Journal of Asian-African focus in Health

ISSN: 2987-9418
Vol. 4 No. 1, 2026
Page: 175-188

The Relationship of Work Requiring Heavy Lifting to the Severity of Inguinal Hernia at Prof. Dr. Margono Soekarjo Purwokerto General Hospital for the 2022–2023 Period

Gregorius Christian Hamid[1], Yonathan Adi Purnomo[1]

[1]Bachelor of Medicine Study Program, Faculty of Medicine, Universitas Tarumanagara, Jakarta, Indonesia

*Corresponding Author: Gregorius Christian Hamid

Email: gregorius.405220117@stu.untar.ac.id

Article Info

Article History:

Received March 21, 2026
Revised April 10, 2026
Accepted: May 20, 2026

Keywords:

Inguinal Hernia, Hernia Severity, Heavy Lifting, Blue-Collar Workers, Occupational Health.

Abstract

This study examined the association between occupations involving heavy lifting and the severity of inguinal hernia among patients treated at Prof. Dr. Margono Soekarjo Hospital, Purwokerto, during the 2022-2023 period. A retrospective observational analytical study with a cross-sectional approach was conducted using secondary data from hospital medical records. The study included 190 adult patients diagnosed with inguinal hernia who met the inclusion and exclusion criteria. Occupational category was classified into blue-collar and white-collar work, with blue-collar work used as a proxy for regular manual labor and heavy lifting. Hernia severity was categorized into uncomplicated and complicated hernia based on documented clinical diagnosis. Data were analyzed using univariate analysis, Chi-square test, and Odds Ratio estimation with a 95% confidence level. Most patients were male (91.6%) and aged 46-65 years (52.6%). Blue-collar workers accounted for 56.8% of the sample, while white-collar workers accounted for 43.2%. Most patients had uncomplicated hernia (90.0%), while 10.0% had complicated hernia. The bivariate analysis showed a significant association between occupational category and inguinal hernia severity ($p = 0.040$). Blue-collar workers had approximately 3.1 times higher odds of experiencing complicated inguinal hernia than white-collar workers (OR = 3.145). These findings suggest that physically demanding occupations may be associated with greater clinical severity of inguinal hernia and should receive attention in occupational health screening and surgical referral decisions. However, the retrospective cross-sectional design limits causal inference, and residual confounding remains possible due to incomplete documentation of obesity, smoking, chronic cough, constipation, and comorbidities. Future prospective studies are therefore needed.

Introduction

A hernia is a condition in which intra-abdominal organs or tissues protrude through a weakened area of the abdominal wall due to increased intra-abdominal pressure or defects in the supporting connective tissue (Sharma et al., 2023). Inguinal hernia is the most common type, accounting for approximately 75% of all abdominal wall hernias, with a higher incidence in males than females because of anatomical differences in the inguinal canal (Vad et al., 2012). Anatomically, inguinal hernias are classified into indirect inguinal hernias, which pass through the internal inguinal ring into the inguinal canal, and direct inguinal hernias, which protrude through the posterior wall of the inguinal canal within Hesselbach's triangle (Tobias et al., 2020).

Clinically, an inguinal hernia is characterized by the protrusion of abdominal contents through the inguinal canal in the groin region. The condition may progress through various stages of severity, ranging from reducible hernias to incarcerated and strangulated hernias, which may

DOI: https://doi.org/10.71435/738851

result in ischemia, tissue necrosis, and life-threatening complications (Rochet & McDonald, 2015). Based on severity, inguinal hernias are generally classified as uncomplicated or complicated. Uncomplicated hernias can be reduced without major complications, whereas complicated hernias involve obstruction or strangulation and often require emergency surgical intervention, with mortality rates reported to range from 10% to 50% (Council for Medical Schemes, 2023).

The development and severity of inguinal hernia are influenced by multiple interacting factors. Well-established risk factors include advanced age, obesity, chronic cough, chronic constipation, smoking, chronic obstructive pulmonary disease (COPD), pregnancy, trauma, and connective tissue weakness (Dixon & Lacy, 2018; Farooq et al., 2019). These conditions may increase intra-abdominal pressure or compromise the structural integrity of the abdominal wall, thereby contributing not only to hernia formation but also to disease progression and severity (Nixon et al., 2011; Rembune et al., 2022).

Among the various risk factors, occupational activities involving repetitive heavy lifting have received considerable attention. In occupational health, strenuous physical activities such as lifting and carrying heavy loads repeatedly can significantly increase intra-abdominal pressure and place continuous mechanical stress on the abdominal wall and inguinal canal structures (Andriani et al., 2017; Octaviaji & Hidayati, 2021). Recurrent increases in intra-abdominal pressure may gradually weaken the posterior wall of the inguinal canal, facilitating hernia formation and potentially accelerating its progression toward more severe conditions (Wahyuni, 2019; Shams et al., 2025; Dudai & Paajenen, 2025).

Based on occupational characteristics, workers can generally be classified as blue-collar and white-collar workers (Rozell et al., 2011; Soto-Rodríguez et al., 2022; Biernat & Piątkowska, 2023). Blue-collar occupations, including construction workers, laborers, farmers, fishermen, and truck drivers, frequently involve manual handling of heavy loads and repetitive physical exertion (Hasibuan, 2001; Oakman etal., 2023; Odebiyi & Okafor, 2023). Such activities can generate intra-abdominal pressures exceeding 100 mmHg and increase mechanical stress on the abdominal wall. In contrast, white-collar workers primarily perform administrative tasks with lower physical demands and reduced exposure to these occupational risk factors (Sayuti & Aprilita, 2023; Adamopoulos & Syrou, 2022; Grabara, 2025; de Freitas Cardoso et al., 2022; Colla et al., 2024).

Globally, inguinal hernia remains a significant public health problem. Data from the Global Burden of Disease (GBD) 2019 study indicate that hernia prevalence affects approximately 1.7% of the global population and increases substantially after the age of 45 years (Ma et al., 2023). Abebe et al. (2022) reported a higher prevalence among men than women, at 7.7% and 1.1%, respectively, particularly in developing countries. Several studies have demonstrated that occupations involving heavy lifting increase the risk of inguinal hernia occurrence and complications. Vad et al. (2012) reported a 1.32-fold increase in risk, whereas Kuijer et al. (2020) found an increased risk of up to 2.30-fold (95% CI: 1.56–3.40).

Despite the growing body of evidence regarding occupational risk factors, most previous studies have focused primarily on the incidence of inguinal hernia rather than its severity or progression to complicated forms (Nixon et al., 2011; Tigora et al., 2025; Croghan et al., 2023; Huerta & Garza, 2025). Studies specifically evaluating the relationship between occupations involving heavy lifting and the severity of inguinal hernia remain limited. Furthermore, evidence from Indonesian populations concerning the influence of occupational heavy lifting on hernia severity is still scarce. Therefore, a significant research gap exists regarding the contribution of occupational physical workload to the severity of inguinal hernia.

DOI: https://doi.org/10.71435/738851

Based on these considerations, the novelty of this study lies in its focus on hernia severity rather than merely hernia incidence. This study specifically evaluates occupational heavy lifting as a potential risk factor for increased severity of inguinal hernia among patients treated at Prof. Dr. Margono Soekarjo Hospital during the 2022–2023 period. The findings are expected to provide local epidemiological evidence and support the development of occupational health interventions and preventive strategies aimed at reducing the burden of severe inguinal hernia.

Method

Study Design

This study used a retrospective observational analytical design with a cross-sectional approach. The design was selected to examine the association between occupational category and the severity of inguinal hernia among patients treated at Prof. Dr. Margono Soekarjo Hospital, Purwokerto, during the 2022–2023 period. The retrospective approach was used because the data were obtained from existing medical records. The cross-sectional approach was applied because the exposure variable, namely occupational category, and the outcome variable, namely inguinal hernia severity, were assessed at the same point of data review. This design was appropriate for identifying statistical associations between exposure and outcome variables. However, it could not establish temporal sequence or causal relationships. Therefore, the findings of this study were interpreted as associations rather than evidence of causation.

Study Setting and Period

The study was conducted at Prof. Dr. Margono Soekarjo Hospital, Purwokerto, Banyumas Regency, Central Java, Indonesia. This hospital was selected because it serves as a referral health facility and receives patients with various surgical conditions, including inguinal hernia. The study used medical record data from patients diagnosed with inguinal hernia during the 2022–2023 period. Data collection and review were carried out from June to August 2025. The use of this time frame allowed the researchers to obtain enough cases and assess the pattern of inguinal hernia severity in relation to occupational characteristics.

Population and Sample

The target population in this study consisted of all adult patients diagnosed with inguinal hernia. The accessible population included all patients with inguinal hernia who received treatment at Prof. Dr. Margono Soekarjo Hospital during the 2022–2023 period and whose medical records were available for review. The sample consisted of patients who met the inclusion and exclusion criteria. A minimum sample size of 96 participants was calculated using the Lemeshow formula with a 95% confidence level and a 10% margin of error. However, this study used a total sampling technique. Therefore, all eligible patients during the study period were included in the analysis. After applying the inclusion and exclusion criteria, 190 patients were included as the final study sample. The minimum sample size calculation was used to confirm that the final sample exceeded the required number for adequate statistical precision.

Inclusion and Exclusion Criteria

The inclusion criteria were patients aged 18 years or older, patients diagnosed with inguinal hernia, and patients with complete medical record information regarding occupation, diagnosis, and hernia severity. These criteria were applied to ensure that all selected records contained the core variables required for analysis. The exclusion criteria were patients with non-inguinal hernias, patients with recurrent hernias, patients with a history of previous abdominal surgery, and patients with incomplete medical records. Patients with recurrent hernias and previous

DOI: https://doi.org/10.71435/738851

abdominal surgery were excluded because these conditions could influence hernia severity through mechanisms that differed from occupational physical workload. Medical records with incomplete information on occupation, diagnosis, or hernia severity were excluded to reduce misclassification and improve data accuracy.

Study Variables

The independent variable in this study was occupational category. Occupation was classified into blue-collar and white-collar work based on the dominant physical demands of the job. The dependent variable was the severity of inguinal hernia, which was classified into uncomplicated and complicated hernia. This classification allowed the study to examine whether patients in occupations with higher physical demands had different patterns of hernia severity compared with patients in occupations with lower physical demands. Demographic characteristics, such as age and sex, were also collected to describe the profile of the study participants.

Operational Definitions

Occupational category was defined based on the type of work recorded in the medical record. Blue-collar workers were defined as patients whose occupations commonly involved manual labor, physical exertion, or regular lifting activities. This category included laborers, farmers, construction workers, fishermen, drivers, and other similar occupations. White-collar workers were defined as patients whose occupations mainly involved administrative, professional, or office-based activities with lower physical demands. This category included office employees, teachers, healthcare professionals, and other occupations with predominantly non-manual work characteristics. In this study, occupational category served as a proxy indicator of exposure to heavy lifting because direct measurements of lifting frequency, lifting load, work duration, and cumulative workload were not available in the medical records.

Inguinal hernia severity was determined based on the clinical diagnosis documented in the medical records. An uncomplicated inguinal hernia was defined as an inguinal hernia without obstruction, strangulation, or gangrene. A complicated inguinal hernia was defined as an inguinal hernia accompanied by obstruction, strangulation, and/or gangrene that required urgent clinical attention. This classification was used to distinguish patients with less severe presentations from those with clinically serious complications.

Data Source and Data Collection Procedure

This study used secondary data obtained from hospital medical records. The data included age, sex, occupation, diagnosis of inguinal hernia, and hernia severity. The researchers reviewed all medical records of patients diagnosed with inguinal hernia during the 2022–2023 period. Each record was screened according to the inclusion and exclusion criteria. Eligible records were then extracted using a structured data collection sheet to ensure consistency during data collection. The occupation recorded in the medical record was classified into blue-collar or white-collar categories. The severity of inguinal hernia was classified into uncomplicated or complicated hernia according to the documented clinical diagnosis.

Data Quality Control

Data quality control was performed before analysis. Each medical record was reviewed to assess completeness, consistency, and eligibility. Records with missing information on key variables were excluded from the analysis. The extracted data were checked to identify coding errors, duplicate entries, and inconsistent classifications. Occupational categories were reviewed carefully to ensure that each occupation was classified according to its dominant work characteristics. Hernia severity was also checked against the documented clinical diagnosis to

DOI: https://doi.org/10.71435/738851

reduce outcome misclassification. These procedures were conducted to improve the reliability of the dataset and reduce information bias.

Data Management

All collected data were coded before statistical analysis. Occupational category was coded as white-collar or blue-collar. Hernia severity was coded as uncomplicated or complicated. Age was grouped into relevant age categories, while sex was categorized as male or female. The coded data were entered into SPSS software for analysis. Data entry was checked to ensure that the values matched the original extraction sheet. Any inconsistent or unclear data were reviewed again using the source medical record before final analysis.

Statistical Analysis

Data analysis was performed using SPSS software. Univariate analysis was used to describe the distribution of respondent characteristics, occupational categories, and inguinal hernia severity. The results of the univariate analysis were presented as frequencies and percentages. Bivariate analysis was conducted to examine the association between occupational category and inguinal hernia severity. The Chi-square test was used when the expected cell counts met the test assumptions. Fisher's Exact Test was used when the expected cell counts were too small. The level of statistical significance was set at 95%, with an alpha value of 0.05. A p-value of less than 0.05 was considered statistically significant. Odds Ratios and 95% Confidence Intervals were calculated to estimate the strength and precision of the association between occupational category and hernia severity.

Bias and Confounding Control

Several potential sources of bias were considered in this study. Selection bias was reduced by using total sampling, which included all eligible patients during the study period. Information bias was reduced by reviewing medical records systematically and excluding records with incomplete information on key variables. However, exposure misclassification could still occur because occupational category was used as a proxy for heavy lifting. Not all blue-collar workers have the same lifting intensity, and some white-collar workers may perform physically demanding activities outside their formal occupation.

Potential confounding variables included obesity, smoking status, chronic cough, constipation, chronic obstructive pulmonary disease, and other comorbid conditions that may influence the severity of inguinal hernia. These variables could not be comprehensively analyzed because they were not consistently documented in all medical records. As a result, multivariable adjustment was not feasible. The findings should therefore be interpreted with caution because residual confounding may remain.

Result and Discussion

This section presents the general characteristics of the study respondents, including sex and age distribution, to provide a clear profile of patients diagnosed with inguinal hernia. These characteristics are relevant because demographic and biological factors may influence the clinical presentation and progression of inguinal hernia. The section then describes the distribution of hernia severity and occupational category to establish the main pattern of the study population. The association between occupational category and inguinal hernia severity is then analyzed to determine whether patients engaged in physically demanding occupations, particularly blue-collar work involving regular manual labor and heavy lifting, were more likely to present with complicated inguinal hernia. The discussion interprets these findings in

DOI: https://doi.org/10.71435/738851

relation to clinical progression, occupational exposure, preventive implications, and the limitations of retrospective medical record-based research.

Table 1. Characteristics of Respondents

Respondent Characteristics	Frequency	Percentage (%)
Sex		
Male	174	91.6
Female	16	8.4
Total	**190**	**100.0**
Age Group		
18-25 years	1	0.5
26-45 years	33	17.4
46-65 years	100	52.6
>65 years	56	29.5
Total	190	100.0

Table 1 shows that most patients diagnosed with inguinal hernia were male, with 174 cases, or 91.6% of the total sample. Female patients accounted for only 16 cases, or 8.4%. This finding indicates a clear male predominance among inguinal hernia patients in this study. The higher proportion of male patients is consistent with the anatomical characteristics of the male inguinal canal, where the passage of the spermatic cord creates a weaker area in the lower abdominal wall. This anatomical condition may increase susceptibility to inguinal hernia, especially when combined with increased intra-abdominal pressure or tissue weakening.

Based on age group, most patients were aged 46-65 years, with 100 patients, or 52.6%. The second largest group was patients aged more than 65 years, with 56 patients, or 29.5%. Patients aged 26-45 years accounted for 17.4%, while only 0.5% were aged 18-25 years. These findings suggest that inguinal hernia was more common among middle-aged and older adults. Aging may reduce collagen strength, decrease tissue elasticity, and weaken the abdominal wall. These physiological changes can make the inguinal region more vulnerable to hernia formation and progression. The predominance of patients aged 46 years and above also suggests that cumulative physical strain may interact with age-related tissue degeneration.

Table 2. Distribution of Inguinal Hernia Severity

Inguinal Hernia Severity	Frequency	Percentage (%)
Uncomplicated hernia	171	90.0
Complicated hernia	19	10.0
Total	190	100.0

Table 2 shows that most patients had uncomplicated inguinal hernia. A total of 171 patients, or 90.0%, were classified as uncomplicated cases. Meanwhile, 19 patients, or 10.0%, had complicated inguinal hernia. This finding indicates that most patients were treated before severe complications occurred. It may reflect earlier clinical recognition, access to hospital care, or patient presentation before progression to obstruction or strangulation. Although complicated cases represented only 10.0% of the sample, this group remains clinically important. Complicated inguinal hernia can lead to bowel obstruction, strangulation, ischemia, tissue necrosis, and increased morbidity. Therefore, the presence of complicated hernia among 19 patients suggests that delayed presentation or prolonged exposure to risk factors may still

DOI: https://doi.org/10.71435/738851

occur. This result highlights the need for early diagnosis, patient education, and timely surgical management to prevent progression from uncomplicated to complicated hernia.

Table 3. Distribution of Occupational Category

Occupational Category	Frequency	Percentage (%)
White-collar workers	82	43.2
Blue-collar workers	108	56.8
Total	190	100.0

Table 3 shows that most patients were blue-collar workers. A total of 108 patients, or 56.8%, were classified as blue-collar workers, while 82 patients, or 43.2%, were classified as white-collar workers. This finding indicates that a large proportion of inguinal hernia patients in this study had occupations with higher physical demands.

Blue-collar work often involves repeated manual activity, including lifting heavy objects, carrying loads, prolonged standing, and other forms of physical exertion. These activities may increase intra-abdominal pressure and place continuous mechanical stress on the abdominal wall and inguinal canal. Over time, repeated physical strain may contribute to the development or progression of inguinal hernia. However, this study used occupational category as a proxy for heavy-lifting exposure. It did not directly measure lifting load, lifting frequency, duration of exposure, or ergonomic conditions. Therefore, the occupational classification should be interpreted as an indirect indicator of physical workload.

Table 4. Association Between Occupational Category and Inguinal Hernia Severity

Occupational Category	Uncomplicated Hernia n (%)	Complicated Hernia n (%)	Total n (%)	p-value	OR	95% CI
White-collar workers	78 (95.1)	4 (4.9)	82 (100.0)	0.040	Reference	Reference
Blue-collar workers	93 (86.1)	15 (13.9)	108 (100.0)		3.145	1.00-9.85
Total	171 (90.0)	19 (10.0)	190 (100.0)			

Table 4 shows that complicated inguinal hernia was more frequent among blue-collar workers than among white-collar workers. Among white-collar workers, 4 of 82 patients, or 4.9%, had complicated hernia. Among blue-collar workers, 15 of 108 patients, or 13.9%, had complicated hernia. This difference indicates that patients with physically demanding occupations had a higher proportion of complicated hernia.

The Chi-square test showed a statistically significant association between occupational category and inguinal hernia severity, with a p-value of 0.040. Since the p-value was lower than 0.05, the association between occupational category and hernia severity was statistically significant. The Odds Ratio was 3.145, which means that blue-collar workers had approximately 3.1 times higher odds of developing complicated inguinal hernia compared with white-collar workers. The estimated 95% Confidence Interval was 1.00-9.85, indicating a borderline but statistically meaningful association.

DOI: https://doi.org/10.71435/738851

These findings suggest that blue-collar work may be associated with greater severity of inguinal hernia. Repetitive heavy lifting and strenuous physical activity can increase intra-abdominal pressure. Repeated increases in intra-abdominal pressure may weaken the posterior wall of the inguinal canal, enlarge an existing hernia defect, and increase the risk of incarceration or strangulation. This mechanism provides a plausible explanation for the higher proportion of complicated hernia among blue-collar workers.

However, the result should be interpreted carefully. The study design was retrospective and cross-sectional, so it could not establish a causal relationship. The findings only show an association between occupational category and inguinal hernia severity. In addition, occupational category was used as a proxy measure of heavy-lifting exposure. The study did not measure actual lifting intensity, lifting frequency, years of exposure, or cumulative workload. Some blue-collar workers may have lower physical exposure, while some white-collar workers may perform physically demanding activities outside their formal occupation.

Potential confounding factors also need to be considered. Variables such as obesity, smoking status, chronic cough, constipation, chronic obstructive pulmonary disease, and other comorbidities may influence the severity of inguinal hernia. These factors could not be fully analyzed because they were not consistently documented in the medical records. Therefore, residual confounding may remain. Future studies should collect these variables prospectively and use multivariable logistic regression to determine whether occupational heavy lifting remains independently associated with complicated inguinal hernia.

Occupational Heavy Lifting and the Clinical Severity of Inguinal Hernia

The central contribution of this study lies in shifting the discussion of occupational heavy lifting from the conventional question of hernia occurrence to the more clinically important question of hernia severity. Much of the existing literature treats inguinal hernia as an endpoint, focusing on whether a person develops a hernia or undergoes hernia repair. However, this approach is incomplete because inguinal hernia is not a static condition. It may remain reducible and uncomplicated, or it may progress toward incarceration, obstruction, strangulation, bowel ischemia, and emergency surgery. Therefore, the objective of this study was more specific: to examine whether occupations involving heavy lifting are associated with the severity of inguinal hernia among patients treated in a referral hospital setting.

This distinction is important because severity determines urgency, operative risk, resource use, and preventable morbidity. Global and population-based studies have shown that groin hernias represent a substantial surgical burden, particularly among men and older adults. The present study adds a more focused occupational argument by suggesting that manual work should not only be viewed as a possible contributor to hernia formation, but also as a potential marker of progression toward more serious clinical presentation.

The findings should be interpreted within the broader epidemiological and biological context of inguinal hernia. Male sex, older age, abdominal wall weakness, patent processus vaginalis, connective tissue changes, and cumulative mechanical exposure all contribute to hernia susceptibility. Heavy lifting should therefore not be understood as an isolated cause that mechanically creates a hernia in a normal abdominal wall. A stronger interpretation is that repetitive mechanical loading acts on a vulnerable anatomical and biological substrate. In this sense, occupational strain may function as a progression factor by worsening an existing defect, accelerating hernia enlargement, increasing irreducibility, and raising the likelihood of severe presentation.

DOI: https://doi.org/10.71435/738851

The biological plausibility of this association is supported by the relationship between intra-abdominal pressure and tissue competence. Lifting, squatting, carrying, pushing, pulling, coughing, and straining can increase intra-abdominal pressure. In blue-collar work, lifting is often performed repeatedly, in awkward positions, under time pressure, and without ideal ergonomic support. When these mechanical demands act repeatedly on the inguinal canal, the issue is not only a single peak load, but cumulative tissue stress over time. A reducible hernia exposed to recurrent pressure may become larger, more symptomatic, and more prone to trapping of abdominal contents.

Clinical, Occupational, and Policy Implications

The clinical implication of this study is direct. Surgeons and primary care clinicians should ask more detailed occupational questions when assessing patients with inguinal hernia. In many clinical records, occupation is often treated only as a demographic variable. This is insufficient. A patient's work may indicate repeated exposure to heavy lifting, prolonged standing, poor access to early care, limited rest, and economic pressure to continue working despite symptoms. Therefore, occupational history should become part of clinical risk assessment.

The relevant question is not only "What is your job?" but also "How much do you lift, how often, from what position, for how many years, and do symptoms worsen during work?" These questions can help identify patients who may need earlier surgical referral, closer follow-up, clearer warning-sign education, or temporary work modification. This is especially important for patients whose work requires daily heavy lifting, because they may not have the same risk profile as sedentary patients with small or minimally symptomatic hernias.

This argument also has implications for watchful waiting. Although watchful waiting can be safe for selected male patients with asymptomatic or minimally symptomatic inguinal hernia, it should not be applied mechanically. A manual worker who lifts heavy loads daily may require different clinical consideration from a patient with low physical workload. In workers exposed to repeated heavy lifting, watchful waiting may need closer monitoring, stronger safety-netting, and clearer discussion about work modification.

The prevention message should also be realistic. Advising manual workers simply to avoid heavy lifting is often impractical because many workers depend on physical labor for income. Therefore, prevention should focus on structured risk reduction. Occupational health programs should promote load limits, team lifting, mechanical aids, job rotation, rest intervals, safe lifting techniques, early reporting of groin swelling, and referral pathways for symptomatic workers. For hospitals, discharge counseling and outpatient advice should include occupation-specific recommendations. For employers, hernia prevention should be included in ergonomic risk management. For policymakers, inguinal hernia should be recognized as part of the broader health burden of physically demanding labor.

The severity focus also has implications for emergency surgical burden. Complicated groin hernia is not only a more advanced form of the same disease; it changes the entire clinical pathway. Emergency repair is associated with higher morbidity, higher mortality, longer hospital stays, greater possibility of bowel resection, and higher resource use than elective repair. If blue-collar workers are more likely to present with complicated hernia, then the issue is not limited to surgical technique. It also involves delayed recognition, delayed referral, work-related symptom tolerance, and structural barriers to elective care.

DOI: https://doi.org/10.71435/738851

Methodological Considerations and Future Research Directions

This study also exposes a methodological weakness in how occupation is commonly recorded in hospital data. Classifying work only as blue-collar or white-collar is useful as an initial approximation, but it is not enough for mature occupational epidemiology. Occupational titles are crude markers of exposure. A driver may or may not lift heavy goods. A farmer may perform intense manual labor or mainly supervise others. A construction worker may use mechanical aids or carry loads manually. This heterogeneity can create exposure misclassification.

Future studies should therefore move toward more precise occupational exposure assessment. Researchers should record load weight, lifting frequency, years of employment, posture during lifting, use of lifting aids, daily standing duration, work breaks, symptom provocation during work, and whether the worker continued lifting after hernia symptoms appeared. Job-exposure matrices, structured occupational questionnaires, and prospective follow-up would provide stronger evidence than broad occupational labels.

Confounding factors also require careful consideration. Hernia severity may be influenced by obesity, chronic cough, constipation, chronic obstructive pulmonary disease, smoking, diabetes, connective tissue disorders, family history, age, sex, and previous abdominal wall weakness. The inability to control all these variables in retrospective records is a limitation. However, this limitation should not lead to dismissing occupational workload. Instead, it highlights the need for stronger prospective or multicenter studies that can test whether heavy lifting remains independently associated with complicated hernia after controlling for relevant clinical and socioeconomic factors.

The concept of severity should also be developed further. In this study, severity was classified into uncomplicated and complicated hernia, which is clinically meaningful because obstruction, strangulation, and gangrene represent serious escalation. However, future research may use a more multidimensional severity framework, including hernia size, reducibility, pain intensity, symptom duration, frequency of irreducibility, impact on work, emergency presentation, bowel resection, operative complexity, and postoperative morbidity. This would help determine whether occupational heavy lifting is mainly associated with anatomical progression, delayed presentation, emergency status, operative complexity, or recovery after surgery.

Conclusion

This study found that occupational category was significantly associated with the severity of inguinal hernia among patients treated at Prof. Dr. Margono Soekarjo Hospital during the 2022-2023 period. Most patients were male, middle-aged or older adults, and worked in blue-collar occupations. Although uncomplicated hernia was the most common clinical presentation, complicated hernia occurred more frequently among blue-collar workers than among white-collar workers. The statistical analysis showed a significant association between blue-collar work and complicated inguinal hernia, with blue-collar workers having approximately three times higher odds of experiencing complicated hernia. These findings suggest that physically demanding work, particularly work involving repetitive heavy lifting, may contribute to the clinical progression of inguinal hernia. However, because this study used a retrospective cross-sectional design and relied on medical record data, the findings should be interpreted as evidence of association rather than causation. Future studies should use prospective designs, detailed occupational exposure measurements, and adjustment for confounding factors such as

DOI: https://doi.org/10.71435/738851

obesity, smoking, chronic cough, constipation, and other comorbidities to strengthen the evidence on the role of occupational workload in inguinal hernia severity.

References

Abebe, M. S., Tareke, A., Alem, A., Debebe, W., & Beyene, A. (2022). Worldwide magnitude of inguinal hernia: A systematic review and meta-analysis of population-based studies. *SAGE Open Medicine*, *10*, 20503121221139150. https://doi.org/10.1177/20503121221139150

Adamopoulos, I. P., & Syrou, N. F. (2022). Workplace safety and occupational health job risks hazards in public health sector in Greece. *European Journal of Environment and Public Health*, *6*(2), em0118. https://doi.org/10.21601/ejeph/12229

Afolabi, O. G., Adegbamigbe, A. B., Oluwajuyigbe, M. E., Okunlola, A. I., Adegbamigbe, A., & Oluwajuyigbe, M. (2026). Patterns and Outcomes of Surgically Treated Non-traumatic Acute Abdomen in a Teaching Hospital in Nigeria: A 10-Year Retrospective Study. *Cureus*, *18*(6). https://doi.org/10.7759/cureus.110608

Almarhabi, T. A., Almahdawi, M. S., Ibrahim, H., & Alnashri, K. H. (2022). Knowledge and attitude towards hernia among adults in Al-Qunfudhah, Saudi Arabia; a cross-sectional community-based study. *hernia*, *9*, 10.

Andriani, M., Hasan, M. T., & Fradila, S. (2017). Perbaikan beban kerja pegawai tidak tetap badan pertanahan nasional melalui redesign system. *Jurnal Sistem Teknik Industri*, *19*(2), 95–102.

Biernat, E., & Piątkowska, M. (2023). Sedentary behaviour as a lifestyle risk factor in public health–Evidence of white-collar and blue-collar workers from Poland. *Annals of Agricultural and Environmental Medicine*, *30*(4), 743-748. https://doi.org/10.26444/aaem/165980

Colla, N., Maul, J. T., Vallejo-Yagüe, E., Burden, A. M., Möller, B., Nissen, M. J., ... & Micheroli, R. (2024). Impact of blue-collar vs. white-collar occupations on disease burden in psoriatic arthritis patients: A Swiss clinical quality management in rheumatic diseases cohort study. *Clinical Rheumatology*, *43*(10), 3147-3155. https://doi.org/10.1007/s10067-024-07077-1

Council for Medical Schemes. (2023). *Final prescribed minimum benefit (PMB) definition guideline: Uncomplicated hernias below 18 years and hernias with obstruction or gangrene*. CMS.

Croghan, S. M., Mohan, H. M., Breen, K. J., McGovern, R., Bennett, K. E., Boland, M. R., ... & Fleming, C. A. (2023). Global incidence and risk factors associated with postoperative urinary retention following elective inguinal hernia repair: the retention of urine after inguinal hernia elective repair (RETAINER I) study. *JAMA surgery*, *158*(8), 865-873. https://doi.org/10.1001/jamasurg.2023.2137

de Freitas Cardoso, V., Stefane, C. A., de Barros, F. C., Gonçalves, J. S., Figueiredo, L. C., & de Oliveira Sato, T. (2022). Influence of gender and age on musculoskeletal symptoms in white-collar and blue-collar workers: a cross-sectional study. *International Journal of Occupational Safety and Ergonomics*, *28*(4), 2482-2491. https://doi.org/10.1080/10803548.2022.2037325

Dixon, R., & Lacy, M. (2018). Risk factors for inguinal hernia: A review of the literature. *American Journal of Surgery*, *215*(4), 658–663.

DOI: https://doi.org/10.71435/738851

https://doi.org/10.1016/j.amjsurg.2017.12.012

Dudai, M., & Paajanen, H. (2025). Narrative Review and Clinical Recommendations for Sportsman's Hernia and Athletic Pubalgia Based on 30 Years of Expert Experience. *Journal of Abdominal Wall Surgery*, *4*, 15394.

Dwyer, D., Ye, R. R., Nelson, B., & McGorry, P. (2025). Clinical staging for psychiatry and psychology. *Annual Review of Clinical Psychology*, *21*(1), 497-527. https://doi.org/10.1146/annurev-clinpsy-081423-025310

Farooq, S., Chaudhry, A., Ahmad, Z., Khan, M. A., & Rehman, A. U. (2019). Ultrasound diagnosis of hernia. *Journal of Clinical Imaging Science*, *9*(1), 58. https://doi.org/10.25259/JCIS_78_2019

Ferranti, F. (2023). Incarcerated Inguinal Hernia in the Elderly: Surgical Implication. In *Hernia Updates and Approaches*. IntechOpen.

Fitzgibbons Jr, R. J., & Forse, R. A. (2015). Groin hernias in adults. *New England Journal of Medicine*, *372*(8), 756-763.

Grabara, M. (2025). Prevalence of musculoskeletal disorders among Polish white-collar workers: the role of physical activity and risk factors. *Frontiers in Public Health*, *13*, 1551728. https://doi.org/10.3389/fpubh.2025.1551728

Güneş, E., & Ayaz-Alkaya, S. (2022). The effect of health education on prevention of low back pain for health caregivers and cleaning workers. *International Journal of Nursing Practice*, *28*(1), e12973. https://doi.org/10.29011/2574-7754.101054

Hasibuan, M. S. P. (2001). *Manajemen sumber daya manusia*. Bumi Aksara.

Hollingshead, J., & Thomas, C. T. (2025). Emergency small and large bowel surgery and surgery for benign disease. In *Farquharson's Textbook of Operative General Surgery* (pp. 243-271). CRC Press. https://doi.org/10.1201/9781003341710

Huang, Y., Lee, J., McFadden, A. C., Murphy, L. A., Robertson, M. M., Cheung, J. H., & Zohar, D. (2017). Ergonomics and musculoskeletal disorders in the workplace. *International Journal of Environmental Research and Public Health*, *14*(12), 1560. https://doi.org/10.3390/ijerph14121560

Huerta, S., & Garza, A. M. (2025). A systematic review of open, laparoscopic, and robotic inguinal hernia repair: management of inguinal hernias in the 21st century. *Journal of Clinical Medicine*, *14*(3), 990. https://doi.org/10.3390/jcm14030990

Hutsebaut, J., Videler, A. C., Verheul, R., & Van Alphen, S. P. (2019). Managing borderline personality disorder from a life course perspective: Clinical staging and health management. *Personality Disorders: Theory, Research, and Treatment*, *10*(4), 309. https://doi.org/10.1037/per0000341

Joyce, S., Murphy, K. P., Maher, M. M., & O'Connor, O. J. (2022). Abdominal cavity: anatomy, structural anomalies, and hernias. *Yamada's Textbook of Gastroenterology*, 131-145.

Kuijer, P. P. F. M., Hondebrink, D., Hulshof, C. T. J., & van der Molen, H. F. (2020). Work-relatedness of inguinal hernia: A systematic review including meta-analysis and GRADE. *Hernia*, *24*(5), 943–950. https://doi.org/10.1007/s10029-020-02193-1

Ma, Q., Jing, W., Liu, X., Liu, J., Liu, M., & Chen, J. (2023). The global, regional, and national

DOI: https://doi.org/10.71435/738851

burden and its trends of inguinal, femoral, and abdominal hernia from 1990 to 2019. *International Journal of Surgery*, *109*, 333–342. https://doi.org/10.1097/JS9.0000000000000025

Nixon, A. E., Mazzola, J. J., Bauer, J. R., Krueger, J. R., & Spector, P. E. (2011). Can work stress interfere with health and work performance? *Journal of Applied Psychology*, *96*(2), 361–376. https://doi.org/10.1037/a0021726

Oakman, J., Macdonald, W. A., & McCredie, K. (2023). Psychosocial hazards play a key role in differentiating MSD risk levels of workers in high-risk occupations. *Applied Ergonomics*, *112*, 104053. https://doi.org/10.1016/j.apergo.2023.104053

Octaviaji, M. R., & Hidayati, R. A. (2021). Analisis beban kerja mental karyawan di laboratorium PT ABC menggunakan metode NASA-TLX. *Jurnal Ergonomi Indonesia*, *7*(1), 23–30.

Odebiyi, D. O., & Okafor, U. A. C. (2023). Musculoskeletal disorders, workplace ergonomics and injury prevention. In *Ergonomics-new insights*. IntechOpen. https://doi.org/10.5772/intechopen.106031

Pirvu, C., Pantea, S., Popescu, A., Grigoras, M. L., Bratosin, F., Valceanu, A., ... & Selaru, M. (2022). Difficulties in diagnosing extraperitoneal ureteroinguinal hernias: a review of the literature and clinical experience of a rare encounter in acute surgical care settings. *Diagnostics*, *12*(2), 353. https://doi.org/10.3390/diagnostics12020353

Quick, J. A., Beffa, L. R., & Barnes, S. L. (2022). Abdominal Wall Hernias. In *The Acute Management of Surgical Disease* (pp. 177-195). Cham: Springer International Publishing.

Rembune, Z., Syapitri, S., Lubis, Z. A., & Saragi, M. P. D. (2022). Aspirasi karir mahasiswa tingkat akhir BPI UIN Sumatera Utara dalam mencari pekerjaan. *Jurnal Pendidikan dan Konseling (JPDK)*, *4*(6), 2950–2956. https://doi.org/10.31004/jpdk.v4i6.8667

Rios-Diaz, A. J., Cunning, J., Hsu, J. Y., Elfanagely, O., Marks, J. A., Grenda, T. R., ... & Fischer, J. P. (2021). Incidence, burden on the health care system, and factors associated with incisional hernia after trauma laparotomy. *JAMA surgery*, *156*(9), e213104. https://doi.org/10.1001/jamasurg.2021.3104

Rochet, S., & McDonald, A. (2015). Biomechanics of heavy lifting and hernia development. *Journal of Surgical Research*, *193*(2), 424–429. https://doi.org/10.1016/j.jss.2014.08.056

Rozell, E., Pettijohn, C., & Parker, R. (2011). White vs. blue: Does the collar color affect job attitudes and behaviors? *Academy of Strategic Management Journal*, *10*, 65–80.

Ruhl, C. E., & Everhart, J. E. (2007). Risk factors for inguinal hernia among adults in the US population. *American journal of epidemiology*, *165*(10), 1154-1161. https://doi.org/10.1093/aje/kwm011

Sayuti, M., & Aprilita, R. (2023). Teknik operasi hernia inguinalis dan faktor risiko hernia inguinalis residif di 7 rumah sakit perifer di Aceh. *Jurnal Ilmu Kesehatan dan Gizi*, *1*(3), 98–107. https://doi.org/10.55606/jikg.v1i3.1612

Shams, M., Kapur, A., Mian, A., & Marples, R. (2025). Abdominal Wall, Bowel Obstruction and Hernia. In *Hamilton Bailey's Emergency Surgery* (pp. 582-599). CRC Press. https://doi.org/10.1016/j.emc.2011.01.004

DOI: https://doi.org/10.71435/738851

Sharma, D., Singh, A., & Bhardwaj, S. (2023). Inguinal hernias in adults: Epidemiological, clinical and surgical aspects. *International Journal of Surgery Research*, *10*(3), 12–19.

Soto-Rodríguez, F. J., Pérez-Mármol, J. M., Bascour-Sandoval, C., Muñoz-Poblete, C., & Marzuca-Nassr, G. N. (2022). The association of musculoskeletal complaints and individual and work-related factors with work ability in Chilean white-collar and blue-collar workers. *International Journal of Occupational Safety and Ergonomics*, *28*(2), 1077-1084. https://doi.org/10.1080/10803548.2020.1865639

Tigora, A., Radu, P. A., Garofil, D. N., Bratucu, M. N., Zurzu, M., Paic, V., ... & Ramboiu, S. (2025). Modern perspectives on inguinal hernia repair: a narrative review on surgical techniques, mesh selection and fixation strategies. *Journal of Clinical Medicine*, *14*(14), 4875. https://doi.org/10.3390/jcm14144875

Tobias, M., Vining, J., & Gaw, L. (2020). Risk factors for inguinal hernia: The role of obesity and chronic disease. *Clinical Surgery Journal*, *37*(5), 1022–1030.

Vad, M. V, Frost, P., Bay-Nielsen, M., & Svendsen, S. W. (2012). Impact of occupational mechanical exposures on risk of lateral and medial inguinal hernia requiring surgical repair. *Occupational and Environmental Medicine*, *69*(11), 802–809. https://doi.org/10.1136/oemed-2012-100787

Wahyuni, E. S. (2019). Hubungan berat beban terhadap tingkat kejadian nyeri punggung bawah pada pekerja buruh angkut Pasar Legi Surakarta. *Interest: Jurnal Ilmu Kesehatan*, *8*(2), 158–161. https://doi.org/10.37341/interest.v8i2.170

Yangsap, A. (2025). *The evaluation of the effectiveness of industrial back-support exoskeleton (BSEs) in caregiving activities* (Doctoral dissertation, Loughborough University).

DOI: https://doi.org/10.71435/738851