

An Overview of The Risk Factors for Patients with Inguinal Hernia at Aloei Saboe Hospital in Gorontalo

Aliffa Cahya Potutu¹, Romy Abdul², Vivien Novarina A. Kasim^{3*}, Sri Manovita Pateda⁴, Serly Daud⁵

¹Medical Study Program, Faculty of Medicine, Universitas Negeri Gorontalo, Gorontalo City, Indonesia.

²Department of Surgery, Faculty of Medicine, Universitas Negeri Gorontalo, Gorontalo City, Indonesia.

³Department of Nutritional Science, Faculty of Medicine, Universitas Negeri Gorontalo, Gorontalo City, Indonesia.

⁴Department of Physiology Faculty of Medicine, Universitas Negeri Gorontalo, Gorontalo City, Indonesia.

⁵Department of Public Health, Faculty of Medicine, Universitas Negeri Gorontalo, Gorontalo City, Indonesia.

*Corresponding Author. Email: viviennovarina@ung.ac.id, Telp: +6282255592502

ABSTRACT

Introduction: Hernias happen when an organ or tissue bulges through a weak point in the abdominal wall. Inguinal hernias are common and may need surgery. The present study report the overview of the risk to affect the inguinal hernia at Aloei Saboe Hospital.

Method: The research focused on patients with inguinal hernias who underwent examinations at Aloei Saboe Hospital, in Gorontalo Province from January to December 2022. The study used the total sampling technique, with a sample size of 42 individuals. It was conducted in September and October 2023 at the same hospital.

Results: The data indicates that a significant portion of patients in the range of age 56-65 years (28.6%), with a majority being male (85.7%). Additionally, the majority of patients who were not employed (19.0%) were also found to have this condition, as well as a vast majority of those with a primary diagnosis of inguinal hernia (88.1%).

Conclusion: Most patients with inguinal hernia at Aloei Saboe Hospital are males in the late elderly age group who are no longer working. The main diagnosis for most patients is inguinal hernia. The study's findings suggest that the hospital can enhance its system, particularly in archiving medical records or electronic medical forms, to serve its patients better.

Key words: Gorontalo, hernias, inguinal hernia



Published by:
Universitas Negeri Gorontalo

Mobile number:
+62852 3321 5280

Address:
Jl. Jend. Sudirman No.6, Gorontalo
City, Gorontalo, Indonesia

Email:
jmhsj@ung.ac.id

Article History:
Received 09 February 2024
Accepted 31 March 2024
Published 1 April 2024

DOI:
<https://doi.org/10.37905/jmhsj.v3i1.24421>

Introduction

A hernia is an abnormal protrusion of a defective organ or tissue through a weak abdominal cavity.¹ Inguinal hernia is one of the most frequently encountered surgical problems, accounting for approximately 70-75% of all hernia operations.² This inguinal hernia most often occurs in the age range between 75 and 80 years.³ Based on research from Merry et al., the most common inguinal hernias were between the ages of 41-65 years, namely 50 people (43.8%), as many as 27 people (23.7%) experienced inguinal hernias at the age of more than 65 years, as many as 13 people (11.4%) had inguinal hernias between the ages of 0-5 years, 10 people (8.8%) had inguinal hernias between the ages of 21-40 years, 8 people (7.0%) subjects experienced inguinal hernias between the ages of 11-20 years, and as many as 6 (5.3%) subjects experienced inguinal hernias at the ages of 11-20 years.⁴ The older a person gets, the possibility of anatomical and functional decline in the body, the larger the organs, and hernias are one of the diseases that can be caused by increasing age.⁴

The incidence of inguinal hernias is more common in men, with a ratio of 8 to 10 times more at risk of experiencing inguinal hernias than women, men who have undergone a prostatectomy or who have a family history of hernias.³ As many as two-thirds of these hernias are a type of hernia *indirect* which causes inguinal hernias to be the most common type of hernia in men and women. From data on all cases of inguinal hernia, around 90% occur in men and around 10% occur in women. More than 20 million patients undergo inguinal hernia repair surgery.²

Apart from the two factors above, work factors are one aspect that is often assessed in looking at the risk factors for inguinal hernias. Based on data from Regional Health Research (2018), in 2017 in Indonesia, the majority of hernia cases in Indonesia occurred in heavy workers, reaching 70.9% (7,347), and the most were in Banten at 76.2% (5,065), while the lowest number was in the Papua region, namely 59.4% (2,563). Based on research conducted by Ryan et al. Based on job distribution data, the majority of inguinal hernia sufferers worked as laborers, namely 16 subjects (35.6%) and the smallest number worked as farmers, namely 3 subjects (6.7%).⁶

Inguinal hernias are one of the most frequently encountered surgical problems, accounting for approximately 70-75% of all hernia operations.² The risk factor for the occurrence of hernias that has been obtained in a research result is that the number of respondents in the final elderly category was 16 people, covering around 35.6% of the total sample, with ages ranging from 56-65 years.⁶ Most of the research respondents indicated that 35.6% of them worked as laborers.⁶ Inguinal hernias occur more often in men than women,

with a percentage of 95.6%.⁶

According to Jenkins & Dwyer, based on a 2010 report from *World Health Organization* (WHO) who obtained data from *National Health Service* (NHS), it was found that approximately 70,000 inguinal hernia operations were carried out in England in the period 2001-2002. The operation involved as much as 0.14% of the population. Of this number, 62,969 operations were performed to repair primary hernias, while 4,939 operations were performed to repair recurrent hernias.⁷ The operation performed to repair an inguinal hernia is a procedure that is often performed in various countries, one of which is the United States. Every year it is estimated that around 800,000 cases of inguinal hernia are operated on.³

Based on data obtained from Regional Health Research (2018), in 2017 in Indonesia, hernia was a disease that was ranked second after urinary tract stones with a total of 2,245 cases.⁸ According to data obtained from the Health Services Section of the Gorontalo Provincial Health Service (2023), the number of inguinal hernia cases in Gorontalo Province recorded from 2019 - 2021 was 330 cases and spread across several districts/cities. With detailed numbers in 2019 there were 138 cases, in 2020 there were 67 cases, and in 2021 there were 125 cases.⁹ Based on data obtained from the Medical Records Subdivision of Prof. Hospital. Dr. H. Aloei Saboe (2022), which is the place where this research was conducted, the number of patients confirmed with inguinal hernia at RSUD Prof. Dr. H. Aloei Saboe for the period January – December 2022, there were 104 cases. According to the Directorate General of YANKES (2021) that the Regional General Hospital Prof. Dr. H. Aloei Saboe Gorontalo is one of two class B hospitals in Gorontalo Province, located in Wongkaditi Village, Kota Utara District, Gorontalo City. This hospital is the largest referral hospital in Gorontalo Province in the Gorontalo City area.¹⁰

Methods

This research was carried out in September - October 2023 at RSUD Prof. Dr. H. Aloei Saboe, Gorontalo City, Gorontalo Province. This type of research is an observational descriptive study. The population in this study were all inguinal hernia patients who underwent examinations at the Prof. Regional General Hospital. Dr. H. Aloei Saboe for the period January – December 2022 which has medical record data for a total of 42 people and samples were taken using the *total sampling*.

The research variables used in this study are univariate variables, namely a description

of the risk factors for inguinal hernia patients including age, gender and occupation. Univariate analysis in this research is frequency, mean, median and mode using the application *Statistical Package for The Social Sciences (SPSS)*.

Result

In Table 1, of 42 respondents, the age distribution of inguinal hernia patients was mostly found in the 56 - 65 year age group (12 patients, 28.6%). The gender distribution of inguinal hernia patients was mostly found to be male (36 patients, 85.7%). The distribution of work in inguinal hernia patients was mostly found in patients who did not work as many (8 patients, 19.0%).

Table 1. Distribution of respondents based on age, gender, and work of inguinal hernia patients in Aloe Saboe Hospital

Characteristics	Frequency	Percentage (%)
Age (years)		
0 – 5	4	9.5
5 – 11	1	2.4
17 – 25	2	4.8
26 – 35	3	7.1
36 – 45	5	11.9
46 – 55	7	16.7
56 – 65	12	28.6
> 65	8	19.0
Gender		
Male	36	85.7
Female	6	14.3
Working Status		
Unemployed	8	19.0
Civil Servants	3	7.1
Entrepreneur	4	9.5
Private Sector	6	14.3
Farmer	7	16.7
Fisherman	2	4.8
Housewife	3	7.1
High School Student	2	4.8
Retired	2	4.8
Labored	1	2.4

Table 2 indicate the sample's distribution based on diagnosis in inguinal hernia. Most of them were in patients with the main diagnosis of inguinal hernia (37 patients, 88.1%).

Table 2. Distribution of respondents based on main diagnosis and accompanying inguinal hernia patients in Aloei Saboe Hospital

Inguinal Hernia	Frequency	Percentage (%)
Primary diagnosis	37	88.1
Secondary diagnosis	5	11.9
Total	42	100

Discussion

The results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 2 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe with the main diagnosis of inguinal hernia in 37 patients (88.1%) and the diagnosis of inguinal hernia accompanied by other diagnoses in 5 patients (11.9%). Of the 37 patients (88.1%) with a primary clinical diagnosis of inguinal hernia, there were 15 patients who were confirmed and written in the medical record data as having a reponible type of inguinal hernia, namely a hernia that occurs where the contents of the hernia can go in and out.¹¹ Meanwhile, irreparable hernias are hernias that occur when the contents of the hernia sac cannot be returned to the cavity.¹¹ From medical record data, 7 patients were recorded as having irreparable inguinal hernias while the rest were not recorded in the medical record.

Based on the data obtained, 5 patients (11.9%) were recorded in the medical record as having a diagnosis of inguinal hernia and accompanied by other clinical diagnoses such as incisional hernia and *suspect* incisional hernia, a history of previous hernia surgery, and the main diagnosis was even found to be other diseases such as chronic kidney disease (CKD), ascites, and dyspepsia syndrome. This is in line with the results of research conducted by Merry et al. which shows that several factors can trigger hernias, including increased intra-abdominal pressure due to diseases such as chronic cough, constipation, ascites and abdominal malignancies, as well as a history of frequently lifting heavy weights.⁴ Apart from that, weakness of the abdominal wall muscles can also be a contributing factor, such as in cases of pregnancy, prematurity, old age, incision procedures that cause incisional hernias, and obesity. Several main diagnoses other than inguinal hernias found in medical record data may be related to the presence of triggering factors for the main diagnosis which resulted in inguinal hernias, so that the 5 patient data above were included in the list of hernia patients when the researchers carried out data collection.

Based on the analysed data, a minor subset of geriatric hernias, specifically in five individuals (11.9%), is attributed to comorbid conditions predisposing these patients to hernia

development. The study by Merry et al. elucidates that hernias can be precipitated by several factors, notably increased intra-abdominal pressure. This elevation in pressure can result from various pathologies, including chronic respiratory conditions leading to persistent coughing, constipation, ascites, and abdominal neoplasms. Additionally, a history of recurrently engaging in activities that involve lifting heavy objects has also been identified as a significant contributing factor.⁴

In the results of the data obtained, based on the medical records of patients with the main clinical diagnosis of CKD and ascites, they had a history of having had a hernia operation about 1 month ago before the patient was admitted to hospital. This is in line with research conducted by Zeitler & Wouk that herniation that occurs in the abdominal wall (umbilical, inguinal and incisional) is a complication of ascites and carries a risk of intestinal incarceration, intestinal strangulation and abdominal wall perforation.¹² Ascites occurs because there is an increase in intra-abdominal pressure which results in herniation of the abdominal wall.¹² According to research from Chiu et al., hernias that occur in the abdominal wall, especially inguinal hernias, account for 83.08% of all types of hernias in this study.¹³ Patients undergoing *peritoneal dialysis* tend to experience increased abdominal pressure due to the presence of dialysis fluid in the abdominal cavity.¹³ This increase in intra-abdominal pressure is consistent with the peritoneal volume inserted and is also associated with a higher risk of hernia development.¹³ Findings from this study indicate that patients receiving PD have a higher risk of developing a hernia, which is 7 times higher than that of patients undergoing hemodialysis (HD).¹³ In the research conducted by the researchers, the medical record data did not show any follow-up care received by patients with a primary diagnosis of CKD.

The results of the data obtained are based on the patient's medical records with the main clinical diagnosis in the form of *syndrome dyspepsia* as a differential clinical diagnosis of scrotal hernia. These results are in line with a case study conducted by Mehta et al., that in this case, an inguinal hernia caused gastric outlet obstruction, where mechanical resistance could prevent emptying of the stomach into the small intestine.¹⁴ It has been assumed that if the greater omentum is pulled for a long time and if the hernia occurs continuously, it will cause the stomach to enter the small intestine.¹⁴ So this is what is most likely to cause symptoms *syndrome dyspepsia* felt by the patient.

Based on the results of several previous studies and supporting theories, the researchers concluded from the existing data that 37 patients (88.1%) had a primary diagnosis of inguinal hernia and 5 patients (11.9%) had a diagnosis of inguinal hernia

accompanied by other diagnoses. The research results of the diagnosis of inguinal hernia accompanied by other diagnoses have various factors so that it can occur and be included in the inguinal hernia diagnosis category in the research data. Various factors are the reasons, including the close relationship between the process of inguinal hernia and the main diagnosis *syndrome dyspepsia*, CKD related to the therapeutic process and ascites.

From the results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 1 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe most often occurs in the late elderly age group aged 56 – 65 years, as many as 12 patients (28.6%). This is in accordance with research conducted by Ryan et al. that several risk factors for the occurrence of hernias based on age are in the final elderly category, namely 16 people (35.6%), namely in the age range 56-65 years.⁶ This research is not much different from research conducted by Agarwal which was conducted on 110 people at a treatment center in India. It was found that the largest age range for inguinal hernia sufferers was 43 patients (39.09%) aged >50 years.¹⁵ This research is also in line with research conducted by Merry et al., that older people have a greater risk of experiencing inguinal hernias.⁴ This factor is influenced by a person's age, where the chance of a decline in anatomy and organ function increases over time.⁴ Hernia is a disease that can appear with age.⁴ A study conducted by Columbia University Medical Center concluded that the decline in muscle strength in the aging process occurs due to calcium leakage from a group of proteins in muscle cells called ryanodine.¹⁶ This triggers a series of events that limit muscle fiber contraction. With decreased calcium availability, muscle contractions become weaker.¹³

From a biological point of view, aging is the result of the accumulation of various molecular and cellular damages over time.¹⁷ This damage leads to decreased physical and cognitive capacity, as well as increased risk of disease and death.¹⁷ According to the theory of Professor Dame Linda Partridge, who serves as Director of Management at the Max Institute, she states that aging is a process that involves random things going wrong and never being corrected during evolution.¹⁷ Several evolutionary reasons have been proposed to explain the accumulation of cellular and molecular damage over the life of an organism.¹⁷

The integrity and functionality of the transversal fascia tissue in resisting elevated intra-abdominal pressures arising from physiological and pathological states are contingent upon the structural condition of the collagen fibres that constitute the tissue's foundation and confer its tensile strength. The resilience of the transversal fascia is compromised by factors that negatively affect collagen biosynthesis, induce collagen degradation, or result in the

anomalous production of collagen fibres. This is exemplified in individuals who smoke, as they are subjected to noxious constituents in cigarette smoke that can disrupt normal collagen metabolism within the fascial tissue.²⁶

The abdominal wall's structural integrity and mechanical stability are critically dependent on the composite architecture of its musculature and associated protective membranes. These biomechanical characteristics are significantly modulated by the qualitative and quantitative composition of the connective tissue matrix, particularly the types and distribution of collagen present. Type I collagen, characterized by its mature fibrillar structure, confers greater mechanical strength and resilience than Type III collagen, predominant during the initial wound healing and repair phases. The physiological ratio of Type I to Type III collagen in healthy tissue is typically maintained at approximately 4:1. Notably, in patients afflicted with inguinal hernias, this balance shows a demonstrable alteration, with an increased prevalence of Type III collagen fibres relative to Type I. This aberration in the collagen composition may underlie the compromised mechanical integrity observed in the abdominal walls of these individuals.²⁶

The observed elevation in type III collagen within the study cohort was attributed to an enhanced expression of type III collagen mRNA, a deviation from the expression patterns typically observed for type I collagen. Concurrently, there was a notable increase in matrix metalloproteinase-2 (MMP-2) activity, an enzyme instrumental in the degradation of the extracellular matrix, among patients diagnosed with inguinal hernia. This biochemical alteration culminates in the formation of collagen tissue that is markedly thinner and demonstrates diminished mechanical integrity in comparison to normative benchmarks. Consequently, this compromised tissue structure facilitates the protrusion of abdominal contents through weakened segments of the abdominal wall, characteristic of inguinal hernia pathology.²⁶

In the scope of this study, the investigation into smoking as a potential risk factor for inguinal hernia was not pursued. This omission was due to the limitations in the data extracted from medical records, which did not systematically record the patients' smoking status. Similarly, information regarding the history of prostate diseases or interventions, such as prostatectomy, was not available within the collected dataset. Notwithstanding, it is pertinent to highlight that existing literature and clinical observations suggest a correlation between prostatectomy, particularly radical prostatectomy, and an elevated risk of inguinal hernia. This association is primarily attributed to the procedural requirement of incising the lower abdominal wall muscles and fascia during a radical prostatectomy, thereby potentially

compromising the structural integrity of the abdominal wall and escalating the risk of hernia formation through the elevation of intra-abdominal pressure.

Based on the results of previous research and supporting theories, the researchers concluded that inguinal hernias occurred more frequently in patients aged 56 - 65 years, namely 12 patients (28.6%). This is because, as a person's age decreases, several organ functions in the body also decrease, such as the body's anatomical functions. According to a study conducted by Erianto et al., increasing a person's age has an impact on decreasing the function of the body's systems, making them more susceptible to various diseases.¹⁸

Increasing age is also closely related to the prognosis of a disease and life expectancy. This is also in line with research from Budiono & Rivai that the health of the elderly declines with age, thus affecting their quality of life.¹⁹ Increasing age will cause a decrease in body function, the emergence of various diseases, body imbalance and the risk of falls.¹⁹

From the results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 2 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe most commonly occurs in men, namely 36 patients (85.7%). This is in accordance with research conducted by Kwartawati et al., of the total participants registered for the activity and who were respondents to the research, totaling 115 people, there were 105 men and 10 women.²⁰ Similar research was also carried out by Dewi where the results of the research were that the gender of inguinal hernia patients was 57 people or 96.61%.²⁰

Based on the theory of Erianto et al., that the incidence of hernias is more common in men than women, and this difference is caused by differences in the development process of the reproductive organs in male and female fetuses.¹⁸ In male fetuses, the testicles descend from the abdominal cavity into the scrotum between the seventh and eighth months of pregnancy.¹⁸ This canal hole will generally close before birth or before the baby reaches one year of age.¹⁸ In adulthood, this area can become a weak point that has the potential for a hernia.¹⁸ Adult men tend to be more active and often lift heavy loads, thereby increasing intra-abdominal pressure, which is a risk factor for inguinal hernias.¹⁸

According to research conducted by Alifita Kinanti et al., based on observations of the community, there is a tendency that women are more often involved in activities related to caring for children, while men are more likely to be involved in activities that emphasize physical strength and competition.²²

Based on previous research and supporting theories, the researchers concluded that inguinal hernias occurred more frequently in male patients, namely 36 people (85.7%). This

is due to several factors, namely differences in the process of reproductive organ development in men which are different from women, apart from that, the severity of activities generally carried out by men is in the form of heavy activities.

The results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 1 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe most often occurs in patients who do not work, as many as 8 patients (19.0%). The results of this study are in line with the results of research conducted by Kurnia et al., where the duration of work can also be a risk factor for increasing the incidence of inguinal hernias, especially in jobs with moderate and heavy levels of work carried out for more than 1 year.⁷ This research shows that the risk increases by 4 times in the context of work of longer duration.⁷

This is in line with research by Wagner that one of several other possibilities that could be the cause of an inguinal hernia is that there is a congenital connective tissue disorder.²³ This is also in line with this study which found that there were 8 patients (19.0%) who were no longer working and 5 of them were patients aged between toddlers and children.

If related to theory, according to research conducted by Merry et al., this is influenced by the increasing age of a person, the greater the possibility of anatomical and functional decline in his organs and hernias are one of the diseases that can be caused by increasing age.⁴ In patients who are elderly, habits or activities in their youth often involved doing moderate or heavy work. The results of this study show that the majority of patients are men who do not work and are elderly. A man who has a greater opportunity to do moderate activities or work tends to be heavy. In another study, it was stated that there was a decrease in testosterone levels in the blood and an increase in estrogen through the activity of the aromatase enzyme which is associated with the aging process. The lower abdominal muscles are sensitive to the hormone estrogen in the body and tend to express very high levels of estrogen receptor- α . As a result, increased estrogen concentrations can result in atrophy and fibrosis of the lower abdominal muscles, which can lead to hernias in men.²⁴

For toddlers and children who in this study are included in the non-working category, this is influenced by congenital abnormalities in the tissue which triggers the occurrence of inguinal hernias. Most hernias and hydroceles that occur in children are caused by failure to close the processus vaginalis. During fetal development, the testes are initially located in the peritoneal cavity. When the testicles descend through the inguinal canal into the scrotum, this is followed by an extension of the peritoneum that resembles a sac, known as

processus vaginalis.²⁵ After the testis descends, the processus vaginalis normally closes in a healthy baby and turns into fibrous fibers without a lumen.²⁵ If the processus vaginalis is not closed properly, this condition is known as patent processus vaginalis (PPV) which leads to the risk of a hernia.²⁵

Based on previous research and supporting theories, the researchers concluded that inguinal hernias occur more often in patients who are no longer working, namely based on data for patients who do not work consisting of groups of patients aged > 65 years and also in children under school age. . In this study, researchers did not conduct direct interviews with patients so that their work history during their youth is unknown, and it cannot be ascertained whether the patient did work that tended to be moderate or even heavy on a daily basis. Patients with a history of working and carrying out activities that tend to be strenuous are at greater risk because muscle strength is decreasing because they have done a lot of heavy activities and this is also made worse by the age factor and the aging process that occurs in it which is experienced by elderly patients.

In this study, the researcher had several limitations, including that the data obtained from initial data collection in the medical record section was different from the data obtained in the field when the researcher was going to conduct the research. In this study, there were several patient data statuses that were not available when a search was carried out when the researcher had conducted the research.

Conclusion

Distribution of inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe is most common in the late elderly age group with male gender, the majority are no longer working and most of the patients have the main diagnosis of inguinal hernia. It is hoped that after this research, the hospital can further improve the system, especially in terms of archiving medical records..

Conflicts of Interest

Nothing to declare

Funding sources

Nothing to declare

Acknowledgments

Nothing to declare

References

1. Yusmaidi, Ilma W. Giant Inguinal Hernia: A Case Report. *Medical Faculty Lampung*.2021;11(4):154 – 155
2. Rossana A, Paolo L, Francesco MSM, et al. Inguinal Hernia : A New Not Anatomical) Classification. *Journal of Surgery*. 2019; 7(3):74-77.
3. Hammoud M, Gerken J. Inguinal Hernia. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; August 8, 2023.
4. Merry FA, Virgiandhy IGN, Arif W. Relationship between Age and Inguinal Hernia at RSUD Dr. Soedarso Pontianak.*Cerebellum Journal*. 2018; 4(2):1052–1058.
5. Meliani RI, Dytho MS. Hernia. *Proceeding Book Call for Paper Fakultas Kedokteran Universitas Muhammadiyah Surakarta (Synapse)*. 2022;16:406–417.
6. Ryan IG, Wirajaya W, Dewi SR, et al. Description of Risk Factors in Inguinal Hernia Patients at Buleleng Regional Hospital 2019 – 2020.*Aesculapius Medical Journal*. 2023;3(1):101–105.
7. Kurnia SRI, Siambaton R. Description of Occupational Risk Factors and Age on the Incidence of Inguinal Hernia at Haji Hospital Medan in 2017. Faculty of Medicine, Universitas Sumatera Utara. *Thesis*. 2018
8. Riskesdas. Ministry of Health Health Research and Development Agency Ministry of Health of the Republic of Indonesia. 2018
9. Health Services Section. Number of Hernia Diseases 2019-2021. Gorontalo. Gorontalo Provincial Health Service. 2023
10. Directorate General of Health Care. *Hospital Profile*. Jakarta. 2021
11. Sjamsuhidajat R, Prasetyono TOH, Rudiman R, et al. *Textbook of Surgery Edition 4*, Jakarta. EGC. 2017.
12. Zeitler MR, Wouk N. Incarcerated inguinal hernia as a complication of new-onset ascites. *BMJ Case Reports*. 2017; 2017: bcr2017219613.
13. Chiu PH, Liu JM, Hsieh ML, et al. The risk factors of the occurrence of inguinal hernia in ESRD patients receiving dialysis treatment: An observational study using national health insurance research database. *Medicine (Baltimore)*. 2022; 101(49): e31794.
14. Mehta T, Weissman S, Vash A, et al. Gastric Inguinoscrotal Hernia. *ACG Case Reports Journal*. 2019; 6(8):1-2.
15. Agarwal PK.. Study of Demographics, Clinical Profile and Risk Factors of Inguinal Hernia : A Public Health Problem in Elderly Males. *Cureus*. 2023;15(4):e38053.

16. Setiorini A. Muscle strength in the elderly. *JK Unila*. 2021;5(3): 69–74.
17. Mair, Lord. *Science and Technology Select Committee Ageing : Science, Technology and Healthy Living*. London. House of Lords. 2021
18. Erianto M, Putri FN, Triwahyuni T, et al. Relationship between age and type of inguinal hernia at Pertamina Bintang Amin Hospital. *Lampung.Journal of Integrated Health Science and Technology*.2022; 1(2):73–79.
19. Budiono NDP, Rivai A.. Factors that influence the quality of life of the elderly. *Sandi Husada Health Scientific Journal*. 2021;10(2):371–379.
20. Kwartawati NN, Harjanti AI, Trihajanti S. Improving Health Access for the Poor Through Free Hernia Operations at Telogorejo Hospital Semarang. *BSI Abdimas Journal: Journal of Community Service*. 2022;5(2):315–325.
21. Dewi LK. Characteristics of Inguinal Hernia Patients at RSUP Dr. Wahidin Sudirohusodho January – December 2016 period. Universitas Hasanuddin. *Thesis*.2017
22. Kinanti NA, Syaebani MI, Primadini DV. Gender-Based Job Stereotypes in the Indonesian Context Gender-Based Job Stereotypes in the Indonesian Context. *Jurnal Manajemen dan Usahawan Indonesia*. 2021;44(1):1–16.
23. Wagner, J. et al. Chapter 37 : Inguinal Hernias. *Mc Graw Hill*. 2023.
24. Kibret AA, Tekle SY, Hmariam MM, et al. Prevalence and associated factors of external hernia among adult patients visiting the surgical outpatient department at the University of Gondar Comprehensive Specialised Hospital, Northwest Ethiopia: A cross- sectional study. *BMJ Open*. 2022; 12(4):1–6.
25. Mahayani IAW. Inguinal hernia and hydrocele in children. *Liege Medical Review*. 2018; 20(19):522–528.
26. Putri NA, Feby N, Agistany F, et al. Inguinal Hernia : Diagnosis and Management. *Jurnal Biologi Tropis*. 2023. 23(1):96–103.