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Relationship between obesity with risk of obstruction in lateral inguinal hernia

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Abstract---Obesity is a state of excess weight due to the accumulation of fat in adipose tissue so that it can increase intra-abdominal pressure. Increased intra-abdominal pressure can increase the risk of obstruction in the lateral inguinal hernia. This study aims to determine the relationship between obesity and the risk of obstruction in patients with lateral inguinal hernia. This study uses an analytical research design with a cross-sectional approach by involving 152 respondents with a lateral inguinal hernia at Ari Canti General Hospital January 2018 – August 2019. The technique of this research is a consecutive sampling and data was obtained from the patient's medical records. The samples then analyzed with Chi-Square and stratification confounding factors with Mantel-Haenzel. From 152 respondents, 71 (46.7%) are obese and 81 (53.3%) are non-obese, 59 (38.8%) are with obstruction, 93 (61.2%) are without obstruction. There are relationship between obesity and the risk of obstruction in lateral inguinal hernia ($p = 0.032$, $OR = 2.058$, $CI = 1.061-3.993$). The analysis of Mantel-Haenzel shows that a history of heavy lifting ($p = 0.125$) and a history of alcohol ($p = 0.077$) as confounding. The Breslow-Day homogeneity analysis shows that the history of prostate enlargement ($p = 0.003$) as a confounding variable. Obesity has a relationship with the risk of obstruction in patients with lateral inguinal hernia, with a confounding variable history of weight lifting, alcohol history, and a history of prostate enlargement.

Keywords---alcohol history, lateral inguinal hernia, Mantel-Haenzel test, obesity, obstruction.

1 Introduction

A hernia is a protrusion of the contents of the stomach from a normal cavity through a defect in the fascia and musculoskeletal abdominal wall, either congenitally or acquired, which gives away to everybody tool other than the usual through the wall (Scoot & Jones, 2003). In 2005 - 2010, the World Health Organization (WHO) obtained data on hernias reaching 19,173,279 people. Data from the Indonesian Ministry of Health states that based on the distribution of digestive system diseases inpatients according to the cause of illness in Indonesia in 2004, hernias ranked 8th with 18,145 cases, 273 of them died. Of the total, 15,051 of them occurred in men and 3,094 cases occurred in women (Ministry of Health, 2004).

Nearly 75% of abdominal hernias are inguinal hernias. Lateral inguinal hernias are the most commonly found hernias, around 50%, while the medial inguinal hernias are 25% and femoral hernias around 15%. The adult population of 15% who suffer from inguinal hernias, 5-8% in the age range of 25-40 years and reaches 45% at the age of 75 years. Inguinal hernias are found 25 times more in men than women (Zendejas *et al.*, 2014).

Risk factors that can be the etiology of inguinal hernias are increased intra-abdominal pressure such as chronic coughing, constipation, strenuous exercise, heavy work, overweight, and obesity as well as abdominal wall muscle weakness such as sex, genetics, and old age (Park *et al.*, 2011). The incidence of inguinal hernias is higher in patients

with overweight and obesity compared with normal body weight. Body mass index also plays a role in increasing intra-abdominal pressure which is the main etiological factor of inguinal hernias. According to the World Health Organization (WHO) during 2010, 32.9% in Indonesia or 78.2 million people were overweight. When compared with obesity data in 2008 which was only 9.4 percent, it can be concluded that the obesity rate in Indonesia is increasing (Agustina, 2014).

Today, many people tend to be wrong in applying the patterns of activities of daily life. Changes in poor activity patterns can trigger an increase in body mass index. Obesity or being overweight will naturally have greater internal pressure. This internal pressure can easily push the fat tissue and internal organs into hernias (Banafa & Aram, 2009). Obesity increases the risk of inguinal hernia 2 times greater with OR = 2.95 indicating that obesity is a risk factor for inguinal hernia (Agustina, 2014).

2 Methodology

This research is a cross-sectional analytic study. The study population was hernia patients at Ari Canti General Hospital in 2018-2019. Samples were taken by consecutive sampling techniques. Samples taken in this study must meet the inclusion criteria. This study uses secondary data in the form of patient medical records at Ari Canti General Hospital in 2018-2019. The research variables consisted of independent variables in the form of risk of obstruction in lateral inguinal hernia, dependent variables in the form of obesity, peer variables in the form of family history, weight lifting history, history of surgery, smoking history, alcohol history, history of constipation, history of prostate enlargement, history of diabetes, history of cough chronic, ascites history, and urethral stricture history. Data were analyzed univariate to calculate the distribution, frequency, respondent characteristics and characteristics of each study variable. Bivariate analysis was performed to determine whether there was a significant relationship between obesity and the risk of obstruction in lateral inguinal hernias with the Chi-Square test. Confounding variables were analyzed using the Breslow-Day test and the Mantel-Haenzel test.

3 Results

The subjects of the study were 152 medical records of hernia patients at Ari Canti General Hospital in 2018-2019. The study was conducted from May to August 2019.

Table 1
Characteristics of research samples (n=152)

Variable		Quantity (n)	Percentage (%)
Sex	Male	140	92,1%
	Female	12	7,9%
Age Category	Children (0-11 tahun)	2	1,3%
	Youth (12-25 tahun)	15	9,9%
	Adult (26-44 tahun)	21	13,8%
	Middle Age (45-59 tahun)	52	34,2%
	Elderly (60-74 tahun)	53	34,9%
	Old (75-90 tahun)	9	5,9%
BMI category	Very Old (>90 tahun)	0	0,0%
	Underweight	7	4,6%
	Normal	50	32,9%
	Overweight	24	15,8%
Obesity	Obese I	54	35,5%
	Obese II	17	11,2%
	Non Obesitas	81	53,3%
	Obesitas	71	46,7%

Based on inclusive and exclusion criteria there are 152 people who meet the research criteria. Based on the descriptive statistics on the research data, it was found that there were 140 male respondents (92.1%) and 12 female

respondents (7.9%), the majority of respondents were 60-74 years old with 53 people (34.9%) and 45-59 years with a total of 52 people (34.2%) while the lowest is 0-11 years as many as 2 people (1.3%) with an average age of 52.11 ± 17.676 years.

Based on the body mass index obtained, after being categorized in the WHO criteria in the Asian category, the tendency is more towards the obese grade I category with 54 people (35.5%), then normal for 50 people (32.9%), overweight as many as 24 people (15.8%), obese grade II categories were 17 people (11.2%), and underweight were 7 people (4.6%) with a mean body mass index of 24.7 ± 4.158 kilograms. Total respondents with non-obesity were 81 people (53.3%) and obesity were 71 people (46.7%).

Table 2
Characteristics of lateral inguinal hernia (n=152)

Variable		Quantity (n)	Percentage (%)
Location	Right	81	53,3%
	Left	68	44,7%
	Bilateral	3	2,0%
Type of Hernia	Reponible	46	30,3%
	Irreversible	47	30,9%
	Inkarserata	31	20,4%
	Strangulata	28	18,4%
Obstruction	Non-obstruction	93	61,2%
	Obstruction	59	38,8%
Hernia Duration	<1 year	83	54,6%
	1-2 years	53	34,9%
	> 2 years	16	10,5%
Repeat	Primary	146	96,1%
	Recurrent	6	3,9%

Based on the characteristics of the hernia location it was found that there were 81 people (53.3%) with the location of the hernia on the right. Then the hernia location on the left was found in 68 people (44.7%), while the bilateral location was 3 people (2.0%). For the type of hernia 47 people (30.9%) had an irreponible hernia, then 46 people were reponible hernias (30.3%), then 31 incarcerated hernias (20.4%), and 28 people (18.4%) had strangulated hernias. For the category of obstruction, 93 people (61.2%) did not experience obstruction while 59 people (38.8%) experienced obstruction.

The duration of hernias in this study most occurred in the <1 year period of 83 people (54.6%). Then the duration of 1-2 years was 53 people (34.9%) and the duration of > 2 years was 16 people (10.5%). For the type of hernia, the most dominant type of primary hernia was 146 people (96.1%) and the type of recurrent hernia was 6 people (3.9%).

Table 3
History of risk factors (n=152)

Variable	Quantity (n)	Percentage (%)
Family History	11	7,2%
Weight Lifting History	58	38,2%
Abdominal Surgery History	34	22,4%
Smoking History	33	21,7%
Alcohol History	26	17,1%
Constipation History	11	7,2%
Prostate Magnification History	14	9,2%
Diabetes Melitus History	22	14,5%
Chronic Cough History	31	20,4%
Ascites History	5	3,3%
History of the Structure of the Urethra	11	7,2%

In this study there are several risk factors, namely respondents with a family history of having a hernia are 11 people (7.2%), a total of 58 people (38.2%) have a history of heavy lifting, then 34 people (22.4%) with a history of

previous operations, then 33 people (21.7%) with a history of smoking, some 26 people (17.1%) had a history of drinking alcohol, then as many as 11 people (7.2%) with a history of constipation, as many as 14 people (9, 2%) had a history of BPH before, a history of chronic cough was found in 31 people (20.4%), then 5 people (9.3%) with a history of ascites, and 11 people (7.2%) had a history of urethral stricture previous.

Bivariate analysis test for the relationship between obesity and risk of obstruction in lateral inguinal hernia

Based on the results of the study found the prevalence in the group of patients with obesity category suffering from hernias without obstruction as many as 37 people (39.8%) and hernias with obstruction as many as 34 people (57.6%). In the category of non-obese suffer hernias without obstruction as many as 56 people (60.2%) and hernias with obstruction as many as 25 people (42.4%).

Table 4
Prevalence of obesity with risk of obstruction in lateral inguinal hernias

			Obstruction		Total
			Non-Obstruction	Obstruction	
Obesity	Non-Obesity	Count	56	25	81
		% within Obstruction	60,2%	42,4%	53,3%
	Obesity	Count	37	34	71
		% within Obstruction	39,8%	57,6%	46,7%
Total	Count	93	59	152	
	% within Obstruction	100,0%	100,0%	100,0%	

Termination of the significance conclusion was tested by the Chi-square bivariate analysis test with the fisher exact value obtained a p-value of 0.032, which is a significant result or a value of $p < 0.05$. This means that there is a significant relationship between obesity and the risk of obstruction in patients with lateral inguinal hernias. Statistical analysis was continued by testing to obtain an odd ratio between obesity and the risk of obstruction in patients with lateral inguinal hernias. There is a relationship between obesity and the risk of obstruction in patients with a lateral inguinal hernia with a large OR = 2.058.

Confounding variable test

Statistical analysis was continued with confounding variables to determine what factors were confusing between the relationship of obesity and the risk of obstruction in patients with lateral inguinal hernias.

Table 5
Confounding Variable Test

No	Variable	cOR	aOR	Breslow-Day	Mantel-Haenzel	Information
1	Gender	2,058	2,075	0,105	0,029	Not Confounding Variable
2	Age	2,058	2,353	0,813	0,022	Not Confounding Variable
3	Hernia Duration	2,058	2,353	0,813	0,022	Not Confounding Variable
4	Family	2,058	2,120	0,741	0,027	Not Confounding Variable
5	Heavy lifting	2,058	1,813	0,757	0,125	Confounding Variable
6	Operation	2,058	2,060	0,107	0,031	Not Confounding Variable
7	Smoke	2,058	1,983	0,873	0,044	Not Confounding Variable
8	Alcohol	2,058	1,841	0,767	0,077	Confounding Variable
9	Constipation	2,058	2,022	1,120	0,033	Not Confounding Variable
10	BPH	2,058	2,071	0,003	0,023	Confounding Variable
11	DM	2,058	1,977	0,989	0,044	Not Confounding Variable
12	Chronic Cough	2,058	2,022	0,375	0,036	Not Confounding Variable
13	Ascites	2,058	2,079	0,502	0,031	Not Confounding Variable

Based on the stratification analysis of various types of variables on the relationship of obesity with the risk of obstruction in HIL patients, it shows that the weight lifting history, alcohol history, and BPH history are confounding variables. In the weight lifting history variable, the Breslow-Day homogeneity test obtained p-value = 0.757 (> 0.05) indicates that the homogeneous data, then the Mantel-Haenzel test obtained p-value = 0.125 (> 0.05) indicates that the weight lifting history variable is confounding variable. In the alcohol history variable, the Breslow-Day homogeneity test obtained p-value = 0.767 (> 0.05) indicates that the data is homogeneous, then the Mantel-Haenzel test obtained p = 0.077 (> 0.05) indicates that the weight lifting history variable is a variable confounding. In the BPH historical variable, the Breslow-Day homogeneity test obtained p-value = 0.003 (<0.05) indicating that the data is not homogeneous so that the BPH historical variable is a confounding variable.

Table 6
Test of Adjusted Odd Ratio Value

No	Variable	OR 1	OR 2	cOR	aOR
1	Heavy lifting	2,026	1,588	2,058	1,813
2	Alcohol	1,929	1,467	2,058	1,841
3	BPH	3,000	0,071	2,058	2,071

Based on the analysis of the confounding of confounding variables on the relationship of obesity with the risk of obstruction in HIL patients, showed that the weight lifting variable was obtained OR 1 = 2.026 showed a large risk in patients without a history of weight lifting, OR 2 = 1.588 showed a large risk in patients with a history of weight lifting. = 1,813 shows the risk after adjusting. In the alcohol history variable obtained OR 1 = 1.929 indicates a large risk in patients without alcohol history, OR 2 = 1.467 indicates a large risk in patients with a history of alcohol, aOR = 1.841 indicates a large risk after adjusting. In the BPH history variable obtained OR 1 = 3,000 indicates a large risk in patients without a history of BPH, OR 2 = 0.071 indicates a large risk in patients with a history of BPH, aOR = 2.071 indicates a large risk after adjusting.

4 Discussion

Demographic characteristics

Based on inclusive and exclusion criteria there are 152 people who meet the research criteria. Based on the results of descriptive statistics on the study data, it was found that there were 140 male respondents (92.1%) and 12 female (7.9%), indicating that men had a greater risk of suffering from HIL than women. This is likely because several factors such as the anatomy of an inguinal analyst in men are wider than women. Besides the intensity of workmen are more at risk than women, such as heavy lifting and other physical activity. The history of BPH also causes a greater risk of HIL in men.8 Based on myrrh the majority of respondents were 60-74 years with a total of 53 people (34.9%) and 45-59 years with a total of 52 people (34.2%) while those who the lowest is 0-11 years as many as 2 people (1.3%) with an average age of 52.11 ± 17.676 years. The age group 46-60 years followed by 30-45 years is most often found in the incidence of lateral inguinal hernia because in the elderly begin to decrease the strength of the abdominal wall muscle (Banafa & Aram, 2009).

Judging from the body mass index obtained, after being categorized in the WHO Asian category criteria, the tendency is more towards the obese grade I category with a total of 54 people (35.5%), then normal for 50 people (32.9%), overweight by 24 people (15.8%), grade II obese categories were 17 people (11.2%), and underweight were 7 people (4.6%) with a mean body mass index of 24.7 ± 4.158 years. Total respondents with non-obesity were 81 people (53.3%) and obesity were 71 people (46.7%).

Characteristics of study hernias

Based on the characteristics of the hernia location it was found that there were 81 people (53.3%) with the location of the hernia on the right. Then the location of the hernia on the left was found in 68 people (44.7%), while the bilateral location was 3 people (2.0%). The results of the study are in line with the research of Balamaddaiah G et al, showing that the right hernia is at most 48%, this is due to the delay in decreased testes and failure of closure of the processus vaginalis most often on the right side. For the type of hernia 47 people (30.9%) had an ireponible hernia, then 46 people were reponible hernias (30.3%), then 31 incarcerated hernias (20.4%), and 28 people (18.4%) had

strangulated hernias. For the category of obstruction, 93 people (61.2%) did not experience obstruction while 59 people (38.8%) experienced obstruction. This is related to the availability of health facilities and the patient's awareness of the conditions experienced, so that obstruction can be prevented. The duration of hernias in this study most occurred in the <1 year period of 83 people (54.6%). Then the duration of 1-2 years was 53 people (34.9%) and the duration of > 2 years was 16 people (10.5%). There is a study where 68% of hernia patient's < 1-year duration of surgery to occur, this is because most patients do not seek medical help, to feel disturbing and very painful. For the type of hernia, the most dominant type of primary hernia was 146 people (96.1%) and the type of recurrent hernia was 6 people (3.9%) (Aljubairy, 2017). There are also studies that show that 85.2% of primary hernias and 14.8% are recurrent hernias, this is related to the quality of operations performed, most in developed countries already use good technology, and patient awareness to reduce risk factors (Goede *et al.*, 2017).

Risk factors for lateral inguinal hernias

Based on research most hernia patients with a history of heavy lifting as much as 38.2%, this is because heavy work can increase intraabdominal pressure on the stomach which causes the abdominal organs (usually the intestine) to bulge through a weak spot or tears in the thin muscle walls that are usually associated with heavy object lifting work.6 Followed by patients with a history of previous abdominal surgery of 22.4%, followed by 21.7% with a history of smoking, 20.4% with a history of chronic cough, 17.1% with a history of drinking alcohol, 9, 3% had a history of ascites, 9.2% had a history of previous BPH, 7.2% had a history of constipation, 7.2% had a family history of hernias, 7.2% had a history of previous urethral stricture. Chronic increase in intra-abdominal pressure that can push the contents of the hernia past the internal annulus which is wide enough can be caused by the constitution of the body, thin people tend to be exposed to hernias of their connective tissue. Whereas in obese people can also be affected by hernias due to a large amount of fat tissue in the body which adds to the workload of the supporting connective tissue in the LMR (Locus minoris resistance) (Kockerling & Simons, 2018; Brunicardi, 2005). Lifting heavy items that do not fit your body size, often straining because of constipation or urinary disorders, tumors that cause intestinal obstruction, chronic cough caused by infections, bronchitis, asthma, emphysema, allergies, pregnancy and a history of ascites can also increase intra-abdominal pressure. Tissue/muscle weakness. Abdominal wall due to age, malnutrition, or paralysis of the motor nerves is also risk factors for lateral inguinal hernias (Townsend *et al.*, 2004; Sjamsuhidajat & Jong, 2005).

Besides smoking is said to increase the risk of inguinal hernias. This is because smoking will cause defects in connective tissue metabolism and increase the risk of COPD (Ober *et al.*, 2017). In the 2016 Modena *et al* study examining the effect of smoking, alcohol and diabetes mellitus on cremastral muscle in inguinal hernia patients, smoking, alcohol and diabetes mellitus cause remodeling of cremaster muscle which will lead to loss support or changes in this section which further strengthens the relationship with the occurrence of inguinal hernias (Modena *et al.*, 2016).

Effect of obesity on the risk of obstruction in lateral inguinal hernias

Obesity is a risk factor for inguinal hernias, this is because obesity or overweight will naturally have greater internal pressure. This internal pressure can easily push the fat tissue and internal organs into hernias (Banafa & Aram, 2009; Sairaoka *et al.*, 2017; Wiardani *et al.*, 2018). While other opinions say that obesity is a protective factor for inguinal hernia due to thin people who tend to be exposed to inguinal hernias due to a small amount of connective tissue in the stomach, so that the intestine easily protrudes out due to weak connective tissue (Agustina, 2014).

5 Conclusion

There was a significant relationship (p-value <0.05) with p-value = 0.032 and OR = 2.058 between obesity and the risk of obstruction in patients with lateral inguinal hernia. There are three confounding variables in the form of history of weight lifting with the Mantel-Haenzel test p = 0.125 (> 0.05), aOR = 1.813. History of alcohol with the Mantel-Haenzel test p = 0.077 (> 0.05), aOR = 1.841. History of BPH with the Breslow-Day test p = 0.003 (<0.05), aOR = 1.841.

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