admission and their associated risk factor.

This study will inform health care providers on the burden of inguinal hernia on the surgical operation. The data from this study also help in health care planning and to provide the necessary attention for increasing resources for surgical treatment of inguinal hernia. This study will also provide information on major risk factors for the development of inguinal hernia which is essential to take appropriate preventive measure and early detection and treatment.

CHAPTER 2: LITERATURE REVIEW

It is very crucial to understand how much hernia can influence due to its prevalence and its outcome of hernia repair because it is the most common surgical procedure performed annually in millions of patient worldwide. In today's world hernia has a prevalence that is age-related and raise from 12% at group age 25-34 to 30%-40% above 60 years old (15). Across the world, the prevalence varies. This may be due to the population age structure, access to surgical care, risk of death from hernia disease. Even if the incidence of hernia repair varies widely between developing and developed country it is lower than the incidence of the disease. Globally the estimated prevalence of inguinal hernia is 5.85%(16).

The clinical presentation of inguinal hernia in adult in Africa indicates how much the disease is neglected and its severity in the community. This makes the major difference between European and Africa in which the manner of the patient present to hospital. Reports from studies done in Ghana, Uganda, Sierra Leon, and Nigeria show a large proportion of adult patient presents to hospital as an emergency case, hernia repair in emergency operation are 65% in Ghana, 76% in Uganda, 33% in Sierra Leon, and 25% in Nigeria (6).

A population-based cross-sectional study done in Arar population (Saudi Arabia) reports that the overall prevalence of abdominal hernia is 11.7%, inguinal hernia (27.3) is the most common hernia next to paraumbilical hernia(33.9)(17). Another population-based study in Uganda(Africa) suggest that the prevalence of untreated hernia in the population is 6.6% (95% CI =4.5%, 8.7%) and 3% (95%CI =1.6%, 4.4%) have scars from previous inguinal hernia surgery and the prevalence of inguinal hernia among patient undergoing surgical operation is 7.7% . The prevalence increase with age, the youngest age group have the overall prevalence of 2.4% which increased to 7.9% at the age range from 35 to 54 years and to 37% at age 55 and above. The most affected age group was 45-55 years. The association between hernia prevalence and age is statically significant ($p<0.001$)(18).

A six-year retrospective audit of surgical operation excluding obstetric and gynecological operation from Kenya report that the prevalence of hernia surgery is 293(5.9%) of total 5055 operations performed, an inguinal hernia is the commonest type (51.4%) that means 151(3%) of total surgical operation. Of inguinal hernias, 81.3% are right-sided(19).

In adult 65% 0f inguinal hernia is indirect and 55% are right-sided (1). A facility-based study in India reports that among the total number of inguinal hernia present to hospitals 84.3% are seen in males, 58.21% are right-sided and 5.25% are bilateral. From this study the pattern of hernia is 82.93% are indirect and 17.07% are direct variety. The peak incidence of indirect inguinal hernia is in age group 0-10 in both sex whereas the peak incidence the direct one in total 61 male cases is in age group 61-70, which is statically significant ($p<0.00001$). This study suggests that three risk factors, strenuous physical activity, constipation, and family history are contributing factor for the development of inguinal hernia (10).

Another study done with similar methodology in this country documented that out of 212 patients 268(72.95) are males, 74.5% are a primary inguinal hernia and 25.5% are recurrent, peak incidence age is in the age group 46-60. The most common side where hernia occurs is right side (48%) and the major risk factors are lifting heavy object (54.2% of patient), constipation (46.7%), chronic obstructive pulmonary disease (COPD) (41.5%), smoking (37.3%) and family history (14.6%) of the total patient. 57.1% of patients had a history of swelling for less than one year (20).

Despite hernia repair is the major surgical procedure performed in Africa, only a few literatures are published on the study of the risk factor contributing to the incidence of inguinal hernia (21). The major identified risk factors for the development of inguinal hernia in men from a case-control study in Nigeria are positive family history 52% ($p=0.001$) and strenuous activity 57% ($p=0.001$) at AOR=5.679(95%CI=3.548, 9.380). Both are statically significant. And also the proportion of straining during defecation, chronic cough, and smoking among inguinal hernia patients is 21%, 12%, 5% respectively. For strenuous activity, it involves weight lifting and the number of year in this activity contribute to the risk. However, it is also reported that the occurrence of inguinal hernia with a single strenuous event. It also finds that 20% of adult have PPV and this predisposes to the development of inguinal hernia in the presence of triggering factor like raised intra-abdominal pressure. Other factors such as chronic cough, constipation/straining during urination and smoking are not a significant risk factor for this study. In this study the most affected age group is 40-60 years (34%) (21).

In US men higher incidence ($P<0.05$) of inguinal hernia is associated with an age of 40-59 years (95% CI=1.7, 2.8), and age of 60-74 years (95% CI=2.2, 3.6). Current smokers have a borderline

risk factor. Among women older age, rural residence, chronic cough are associated with inguinal hernia (5).

Risk factors have a different magnitude of contribution to the development of lateral/indirect and medial/direct inguinal hernia. Etiology that cause high intra-abdominal pressure increase lateral hernia repair than medial one, medial hernia seems to have more profound connective tissue disorder, age, and male gender have a similar contribution for both type. Smoking believed to be a risk factor for both type but has no significant association. Investigating risk factors and explain for patient reduce recurrence after hernia repair. PPV is a risk factor for lateral inguinal hernia. (9). A comparative follow up study for an average of 5.3 years between an individual with PPV and OPV find that the incidence of diagnosed indirect inguinal hernia is 12% in PPV group and 3% in OPV group ($P<0.01$) (22).

Finding from other study show that, risk factors significantly associated with inguinal hernia include a positive family history of hernia ($P<0.01$, 95% CI=4.5, 15.4) and COPD ($P=0.04$, 95% CI= 1.04, 4). A positive family history of hernia increases the likelihood of developing an inguinal hernia in the adult male by 8 fold and also it has a significant association with a higher incidence of PPV in children, COPD has more significant association with direct inguinal hernia than indirect hernia (8).

Recurrence after inguinal hernia repair is the major clinical problem. Several determinants influence the risk of recurrence. Systemic literature review and meta-analysis done in 2013GC find, surgery for primary direct inguinal hernia is significant risk factor for recurrence than the indirect one with a pooled RR of 1.91 (95%CI=1.62, 2.26, $P<0.001$) and other identified significant factors are female sex with an RR of 1.38 (95%CI=1.28, 1.48, $P<0.001$), smoking (95%CI=1.43, 4.47, $P=0.001$) and positive family history is possible risk factors(11). A particular incident, usually a lifting strain, precipitated the hernia (23).

Non-technical patient-related risk factors are not subject to manipulation, or personal error as a technical factor can be. A clinical perspective of knowing patient sub-group with particular risk could be implemented preoperatively for groin hernia repair for future can help to satisfy patient with preoperative information, to different surgical techniques, and together with operative finding provide post-operative follow up (13).

CHAPTER 3: OBJECTIVES OF THE STUDY

3.1: General objective

To asses prevalence and identify risk factors of inguinal hernia among adult male patients admitted to surgical wards in teaching hospitals, in Addis Ababa, Ethiopia.

3.2: Specific objectives

1: To determine the prevalence of inguinal hernia among adult male patients admitted to surgical wards.

2: To identify risk factors associated with inguinal hernia among adult male patients admitted to surgical wards.

CHAPTER 4: METHODOLOGY

4.1: Study area

The study was conducted at Surgical Wards of Government Teaching Hospitals in Addis Ababa, Ethiopia. Addis Ababa, the capital city of the Federal Democratic Republic of Ethiopia, is also the largest city in Ethiopia which covers 530.14 square kilometers. Addis Ababa has a total population density of 4,847.8 persons per square kilometer. Based on the 2007 national Census conducted by the Central Statistical Agency of Ethiopia (CSA), Addis Ababa has a total projected population size of 3,243,514 in 2016, 54% are females.

There are 51 hospitals in Addis Ababa. Of which, 11 are governmental and 40 are non-governmental. There are six governmental teaching hospitals in Addis Ababa. The study was conducted at three selected teaching hospitals, St. Paul Hospital Millennium Medical College, Yekatit 12 Hospital, and Menelik II Hospital. During the study period, there were 323 GP, 190 senior doctors, 806 nurses at St. Paul Hospital Millennium Medical College, 152 GP, 64 senior doctors, 453 nurses at Yekatit 12 Hospital, and 37 GP, 29 senior doctors, 318 nurses at Menelik II Hospital. These hospitals provide teaching service besides giving medical health care services.

4.2: Study design

Institution-based cross-sectional study design through retrospective record review was conducted among adult males admitted to surgical wards in teaching hospitals.

4.3: Study period

The study was conducted beginning from May 1, 2019 to June 15, 2019. Data were collected by reviewing two years of medical records of adult male patients admitted to surgical wards in selected government teaching hospitals.

4.4: Population

4.4.1: Source population

The source population was all male patients who were admitted to surgical wards selected teaching hospitals from March 2017 to February 2019.

4.4.2: Study population

Adult male patients admitted to surgical wards in selected government teaching hospitals during the study period.

4.4.2.1: Inclusion criteria

Medical charts of adult male patients admitted to surgical wards in the selected teaching hospitals between March 2017 and February 2019.

4.4.2.2: Exclusion criteria

- Medical chart of Patients which had more than 10% missed variables.
- Medical chart of Patients which was lost from record office at the time of data collection.
- Medical chart of Patients which lacks evidence on essential variable such as date of admission or date of discharge.

4.5: Sample size calculation and sampling procedure

4.5.1: Sample size calculation

The sample size was calculated for both specific objectives. The larger sample size was taken. The sample size was calculated using Statcalc of Epi info version 7.2.2.2 by taking a proportion of strenuous activities among inguinal hernia patients 57%, a margin of error 4% at alpha 0.05(95% confidence level) which gave the final sample size 589 patients(21).

$$n = \frac{Z_{1/2}^2 (pq)}{d^2}$$

No	Objectives	Assumption for sample calculation	Sample size	Reference
1	To measure the prevalence of inguinal hernia	Prevalence of inguinal hernia p= 3%,margin of error d=4%	70	19
2	To identify risk factor for inguinal hernia	the proportion of strenuous activities among inguinal hernia patients 57%, the margin of error d=4%	589	21

Where

n = the minimum sample size required

p = prevalence of inguinal hernia, 3%

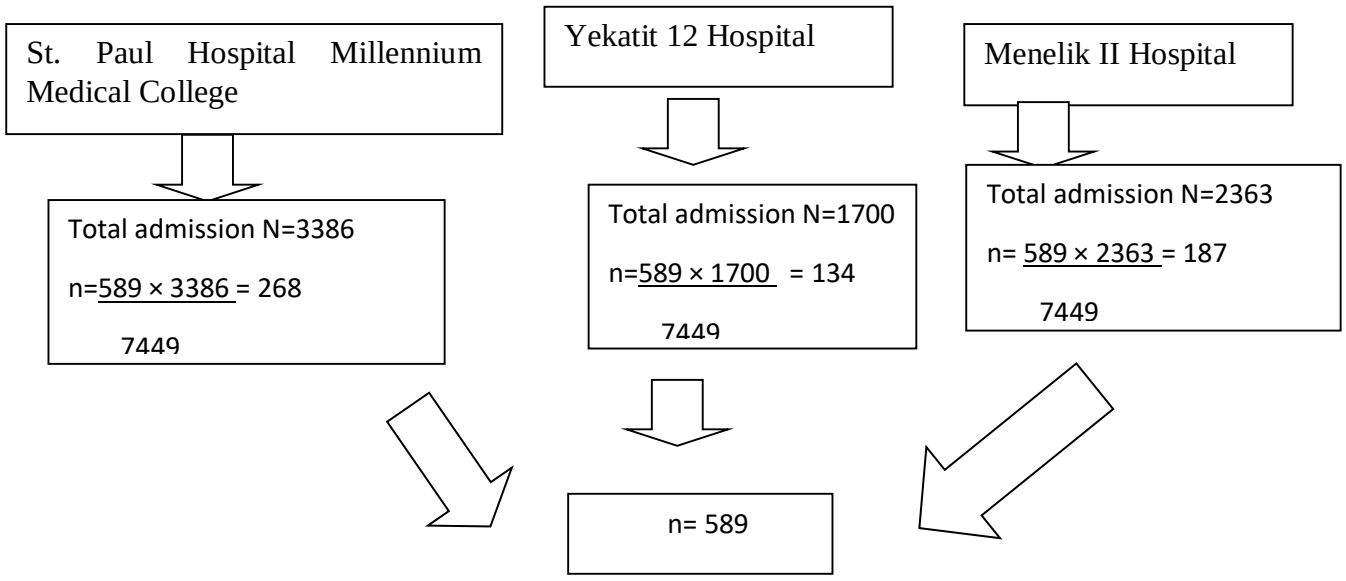
The proportion of strenuous activities among inguinal hernia, 57%

Z = the standard normal score set at 1.96(95% CI)

d = margin of error, 4%

4.5.2: Sampling procedure

Three government teaching hospitals were selected purposely. The sample size was allocated proportionally to the three hospitals based on the total number of patients. The medical records number (MRN) of all adult male patients were collected from surgical wards health management information system (HMIS) registration book of selected hospitals within the study period. Then cards were selected using simple random sampling technique (by using MRN). Then by using MRN, the cards were searched from patients' chart room by data clercks. All data were collected from the card by a trained team of data collectors. Total adults male admissions were 7449



4.6: Variables

Dependent variable: Inguinal hernia.

Independent variables:

- Age
- Smoking
- Family history
- Strenuous activities
- Chronic cough
- Constipation
- Straining during urination

4.7 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 bulging occurs medially to the inferior epigastric vessels.

Indirect inguinal hernia: The protruding peritoneal sac enters the inguinal canal by passing through the deep inguinal ring, just lateral to the inferior epigastric vessels.

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 (24)**.**

4.8: Data collection tools and procedures

Data were collected by using a structured checklist which is adapted from previous literature. In the beginning, MRN was taken from HMIS registration book. Then patient medical cards were obtained from the patients' chart room. From this necessary data was seen such 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.

Six BSc nurses were assigned to collect data and three BSc nurses were assigned to supervise data collectors from medical cards.

4.9: Data quality control

Before data collection, two days of training were given to data collectors and supervisors on data collection techniques, data collection materials and on objectives and relevance of research. The structured checklist was checked by a senior professional. The data collectors were not the ones working in the selected hospitals. Pre-test was performed on 5% of the total sample size of the patients' card prior to data collection to give the necessary correction.

Completeness and consistency of data were also checked by principal investigator daily.

4.10: Data analysis and processing

After data collection, each checklist was checked for its completeness, data was entered to Epi-data version 4.4 and then exported to SPSS version 25 for analysis. 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 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. The variables with $P< 0.2$ in Bi variant analysis were included in multi-variant analysis. In the multivariate analysis using multiple logistic regression adjusted OR with 95%, CI was calculated. The variable $P<0.05$ was interpreted as a significant factor for the development of inguinal hernia.

4.11: Ethical consideration

Ethical clearance was obtained from the Department Research Ethics Review Committee (DRERC), Institutional Review Board (IRB), Addis Ababa University, and Department Of Anatomy. Formal letter or clearance was sent to the department of surgery of selected hospitals to get consent for data collection.

During data collection, the patient medical chart was coded to keep patient confidentiality. Each checklist also coded. The obtained result was presented anonymously, and patient history was not traced back to make an individual association.

4.12: Dissemination Plan

The results of the study will be presented and submitted to Addis Ababa University, College of Health Sciences, School of Medicine, Department of Anatomy. The finding will be also disseminated to the surgery department. The findings of the study will be also disseminated through publications.

5 RESULT

5.1 General characteristics of study participants

The study was conducted on 589 male adult patients from three teaching hospitals in Addis Ababa. The patient's age range was from 18 to 91 years with the mean and standard deviation of 49.05 and 17.8 respectively. Majority of patients in this study were in the age group of 46-60 years 150 (25.5%). More than half of the study participants 387(65.7%) came from the regions of Ethiopia outside Addis Ababa and the remaining 34.3% were from Addis Ababa. Majority of participants were Famer 116 (19.7%). 46% of patients had at least a primary school education (Table 1).

Table 1- Socio-demographic characteristics of adult males admitted to surgical ward at teaching hospitals, Addis Ababa, 2019

No-	Variables	Categories	Number of cases	Percentage
1	Ages	18-30 31-45 46-60 61-75 >75	119 143 150 129 48	20.2 24.3 25.5 21.9 8.1
2	Address	Addis Ababa Outside Addis Ababa	202 387	34.3 65.7
3	Occupation	Farmer Daily laborer Merchant Student Government employee Self-employee Unemployed Others Missing	116 36 54 26 65 111 72 98 11	19.7 6.1 9.2 4.4 11 18.8 12.2 16.6 1.9
4	Level of education	Illiterate Primary school (1-8) Secondary school (9-12) Higher education Missing	95 271 155 53 15	16.1 46 26.3 9 2.5

5.2 The prevalence of inguinal hernia

Of 589 operated patients 38 were done for inguinal hernia making the prevalence of 6.5% (Figure 1). Out of the total 38 inguinal hernia , 36 patients (94.7%) had primary inguinal hernia. Indirect inguinal hernias were seen in 23 (60.5%) of patients. Right side was the most common side. Right-sided inguinal hernias reported were 22(57.9%) followed by left side with 13(34.2%). Bilateral hernias were seen in the patients accounting for 7.9% (Table 2, 3). Duration of illness was one to two years for the majority of patients (57.9%) (Figure 2).

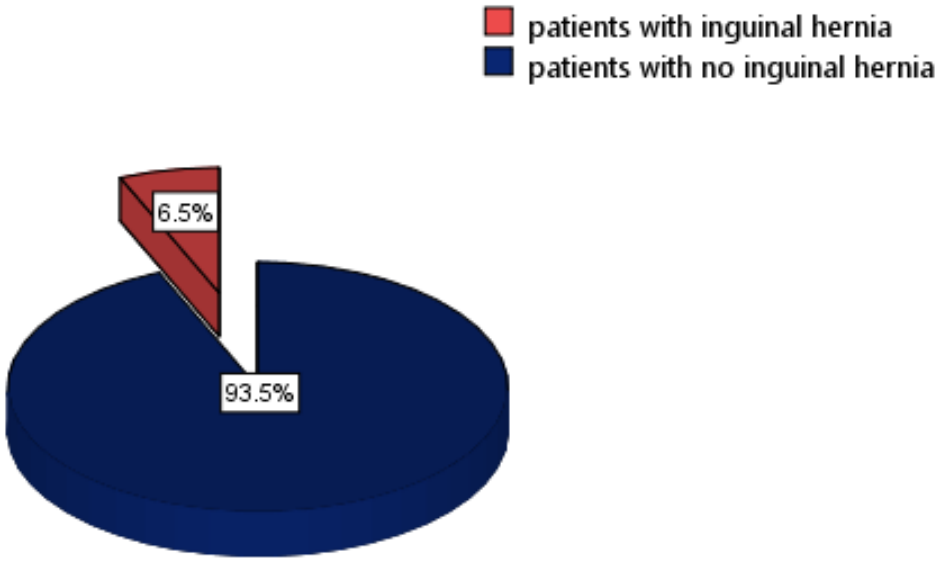


Figure 1-The prevalence of inguinal hernia among adult males admitted to surgical wards at teaching hospitals, Addis Ababa, 2019

Table 2- Prevalence of a specific type of inguinal hernia among adult males at teaching hospitals, Addis Ababa, 2019

No	Type of hernia	Primary Inguinal hernia		Recurrent Inguinal hernia		Inguinal hernia	
		No of case	Percentage	No of case	percentage	No of case	Percentage
1	Indirect	21	38.3	2	100	23	60.5
2	Direct	15	41.7	0	-	15	39.5
Total		36	100	2	100	38	100

Table 3- Side-wise distribution of inguinal hernia among adult males at teaching hospitals, Addis Ababa, 2019

No	Site of hernia	Type of hernia		Total
		Direct hernia	Indirect hernia	
1	Right	9(60%)	13(56.5%)	22(57.9%)
2	Left	6(40%)	7(30.5%)	13(34.2%)
3	Bilateral	0	3(13%)	3(7.9%)
Total		15(100%)	23(100%)	(100%)

Table 4- Age-wise distribution of inguinal hernia among adult males at teaching hospitals, Addis Ababa, 2019

No	Age	Type of hernia		Total
		Direct	Indirect	
1	18-30	1(6.7%)	7(30.4%)	8(21%)
2	31-45	4(26.6%)	2(8.7%)	6(15.8%)
3	46-60	6(40%)	6(26%)	12(31.6%)
4	61-75	3(20%)	5(21.7)	8(21%)
5	>75	1(6.7%)	3(13%)	4(10.6%)
Total		15(100%)	23(100%)	38(100%)

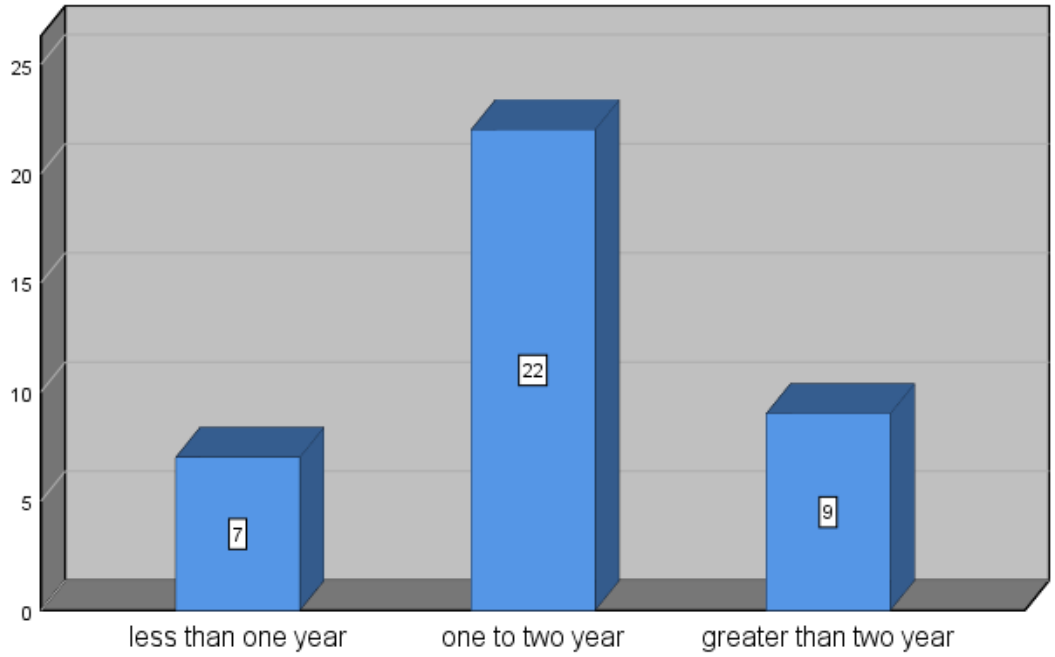


Figure 2--Duration of illness of adult males with inguinal hernia treated at teaching hospitals, Addis Ababa, 2019

5.3 Description of risk factors for inguinal hernia

Distribution of assessed risk factors for inguinal hernia is shown in table 5. Many patients possessed more than one risk factor that have ultimately led to the development of inguinal hernia. The most common risk factor seen was strenuous activity 26 (68.4%) followed by a history of chronic cough and history of constipation which accounts for 11(28.9%), 10(26.3%) respectively. History of straining during urination was seen in 8 (21%) patients. Six (15.6%) of patients had a family history of inguinal hernia and 3 (7.9%) of patients were smokers.

Table 5- Distribution of risk factors of inguinal hernia among adult male patients at teaching hospitals, Addis Ababa, 2019

No	Risk factors	No of case	Percentage
1	Family history of inguinal hernia		
	Present	6	15.8
	Absent	32	84.2
2	history of Smoking		
	Present	3	7.9
	Absent	35	92.1
3	History of chronic cough		
	Present	11	28.9
	Absent	27	71.1
4	History of constipation		
	Present	10	26.3
	Absent	28	73.7
5	Straining during urination		
	Present	8	21
	Absent	30	79
6	Strenuous physical activity		
	Present	26	68.4
	Absent	12	31.6

5.4 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 0.2 were selected to be included in multivariable analysis. These were chronic cough OR= 1.618(95%CI=0.778, 3.365, p=0.197), constipation OR= 1.739(95%CI=0.816, 3.704, p=0.152), and strenuous exercise OR= 3.833(95%CI=1.892, 7.767, p=000) (Table 6).

Table 6- Distribution of risk factors among patients with and without inguinal hernia and results of bivariate analysis at teaching hospitals, Addis Ababa, 2019

Variables	Patient with inguinal hernia n=38 No (%)	Patients without inguinal hernia n=551 No (%)	Bivariate analysis	
			OR(CI=95%)	p-value
Age	38	551	1.71(0.992, 1.92)	0.291
Chronic cough				
Present	11(28.9)	109(19.8)		
Absent	27(71.1)	433(78.6)	1.618(0.778,3.365)	0.197
Missing	--	9(1.6)		
Smoking				
Present	3(7.9)	35(6.4)		
Absent	35(92.1)	495(89.8)	1.22(0.537, 4.164)	0.751
Missing	--	21(3.8)		
chronic Constipation				
Present	10(26.3)	91(16.5)		
Absent	28(73.7)	443(80.4)	1.739(0.816,3.704)	0.152
Missing	--	17(3.1)		
Straining during urination				
Present	8(21)	94(17.1)	1.265(0.562, 2.847)	0.57
Absent	30(79)	446(80.5)		
Missing	--	11(2)		
Strenuous exercise				
Present	26(68.4)	195(35.4)	3.833(1.892, 7.767)	0.000
Absent	12(31.6)	345(62.6)		
Missing	--	11(2)		

Multivariable analysis

As shown in the table below from three variables included in the multivariable analysis one of them remain significant at a p-value of 0.05. This was strenuous activity. The odds of having inguinal hernia among those with strenuous exercise was 4.083 times than those without strenuous activity after controlling for the effects of chronic cough and constipation. That means the risk of developing inguinal hernia in those experiencing strenuous activity was 4.083 times higher compared with those didn't experiencing strenuous activity. But chronic cough and constipation didn't show a statistically significant effect on the occurrence of inguinal hernia (Table 7).

Table 7- Results of multivariate analysis of risk factors for inguinal hernia at teaching hospitals, Addis Ababa, 2019

		95% C.I		
	AOR	Lower	Upper	p-value
Strenuous exercise	4.083	1.984	8.403	0.000
Constipation	1.556	.719	3.367	0.262
Chronic cough	2.088	.975	4.470	0.058

6 DISCUSSION

This institution-based study investigated the prevalence of inguinal hernia and associated risk factors at selected teaching hospitals in Addis Ababa. The study revealed the prevalence of inguinal hernia among admitted adult men at teaching hospitals is 6.5 %. This prevalence value doesn't correlate with findings from hospital based study in Kenya where prevalence of inguinal hernia surgery is 3% and the findings from other study done in eastern Uganda, which is 7.7% (19, 18). The discrepancy 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 under eighteen years. The prevalence from this study is comparable to globally estimated prevalence of inguinal hernia.

In this study, the most affected age group was 46-60 years. This was in line with the study done by Balmaddaiah and his colleague (20). This was concordant with a study in which the 45-54 age group was the most commonly affected age group in eastern Uganda (18). This is also similar to another study by Ashindoitiang et al (21). The reason for the higher incidence in this age group can be due to involvement in high effort activities. The mechanism of injury thought to involve increased intraabdominal pressure leadings to the opening of inguinal canal or deterioration of transversalis fascia or the abdominal muscles (25).

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 kinds of literature (9, 10, 19, 20). The higher percentage of indirect hernia and predominance of right side hernia seemed to be due to late decent down of testis and more frequent failure of closure of right Processus vaginalis.

Twenty-two (57.9%) 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 (20, 26). 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 (68.4%). Followed by chronic cough (28.9%) and constipation (26.3%). Strenuous exercise among hernia cases was the most common in a study by Balmaddaiah and his colleague (20), 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 intraabdominal 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 it was found that a significantly associated risk factor for the development of inguinal hernia was strenuous activity. The odds of having inguinal hernia among those with strenuous exercise was 4.083 times when compared with those didn't experience strenuous exercise at (95%CI =1.984, 8.403, P<0.001). This current finding is consistent with a case-control study conducted in Nigeria in 2012 showed that strenuous activity significantly associated with the occurrence of inguinal hernia at AOR=5.769,(95%CI=3.548, 9.380) (21). The difference in AOR probably because of the difference in methodology. It is believed that lifting heavy objects and doing other strenuous exercise increase intraabdominal pressure leading breakage in fibers of transversalis fascia (21). It is reported that even a single incident, usually a lifting strain, can precipitate the development of hernia, moreover, indirect inguinal hernia (23).

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.

7 LIMITATION

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.

8 CONCLUSION

The prevalence of inguinal hernia was high compared to reported data in literatures. Strenuous work activity was found to be a significant risk factor for the development of inguinal hernia. Long-time morbidity from this disease condition was found to be common in study population.

9 RECOMMENDATION

- Public health initiatives targeting high risk population for an inguinal hernia can help early detection and treatment, which in turn could decrease the duration of morbidity and complications.
- The same or similar studies need to be conducted by collecting prospective data, and including other regions of Ethiopia.
- Population based study is also recommended to determine prevalence of inguinal hernia in the population.

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ANNEX I CHECKLIST

Part 1 socio-demographic characteristics

1. Residence

   A. In Addis Ababa B. In other region

2. Age …….
3. occupation

   A.Farmer B. Merchant C. Government employee

   D. Private employee E. House wife F. Daily laborer G. others

4. Educational status

   A. Illiterate B. Elementary

   B. High school and preparatory D. Higher education

Part 2 risk factors for inguinal hernia

Is there any inguinal hernia A. yes B.no

5. Family history of inguinal hernia

   A. Present B. Absent

6. Chronic cough

   A. Present B. Absent

7. Constipation

   A. Present B. Absent

8. Straining during urination

   A. Present B. Absent

9. Smoking

   A. Never B. smoke less than five years

   C. smoke above five years .

10. Strenuous activities

A. Present B. Absent

Part 3 Type of inguinal hernia

11. Inguinal hernia

A absent B present

12. Type of inguinal hernia

A. primary B recurrent

13. Type of hernia

A. Direct B. Indirect

14. Site of hernia

A. Right B. Left C. Bilateral

15. Duration of illness……..