



Workload, Fatigue, and The Incidence of Gastric Acid Disease: A Study of JNE Couriers in Medan City

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Abstract. Courier workers face high occupational demands that may impact their health, including gastrointestinal disorders. This study aimed to analyze the association between workload, work fatigue, and the incidence of gastric acid disease among package delivery couriers. An observational analytical study with a cross-sectional design was conducted in March 2025 at the main branch office of PT JNE in Medan. All 50 couriers were included as participants via total sampling. Primary data were collected through structured interviews using a pre-tested questionnaire. Data analysis involved univariate and bivariate analysis using the Chi-Square test. The incidence of gastric acid disease was 72%. Most couriers reported high physical workload (66%), high to very high mental workload (72%), and high to very high work fatigue (68%). Statistically significant associations were found between the incidence of gastric acid disease and physical workload ($p = 0.047$), mental workload ($p = 0.022$), and work fatigue ($p < 0.001$). The strongest association was with work fatigue, where 100% of couriers with high and very high fatigue levels experienced gastric acid disease. In conclusion, workload and work fatigue are significantly associated with the incidence of gastric acid disease among couriers.

Keywords: Workload, Work Fatigue, Gastric Acid Disease, Courier

1 Introduction

Gastritis is a gastrointestinal disorder characterized by inflammation of the stomach lining, often accompanied by symptoms such as nausea, vomiting, and abdominal pain [25]. The most prevalent form of gastritis—*Helicobacter pylori*-associated gastritis—is typically transmitted through contaminated food or water and affects approximately 50% of the global population, with the highest prevalence observed in developing countries [2–4]. In Indonesia, gastritis affects approximately 40.8% of the population, primarily linked to *H. pylori* infection [5].

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Recent evidence also indicates that gastritis represents an emerging public health concern among adolescents and young adults in urban areas, with prevalence ranging between 30% and 65% [6]. This condition remains a major global health concern because it contributes to the development of gastric ulcers and significantly increases the risk of gastric cancer, particularly among individuals with chronic or untreated gastritis [7]. In addition to leading to peptic ulcers and cancer, gastritis can cause persistent discomfort, impair quality of life, and result in serious complications if left untreated [8]. Furthermore, individuals engaged in high-stress occupations, such as delivery riders, are particularly vulnerable due to irregular eating habits, physical strain, and mental stress associated with their work—all of which exacerbate gastrointestinal disturbances and heighten susceptibility to gastritis [9,10].

Occupational workload is a critical factor influencing the incidence of gastritis, particularly among courier workers [11]. The physical demands of prolonged working hours, exposure to extreme weather, traffic congestion, and pressure to meet delivery targets contribute to chronic stress and fatigue, which can impair digestive health [9]. Excessive workload, in conjunction with irregular eating schedules and insufficient rest, increases vulnerability to gastrointestinal disturbances and heightens the risk of gastritis [12]. Repeated fatigue and disrupted digestive rhythms create favorable conditions for mucosal irritation, particularly among couriers who face high physical and psychological stress [9,13].

Previous studies have identified several occupational factors contributing to gastritis among workers. Employees working more than 55 hours per week are at a significantly higher risk of endoscopic gastritis, including superficial, erosive, and atrophic types [15]. Moreover, night-shift workers exhibit more than twice the odds of developing gastritis compared with non-shift workers [16]. Psychosocial stress and physical fatigue exacerbate this risk through disturbances in the brain–gut axis, resulting in hypersecretion of gastric acid, reduced mucosal blood flow, and diminished bicarbonate secretion, thereby compromising gastric mucosal integrity [17]. Lifestyle behaviors shaped by occupational stress—such as irregular meals and sleep deprivation—further amplify susceptibility to gastritis, especially among courier workers subject to chronic fatigue and strict delivery schedules [15,16].

The work environment is increasingly recognized as a determinant of gastrointestinal health. Employees in high-demand sectors report higher rates of digestive disorders due to extended working hours and occupational stressors [18]. Epidemiological data indicate that approximately 38% of healthcare workers and 27% of industrial employees experience chronic gastritis symptoms, underscoring the workplace as a key contributor to gastrointestinal morbidity. The underlying mechanisms often involve prolonged activation of the hypothalamic–pituitary–adrenal (HPA) axis, leading to increased gastric acid secretion, weakened mucosal defense, and greater susceptibility to *H. pylori* infection [19]. Beyond individual health impacts, occupationally related gastritis is associated with reduced productivity, increased absenteeism, and elevated healthcare costs, constituting a substantial economic and public health burden [20,21].

Therefore, the aim of the present study is to examine the association between workload-related factors and the prevalence of gastritis among courier workers, and to identify key occupational and psychosocial determinants contributing to its development. The findings are expected to provide evidence-based insights for the design of workplace health interventions that promote gastrointestinal well-being and occupational sustainability.

2 Methods

This study was designed as an observational analytical study with a cross-sectional approach. The design enabled a simultaneous examination of the effects of the independent variables on the dependent variable, the incidence of gastric acid disease, at a single point in time. The research was conducted at the main branch office of PT JNE Express in Medan in March 2025. The study population consisted of all motorcycle-based package delivery couriers employed by the company. Using a total sampling technique, all 50 couriers were included as participants in this study.

Primary data were collected directly from respondents through structured interviews using a pre-tested questionnaire specifically developed to measure the categorized research variables. Physical workload was classified into two categories: “short-term work” and “immediate action required.” Mental workload was categorized as “low,” “moderate,” “high,” or “very high.” Work fatigue was assessed and grouped into four categories: “low,” “moderate,” “high,” and “very high.” The dependent variable, the incidence of gastric acid disease, was dichotomously categorized as either “gastric acid disease” (for respondents experiencing symptoms) or “no gastric acid disease” (for those without symptoms).

Data analysis was carried out in two stages. In the first stage, univariate analysis was performed to describe the frequency distribution and percentage of each variable. In the second stage, bivariate analysis was used to test the research hypothesis regarding the associations between independent and dependent variables. As all variables were categorical, the Chi-Square (X^2) test was applied for statistical testing. Statistical significance was determined at a p-value below the established threshold ($\alpha = 0.05$). Ethical clearance for this study was obtained from the Health Research Ethics Committee of Universitas Prima Indonesia (Number: 117/KEPK/UNPRI/III/2025).

3 Results

Table 1 details the distribution of work-related factors and health status among the 50 respondents surveyed. The data on physical workload indicates that a significant majority, 33 individuals (66%), experienced a workload level categorized as “Immediate Action Required.” The remaining 17 respondents (34%) were classified under “Short-Term Work.” Regarding mental workload, the most common category was “High,” reported by over half of the participants at 26 individuals (52%). An equal number of respondents, 10 individuals (20%) each, fell

into the “Moderate” and “Very High” categories. The smallest group, consisting of 4 respondents (8%), reported a “Low” mental workload.

Table 1. Distribution of respondents by work-related factors and health status (n=50)

Variable	Frequency %	
Physical Workload		
Short-Term Work	17	34
Immediate Action Required	33	66
Mental Workload		
Low	4	8
Moderate	10	20
High	26	52
Very High	10	20
Work Fatigue		
Low	5	10
Moderate	11	22
High	15	30
Very High	19	38
Incidence of Acid Reflux Disease		
Yes	36	72
No	14	28

The analysis of work fatigue shows a similar trend toward higher intensity. The most frequently reported level was “Very High,” with 19 respondents (38%), followed closely by “High” fatigue, reported by 15 respondents (30%). “Moderate” fatigue was experienced by 11 individuals (22%), while only 5 respondents (10%) reported “Low” fatigue. Finally, the health status data reveals a high prevalence of acid reflux disease. A substantial majority of the participants, 36 individuals (72%), reported experiencing the condition, while the remaining 14 respondents (28%) did not.

The analysis reveals a statistically significant association between workload, work fatigue, and the incidence of acid reflux disease among delivery couriers (see Table 2). Regarding physical workload, a higher incidence of acid reflux was observed in the group with more demanding tasks. Among couriers whose jobs were categorized as “Immediate Action Required,” 81.8% (27 out of 33) reported experiencing acid reflux. In contrast, for those in the “Short-Term Work” category, the incidence was lower at 52.9% (9 out of 17). This association between physical workload and acid reflux is statistically significant, as indicated by a p-value of 0.047.

A similar trend was identified for mental workload. The data shows a clear dose-response relationship, where the prevalence of acid reflux increases progressively with higher levels of mental strain. The incidence was lowest in the “Low” mental workload group at 25.0%, increasing to 60.0% for the “Moderate” group, 73.1% for the “High” group, and culminating in 100.0% for all 10 couriers in

Table 2. Association between workload (physical and mental), work fatigue, and the incidence of gastritis among delivery couriers

Variable	Yes (n)	Yes (%)	No (n)	No (%)	Total (n)	Total (%)	p
Physical Workload							0,047
Short-Term Work	9	52,9	8	47,1	17	100,0	
Immediate Action Required	27	81,8	6	18,2	33	100,0	
Mental Workload							0,022
Low	1	25,0	3	75,0	4	100,0	
Moderate	6	60,0	4	40,0	10	100,0	
High	19	73,1	7	26,9	26	100,0	
Very High	10	100,0	0	0,0	10	100,0	
Work Fatigue							< 0,001
Low	2	40,0	3	60,0	5	100,0	
Moderate	0	0,0	11	100,0	11	100,0	
High	15	100,0	0	0,0	15	100,0	
Very High	19	100,0	0	0,0	19	100,0	

the “Very High” mental workload category. This strong, graduated association is statistically significant, with a p-value of 0.022.

The most pronounced relationship was observed with work fatigue. There is a dramatic increase in acid reflux incidence corresponding to higher fatigue levels. While the “Low” fatigue group had a 40.0% incidence and the “Moderate” fatigue group reported no cases (0.0%), every single courier in both the “High” (15 individuals) and “Very High” (19 individuals) fatigue categories experienced acid reflux, corresponding to a 100.0% incidence rate in these groups. This powerful association is highly statistically significant, demonstrated by a p-value of < 0.001.

4 Discussion

This study reveals a significant and concerning prevalence of high-intensity work-related stressors and a corresponding high incidence of acid reflux disease among delivery couriers. The findings demonstrate that the occupational demands placed on this group are substantial, with a majority of couriers reporting high physical workload (66%), high to very high mental workload (72%), and high to very high work fatigue (68%). The concurrent finding that 72% of the surveyed population experience acid reflux disease suggests a strong link between these occupational factors and gastrointestinal health.

The bivariate analysis confirms this link, establishing statistically significant associations between the incidence of acid reflux disease and all three variables examined: physical workload (p=0.047), mental workload (p=0.022), and work fatigue (p<0.001). The relationship with physical workload indicates that more

strenuous tasks, categorized as “Immediate Action Required,” are associated with a considerably higher likelihood of experiencing acid reflux (81.8%) compared to less demanding work. This may be attributable to increased intra-abdominal pressure during physical exertion, coupled with irregular meal patterns often necessitated by demanding delivery schedules, both of which are known risk factors for gastroesophageal reflux.

The available evidence strongly supports significant associations between work-related factors and gastroesophageal reflux disease, with multiple studies confirming links between physical workload, occupational stress, and GERD incidence. The evidence base includes several robust studies supporting these relationships. Reference [22] conducted Mendelian randomization analysis demonstrating that heavy manual/physical work, shift work, and prolonged standing/walking are causal risk factors for GERD. Reference [23] specifically validated the intra-abdominal pressure mechanism, showing significantly higher reflux symptoms among professional singers, wind players, and glassblowers compared to controls, with symptoms correlating with duration of occupational exposure. For mental workload, [24] provided population-based evidence from 65,333 participants, finding high job demands (OR 1.9), job strain (OR 1.9), and low job satisfaction (OR 2.0) significantly associated with severe GERD symptoms. Reference [25] corroborated work-related impacts, showing 25.57% GERD prevalence among 3,590 auto factory workers, with significantly higher rates in rotatory shift workers.

Furthermore, the data demonstrates a compelling dose-response relationship between mental workload and acid reflux. As mental workload increased from “Low” to “Very High,” the incidence of acid reflux rose progressively from 25.0% to a striking 100.0%. This graduated effect underscores the potent role of psychological stress in gastrointestinal pathophysiology. The “brain-gut axis” provides a physiological basis for this connection, whereby psychological stressors can alter gastric acid secretion, impair esophageal motility, and increase visceral sensitivity, thereby triggering or exacerbating reflux symptoms. Given that the vast majority of the couriers in this cohort experience high levels of mental workload, this finding is of paramount clinical and occupational health importance.

The available evidence strongly supports the stress-acid reflux relationship described, though with important mechanistic nuances that warrant consideration. Multiple controlled studies demonstrate that psychological stress significantly impacts GERD symptoms and pathophysiology [26, 27]. The brain-gut axis mechanisms cited are well-established, with stress affecting gastric secretion, gut motility, mucosal permeability and barrier function, visceral sensitivity and mucosal blood flow [28]. However, the evidence reveals complexity: while stress consistently increases subjective reflux symptoms, some studies found no corresponding increase in objective acid reflux parameters [27]. This suggests stress may enhance symptom perception through central mechanisms without increasing the amount of acid reflux [26]. The occupational health implications are significant, as occupational stress and GIT diseases is evident in everyday

clinical practice, supporting the clinical importance for high-stress occupations like courier work [29].

The most profound association identified in this study was between work fatigue and acid reflux, with a highly significant p-value of less than 0.001. The results are stark: while no couriers with moderate fatigue reported acid reflux, 100% of those experiencing both “High” and “Very High” levels of fatigue were affected. Work fatigue likely represents a cumulative state resulting from sustained physical and mental exertion. This state of exhaustion can lead to the dysregulation of the autonomic nervous system, poor dietary choices, and a diminished capacity to cope with stress, creating a cascade of physiological events that culminates in a significantly elevated risk for acid reflux. The fact that every participant reporting high or very high fatigue also reported acid reflux highlights fatigue as a critical indicator and potentially a key mediator in the pathway between occupational strain and gastrointestinal disease in this population.

The available evidence strongly supports a bidirectional relationship between work fatigue and acid reflux/GERD, though the studies demonstrate varying effect sizes and mechanisms. Multiple studies corroborate this association across different populations. Reference [30] found reflux esophagitis significantly associated with high stress (OR 1.94, 95% CI 1.25–3.02) among 6,834 subjects, with fatigue highly correlated with stress levels. Reference [31] demonstrated that GERD symptoms were significantly associated with general/physical fatigue and mental fatigue. Reference [32] identified gastrointestinal sequelae as established consequences of fatigue in their comprehensive review. Reference [33] specifically demonstrated fatigue as a mediator between occupational strain and health outcomes in delivery workers.

5 Conclusion

In conclusion, the findings of this study strongly suggest that the demanding nature of package delivery work, characterized by high physical and mental workloads, contributes directly to high levels of work fatigue, which in turn is powerfully associated with the incidence of acid reflux disease. The high prevalence of these risk factors and the disease itself within the study population highlights an urgent need for targeted occupational health interventions aimed at mitigating workload, managing stress, and preventing work-related fatigue to protect the gastrointestinal health of this essential workforce.

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