



The Relationship between Work Activities and Duration of Symptoms with the Severity of Inguinal Hernia: A Cross-Sectional Study at in Waled Cirebon Hospital, Indonesia

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ABSTRACT

Background: Inguinal hernia repair is one of the most commonly performed surgical procedures worldwide, and inguinal hernia is frequently treated at Waled Regional General Hospital, Cirebon. Heavy physical work may raise intra-abdominal pressure, and delayed treatment may allow a hernia to progress to irreducibility or incarceration. However, whether these two factors are related to the clinical severity of the hernia at presentation has rarely been examined in Indonesia.

Aims: To analyse the association of work activity and of symptom duration with the severity of inguinal hernia among patients treated at Waled Regional General Hospital, Cirebon, in 2020–2025, and to describe how severity is distributed across work-activity and symptom-duration groups.

Methods: This analytical observational study used a cross-sectional design based on the medical records of 88 adult inpatients who underwent surgery for primary inguinal hernia, selected by consecutive sampling. Work activity (light–moderate vs heavy), symptom duration (acute <6 months, sub-acute 6–12 months, chronic >12 months) and severity (reducible, irreducible, incarcerated, strangulated) were extracted from the records. Associations were assessed with cross-tabulation, chi-square tests, Spearman's rank correlation and ordinal logistic regression including both exposures.

Results: Of the 88 patients, 63.6% had light–moderate and 36.4% heavy work; 46.6% had reducible, 34.1% irreducible and 19.3% incarcerated hernias, and none had strangulation. Work activity showed a weak but statistically significant inverse association with severity ($r = -0.234$; $p = 0.028$): reducible hernias were more frequent among heavy than light–moderate workers (62.5% vs 37.5%), whereas irreducible (25.0% vs 39.3%) and incarcerated hernias (12.5% vs 23.2%) were less frequent. This association persisted after adjustment for symptom duration (adjusted OR for a more severe category 0.38; 95% CI 0.16–0.90; $p = 0.027$). Symptom duration was not significantly associated with severity ($r = -0.018$; $p = 0.871$); incarceration occurred in 24.1%, 19.4% and 13.0% of the acute, sub-acute and chronic groups, respectively.

Conclusion: Work activity showed a weak but statistically significant association with hernia severity, with heavy workers more often presenting with reducible hernias, whereas symptom duration was not significantly associated with severity. Because of the cross-sectional design and the lack of adjustment for age and sex, which may have confounded the observed inverse association, these findings indicate associations only and do not establish causality.

Keywords: *Inguinal hernia severity; Work activity; Physical activity, Symptom duration; Hernia incarceration.*

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1. Introduction

An inguinal hernia occurs when a portion of peritoneum containing abdominal visceral organs protrudes through into the inguinal canal or a defect in the abdominal wall (Putri et al., 2023). Inguinal hernias are the most frequently occurring type of hernia and are one of the most frequently performed surgical procedures (Ramadani, et al., 2025). Globally, the estimated number of cases inguinal, femoral, and abdominal hernias worldwide in 2019 reached 32.53 million (Ma, et al., 2023). In Indonesia, inguinal hernias remain a major public health issue with a relatively high number of cases approximately 20,400 cases in 2021, according to data from the Ministry of Health of the Republic of Indonesia (Ramadani et al., 2025).

The incidence of inguinal hernias is caused by multiple factors, one of which is physical activity and type of work. Heavy physical work involving repetitive lifting, pushing, or pulling of objects can increase intra-abdominal pressure, thereby contributing to the weakening of the supporting structures of the inguinal wall and facilitating the development of hernias (Ramadani et al., 2025). In addition to playing a role in the occurrence of hernias, occupational activities are also thought to influence the progression of the hernia. Another factor potentially associated with severity is the duration of symptoms. Prolonged symptoms without treatment may raise the risk of changes in hernia's condition, such as a hernia irreparable, incarceration, or strangulation (Hair et al., 2001).

Several previous studies have shown a link between heavy physical work and the occurrence of inguinal hernia (Handayani & Hardichal, 2016; Kuijer et al., 2020), including a study at Waled Regional General Hospital in which occupation and age were associated with the incidence of inguinal hernia (Ramadani et al., 2025). However, these studies addressed whether a hernia develops, not how severe it is when the patient presents for treatment. The two factors examined here may be related to severity through different pathways. Work activity reflects repeated rises in intra-abdominal pressure that may enlarge the defect and push more abdominal contents into the sac, but it may also influence care-seeking, because a lump that interferes with work may prompt earlier consultation. Symptom duration, in contrast, reflects the time during which the hernia remains untreated. The risk of strangulation rises most steeply in the first months after a hernia appears (Gallegos et al., 1991), and acute incarceration is uncommon in minimally symptomatic hernias that are left untreated (Fitzgibbons et al., 2006), so a longer history does not necessarily mean a more severe hernia. Evidence from Waled Regional General Hospital is needed because it is a regional referral hospital serving a semi-rural population in eastern Cirebon, where agricultural and other manual work is common, and no study there has examined how work activity and symptom duration relate to hernia severity. Such local data are needed to plan targeted education and early referral.

Given these issues, this study aims to analyse the association of work activity and of symptom duration with the severity of inguinal hernia among patients at Waled Regional General Hospital, Cirebon, and to describe how severity is distributed across work-activity and symptom-duration groups. The results are expected to provide information on factors associated with hernia severity, thereby supporting early detection and the prevention of complications.

2. Methods

Study Design and Location

This study was an analytical observational study with a cross-sectional design using a retrospective review of medical records. The study was conducted at Waled Regional General Hospital, Cirebon, Indonesia, and included patients treated during the 2020-2025 period.

Population and Sample

The target population for this research is all patients diagnosed with inguinal hernias at Waled Regional General Hospital in Cirebon, while the accessible population consists of patients diagnosed with inguinal hernias during the 2020–2025 period.

Inclusion and Exclusion Criteria

While inclusion criteria in this study was patient aged more than 18 years with medical records containing data on work activities, duration of symptoms, and severity, and had undergone surgery; but will be excluded if the patients have incomplete medical records and recurrent hernias.

Sampling Techniques

Consecutive sampling was used to select the participants; all medical records that met the criteria were taken in chronological order until the required sample size was reached. The minimum sample size was calculated with the Slovin formula, $n = N/(1 + N \cdot e^2)$, using the number of patients with inguinal hernia recorded in 2020–2025 ($N = 700$) and a margin of error 10%, which gave 88 subjects. Consecutive sampling was chosen to limit selection bias in a retrospective record review, and the Slovin formula was used because the size of the accessible population was known.

Measurements

The variables in this research were obtained from medical records of patients with inguinal hernia. The independent variables consisted of occupational activity and duration of complaints, while the dependent variable was the severity of inguinal hernia.

1. Work activity was defined as the physical workload of the patient's main occupation as recorded in the identity and history sections of the medical record. Following the classification of physical activity by type of work (Yuniar & Dewi, 2008), occupations were grouped into light–moderate work (e.g. office or administrative work, trading, housework and not working) and heavy work (e.g. farming, construction, fishing and other manual labour involving lifting, pushing or pulling loads). Light–moderate work was coded 1 and heavy work 2.
2. Symptom duration was defined as the time from the first appearance of the groin lump or complaint, as reported by the patient and documented in the history (anamnesis), to hospital admission for surgery. It was categorized as acute (<6 months), sub-acute (6–12 months) and chronic (>12 months), coded 1, 2 and 3, respectively.
3. Hernia severity was determined from the clinical and operative diagnosis recorded in the medical record and classified as reducible (the contents return to the abdominal cavity spontaneously or with manual pressure), irreducible (the contents cannot be reduced, without signs of obstruction or ischaemia), incarcerated (irreducible with signs of bowel obstruction) or strangulated (irreducible with compromised blood supply to the contents) (Putri et al., 2023). These categories were coded 1, 2, 3 and 4, respectively.

All variables were measured on an ordinal scale. Age, sex, body mass index (BMI), specific occupation, chronic cough and constipation were not included in the study dataset and therefore could not be analysed as potential confounders.

Statistical techniques

Data were analysed using SPSS. Univariate analysis described the frequencies and percentages of work activity, symptom duration and severity. For bivariate analysis, work activity $\times$ severity and symptom duration $\times$ severity were cross-tabulated with frequencies and row percentages and tested with the Pearson chi-square test and the chi-square test for linear trend (linear-by-linear association). Because all variables were ordinal, Spearman's rank correlation was used to estimate the direction and strength of each association. Two binary outcomes were also compared between groups: a non-reducible hernia (irreducible or incarcerated vs reducible) and incarceration, using Fisher's exact or chi-square tests. The work activity–severity association was also examined within each symptom-duration stratum. Finally, ordinal logistic regression (proportional-odds model) with severity as the outcome and work activity and symptom duration as predictors was used to estimate crude and mutually adjusted odds ratios (ORs) with 95% confidence intervals (CIs); because no strangulated hernia was found, severity was modelled in three levels. A p-value < 0.05 was considered statistically significant.

Ethical clearance

This study was approved by the Ethics Committee (KEPK) of the Waled Cirebon Regional General Hospital under approval number 000.9.2/249/KEPK/IV/2026, issued on April 1, 2026.

3. Results

Respondents' Characteristics

A total of 88 patients with inguinal hernia were included. Table 1 summarizes the distribution of work activity, symptom duration and severity. Most patients had light–moderate work (63.6%), and sub-acute symptom duration was the most common category (40.9%). Nearly half of the hernias were reducible (46.6%), about one-third irreducible (34.1%) and one-fifth incarcerated (19.3%); no strangulated hernia was found. Work activity was not related to symptom duration ($\chi^2 = 0.67$; $p = 0.717$), so the two exposures were largely independent in this sample.

Table 1. Distribution of work activity, symptom duration and severity of inguinal hernia (n = 88)

Characteristic	N	%
Work activity		
Light–moderate	56	63.6
Heavy	32	36.4
Symptom duration		
Acute (<6 months)	29	33.0
Sub-acute (6–12 months)	36	40.9
Chronic (>12 months)	23	26.1
Severity of inguinal hernia		
Reducible	41	46.6
Irreducible	30	34.1
Incarcerated	17	19.3
Strangulated	0	0.0

Bivariate Analysis

Tables 2 and 3 show how severity was distributed across work-activity and symptom-duration groups, together with the chi-square and Spearman correlation results.

Table 2. Severity of inguinal hernia by work activity

Work activity	Reducible N (%)	Irreducible N (%)	Incarcerated N (%)	N
Light–moderate	21 (37.5)	22 (39.3)	13 (23.2)	56
Heavy	20 (62.5)	8 (25.0)	4 (12.5)	32
Total	41 (46.6)	30 (34.1)	17 (19.3)	88

Pearson $\chi^2 = 5.16$, $df = 2$, $p = 0.076$; χ^2 for linear trend = 4.39, $p = 0.036$; Spearman $r = -0.234$, $p = 0.028$. Row percentages are shown. No strangulated hernia was found.

Table 2 shows the pattern behind the correlation coefficient. Among heavy workers, 62.5% had reducible hernias, compared with 37.5% of light–moderate workers, whereas irreducible (25.0% vs 39.3%) and incarcerated hernias (12.5% vs 23.2%) were less common among heavy workers. When irreducible and incarcerated hernias were combined, 37.5% of heavy workers and 62.5% of light–moderate workers had a non-reducible hernia (OR 0.36; Fisher's exact $p = 0.028$). The overall chi-square test was not significant ($p = 0.076$), but the test for linear trend was ($p = 0.036$), indicating a shift of the whole severity distribution towards milder forms rather than a difference confined to one category. The negative Spearman coefficient therefore means that, in this sample, heavy work was associated with lower rather than higher severity.

Table 3. Severity of inguinal hernia by symptom duration

Symptom duration	Reducible N (%)	Irreducible N (%)	Incarcerated N (%)	Total n
Acute (<6 months)	13 (44.8)	9 (31.0)	7 (24.1)	29
Sub-acute (6–12 months)	19 (52.8)	10 (27.8)	7 (19.4)	36
Chronic (>12 months)	9 (39.1)	11 (47.8)	3 (13.0)	23
Total	41 (46.6)	30 (34.1)	17 (19.3)	88

Pearson $\chi^2 = 3.18$, $df = 4$, $p = 0.528$; χ^2 for linear trend = 0.09, $p = 0.767$; Spearman $r = -0.018$, $p = 0.871$. Row percentages are shown. No strangulated hernia was found in any group.

Severity did not increase with longer symptom duration (Table 3). Reducible hernias made up 44.8%, 52.8% and 39.1% of the acute, sub-acute and chronic groups, respectively. Irreducible hernias were most frequent in the chronic group (47.8%), whereas incarceration was most frequent in the acute group (24.1%) and least frequent in the chronic group (13.0%). Neither the proportion of non-reducible hernias (55.2%, 47.2% and 60.9%; $p = 0.576$) nor the proportion of incarcerated hernias ($p = 0.602$) differed significantly across duration groups. Thus, the data do not show that a longer history was accompanied by more incarceration; incarceration was, if anything, more common among patients with a short history.

Within every symptom-duration stratum, heavy workers had a higher proportion of reducible hernias than light–moderate workers (acute 58.3% vs 35.3%; sub-acute 61.5% vs 47.8%; chronic 71.4% vs 25.0%), indicating that the work–severity association was not explained by differences in symptom duration. In ordinal logistic regression (Table 4), heavy work remained associated with lower odds of a more severe hernia after adjustment for symptom duration (adjusted OR 0.38; 95% CI 0.16–0.90; $p = 0.027$), whereas neither sub-acute nor chronic duration was associated with severity. Separate binary models gave consistent estimates for heavy work (non-reducible hernia: adjusted OR 0.36; 95% CI 0.15–0.89; incarceration: adjusted OR 0.44; 95% CI 0.13–1.52), supporting the proportional-odds assumption. Age, sex, BMI, specific occupation and comorbidities were not available and could not be included in the model.

Table 4. Ordinal logistic regression of inguinal hernia severity on work activity and symptom duration ($n = 88$)

Variables	Crude OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Work activity				
Light–moderate	1 (reference)		1 (reference)	
Heavy	0.38 (0.16–0.91)	0.029	0.38 (0.16–0.90)	0.027
Symptom duration				
Acute (<6 months)	1 (reference)		1 (reference)	
Sub-acute (6–12 months)	0.72 (0.28–1.84)	0.494	0.68 (0.26–1.76)	0.422
Chronic (>12 months)	0.94 (0.35–2.57)	0.908	0.84 (0.30–2.32)	0.732

OR < 1 indicates lower odds of being in a more severe category (reducible < irreducible < incarcerated). Crude ORs are from models containing one exposure; adjusted ORs are from a model containing both work activity and symptom duration. OR, odds ratio; CI, confidence interval.

4. Discussion

This study examined how severity was distributed across work-activity and symptom-duration groups among 88 surgically treated adults with inguinal hernia. Two findings stand out. First, work activity was associated with severity, but in the opposite direction to what is usually assumed: heavy workers more often presented with reducible hernias and less often with irreducible or incarcerated hernias, and this pattern was present within each symptom-duration stratum and persisted after adjustment for symptom duration. Second, symptom duration was not associated with severity, and incarceration was, if anything, most common among patients with a short history.

The biological rationale for linking heavy work to hernia is well established: repeated lifting, pushing and pulling raise intra-abdominal pressure and strain the posterior wall of the inguinal canal, and occupational exposure to heavy lifting increases the risk of developing an inguinal hernia (Abrahamson, 1998; Aritiah et al., 2024; Kuijer et al., 2020). Previous studies, including one at the same hospital, related heavy work to the occurrence of hernia (Handayani & Hardichal, 2016; Ramadani et al., 2025). Our findings do not contradict this, because they concern severity at the time of surgery among patients who already had a hernia, not the risk of developing one. A factor that contributes to the formation of a hernia does not necessarily make an established hernia more complicated.

Several explanations may account for the inverse pattern. First, care-seeking: a groin lump that causes pain or interferes with physical work threatens a worker's income and may prompt earlier consultation and elective surgery while the hernia is still reducible, whereas people with light work or no work may tolerate the lump for longer. Second, and probably more important, confounding by age: the light-moderate category is likely to include older patients who are retired, not working or doing housework, and older age is associated with more emergency presentations and more incarcerated or strangulated hernias (Primatesta & Goldacre, 1996; Kulah et al., 2001). If the heavy workers in this sample were younger, the inverse association may partly reflect age rather than workload. Third, misclassification: occupation recorded at admission indicates the type of job rather than the actual lifting load, and patients with symptomatic hernias may already have reduced their physical activity. Because age, sex, BMI and comorbidities were not available, these explanations could not be tested, and the association should be regarded as hypothesis-generating. The weak correlation ($r = -0.234$) also indicates that work activity explains only a small part of the variation in severity.

Hernia severity is therefore likely to be determined mainly by factors that were not captured in this study, such as age, connective-tissue weakness, the size of the hernia defect, hernia type (indirect or direct), obesity, chronic cough, chronic constipation and other causes of increased intra-abdominal pressure (Burcharth et al., 2017; Putri et al., 2023). Future studies should record these variables so that the independent contribution of work activity can be estimated.

Symptom duration was not associated with severity ($r = -0.018$), and the cross-tabulation helps explain why. Irreducible hernias were most frequent in the chronic group, which fits the idea that long-standing hernias gradually enlarge and become adherent, but incarcerated hernias were most frequent in the acute group and least frequent in the chronic group. These opposing patterns cancel each other out in a single correlation coefficient. This is consistent with the observation that the cumulative risk of strangulation rises most steeply in the first three months after a hernia appears and much more slowly thereafter (Gallegos et al., 1991), and with the low rate of acute incarceration among men with minimally symptomatic hernias managed by watchful waiting (Fitzgibbons et al., 2006). It also agrees with Mitura et al. (2018), who found that the duration of a hernia is not consistently related to its clinical manifestations, and with the view that progression depends more on the anatomy of the abdominal wall, the condition of the transversalis fascia and recurrent rises in intra-abdominal pressure (Burcharth et al., 2017).

The course of inguinal hernia varies between individuals. A hernia with a narrow neck may incarcerate soon after it appears, whereas a hernia with a wide defect may remain reducible for years. Therefore, a short history does not necessarily indicate a milder condition, and a long history does not necessarily indicate a more severe one.

Our results differ from those of Hair et al. (2001), who found that the likelihood of a hernia becoming irreducible increased with its duration. The higher proportion of irreducible hernias in our chronic group (47.8%) points in the same direction, but the difference was not significant. The discrepancy may reflect our smaller sample, the recording of duration from patient recall, the use of broad duration categories, the inclusion of surgically treated patients only (which excludes people with long-standing hernias who never sought surgery) and differences in severity classification. In addition, with only 17 incarcerated hernias, the study could detect only large differences in incarceration between duration groups.

Limitations and Future Research

This study has several limitations. First, its cross-sectional design based on medical records shows associations, not causal relationships. Second, the dataset did not include age, sex, BMI, specific occupation, chronic cough, constipation, smoking or hernia type, so the adjusted analysis could account only for symptom duration, and residual confounding, particularly by age, is likely. Third, work activity was classified into two broad groups based on the recorded occupation, which may not reflect the actual physical workload, and symptom duration depended on patient recall. Fourth, only surgically treated inpatients were included, which may have excluded patients with mild hernias managed conservatively and patients with long-standing hernias who never sought care. Finally, the sample size, the small number of incarcerated hernias and the absence of strangulation limited statistical power and increased the risk of type II error. Future research should use a larger, preferably prospective, design with detailed workload measures (e.g. lifting frequency and load) and relevant clinical confounders to better identify the factors associated with the severity and progression of inguinal hernia.

5. Conclusion

In patients who underwent surgery for inguinal hernia at Waled Regional General Hospital, Cirebon, in 2020–2025, work activity showed a weak but statistically significant association with hernia severity: heavy workers more often presented with reducible hernias, and this association persisted after adjustment for symptom duration. Symptom duration was not significantly associated with severity. Because of the cross-sectional design and the lack of data on potential confounders such as age, these findings indicate associations only and do not establish causality.

Recommendations

Workers in physically demanding jobs should receive occupational education on safe lifting techniques and on avoiding excessive rises in intra-abdominal pressure, and should undergo early clinical assessment when a groin lump appears. Because incarceration in this study also occurred among patients with light work and among those with a short history of symptoms, all patients with a groin lump, including older adults and those not working, should be encouraged to seek assessment promptly rather than wait for symptoms to worsen. Larger prospective studies with more detailed workload measures and relevant clinical confounders (age, sex, BMI, chronic cough, constipation and hernia type) are recommended.

Conflict of Interest

There is no conflict of interest.

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