Occupational Health Risks and Health-Care Burden Among Informal Construction Workers in Wayanad District, Kerala

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ABSTRACT

The construction sector is one of the most labour-intensive yet hazardous segments of the informal economy. Workers are exposed to multiple occupational risks, including work at height, heavy manual labour, dust and cement exposure, unsafe machinery, heat stress, dehydration, and musculoskeletal strain. This study examines occupational health risks and the associated health-care burden among informal construction workers in Kerala using primary data from 243 workers across various occupational categories. The findings reveal that occupational health outcomes are shaped not only by working hours but also by exposure conditions, safety practices, and access to basic amenities such as drinking water and health insurance. Approximately one-fourth of workers reported work-related injuries within the past year, while protective equipment usage remains irregular. Heat stress and dehydration emerge as critical concerns, compounded by inadequate access to safe drinking water. The study highlights that health-care burden extends beyond treatment expenditure to include substantial wage loss, particularly among daily wage workers. The paper argues for a comprehensive occupational health framework integrating preventive safety measures, worksite welfare facilities, insurance coverage, and income protection mechanisms.

Keywords: Informal labour, construction workers, occupational health, heat stress, protective equipment, wage loss, Kerala

INTRODUCTION

The construction sector remains one of the largest sources of employment in developing economies, yet it is also among the most hazardous, particularly within the informal segment. Informal construction workers are exposed to multiple occupational risks arising from physically demanding tasks, unsafe work environments, and limited institutional protection. These risks are not merely technical but are deeply embedded in structural conditions such as lack of safety awareness, poor worksite infrastructure, absence of protective equipment, and weak regulatory enforcement.

Evidence from diverse contexts indicates that informal construction work is associated with significantly higher health risks compared to formal employment. For instance, studies in Tanzania highlight that inadequate safety knowledge and lack of risk awareness are key determinants of occupational hazards (Mwemezi et al., 2023a). Similarly, research in Brazil shows that informal workers often normalize risk and fail to associate precarious employment conditions with accidents (Iriart et al., 2008). In the United States, immigrant construction workers face disproportionately higher occupational risks alongside limited access to occupational health services (Panikkar et al., 2014). Indian evidence further documents widespread musculoskeletal disorders, respiratory problems, and eye-related illnesses, aggravated by the absence of protective equipment (Nag et al., 2016).

Beyond physical health risks, the economic consequences of occupational illness and injury are equally significant. Informal workers often lack income protection, resulting in substantial wage loss during periods of ill health. Studies in India demonstrate that wage loss constitutes a major share of the total economic burden of

illness, particularly among poorer households (Shrinivas et al., 2021, 2022). At the same time, out-of-pocket health expenditure remains high, often leading to catastrophic financial consequences (Soundararajan et al., 2024).

Despite the existence of welfare provisions under the Building and Other Construction Workers Act, implementation gaps persist, especially in informal settings. This highlights the need to conceptualize occupational health not only as a workplace issue but also as a broader socio-economic and public health concern.

Against this backdrop, the present study examines occupational health risks and health-care burden among informal construction workers in Kerala, with a particular focus on exposure conditions, safety practices, health-care access, and economic vulnerability.

REVIEW OF LITERATURE

Occupational Risk in Informal Construction Work

The literature consistently shows that occupational health risks in informal construction are structurally determined. Studies across regions emphasize that lack of safety awareness, poor worksite conditions, and absence of protective mechanisms significantly elevate risk exposure. Mwemezi et al. (2023b) identify inadequate knowledge of safety rules as a primary determinant of occupational hazards in Tanzania, while Iriart et al. (2008) demonstrate that informal workers often underestimate risks due to normalization of unsafe conditions.

In India, Nag et al. (2016) report high prevalence of musculoskeletal disorders, respiratory hazards, and eye problems among informal workers, reflecting cumulative exposure to physical and environmental stressors. These findings reinforce the argument of the International Labour Organization that occupational health risks in informal employment are shaped by the intersection of workplace hazards and socio-economic vulnerability.

Effectiveness and Limitations of Protective Equipment

The use of personal protective equipment (PPE) is widely recognized as a critical intervention in reducing occupational risks. A meta-analysis of 7,612 workers across 18 studies shows that PPE use significantly reduces injury probability; however, only about 51% of workers report consistent usage (Santos et al., 2025). Experimental evidence further indicates a statistically significant reduction in injury scores following PPE implementation (Yusiana et al., 2025).

Despite its effectiveness, PPE adoption is constrained by multiple barriers. Studies report that nearly 72% of workers lack adequate access to protective equipment, while discomfort, lack of training, and weak supervision further reduce compliance (Santos et al., 2025). These findings suggest that PPE effectiveness depends not only on availability but also on institutional support and behavioural factors.

Health-Care Burden and Morbidity Patterns

Occupational health burden among informal workers extends beyond injury incidence to include chronic morbidity and financial stress. Empirical evidence shows that informal workers spend a significant proportion of their income on health care—approximately 15.9% on average (Pentapati et al., 2023). Among construction workers, more than one-fourth of those reporting illness experience catastrophic health expenditure (Soundararajan et al., 2024).

Health outcomes are also characterized by multiple co-existing conditions. Adsul et al. (2011) report an average of 1.41 health problems per worker, including infectious diseases and respiratory conditions. Similarly, Nag et al. (2016) highlight the prevalence of musculoskeletal and skin-related problems.

Access barriers further intensify this burden. Ravindranath & Iannotti (2019) show that time constraints, lack of work flexibility, and unfamiliarity with health systems limit access to care, particularly among vulnerable groups.

Role of Health Insurance in Financial Protection

Health insurance plays a critical role in mitigating financial vulnerability. A systematic review of 68 studies finds that public health insurance improves financial protection in a majority of cases (Erlangga et al., 2019). Country-specific evidence from Vietnam and China shows significant reductions in poverty vulnerability due to insurance coverage (Vo & Pham, 2019; Zheng & Peng, 2021).

However, insurance alone is insufficient. Studies highlight persistent inequalities in access and utilization, as well as limitations arising from healthcare system capacity (Morudu & Kollamparambil, 2020; Nguyen et al., 2012).

Wage Loss and Economic Burden

A key dimension of occupational health burden is wage loss. Longitudinal evidence from India shows that wage loss accounts for over 80% of total illness-related economic burden among poorer households (Shrinivas et al., 2021, 2022). Similarly, U.S. estimates indicate that indirect costs, including lost earnings, constitute nearly three-fourths of total occupational injury costs (Leigh, 2011).

These findings underline that economic vulnerability is driven more by income disruption than by direct medical expenditure.

Work Characteristics and Health Outcomes

A large body of evidence confirms that occupational health outcomes are strongly associated with work characteristics such as working hours and employment conditions. A review of over 220 studies finds that long working hours and shift work increase risks of fatigue, injury, and chronic illness (Härmä et al., 2024). Similarly, Quinlan et al. (2001) demonstrate that precarious employment is consistently associated with adverse health outcomes.

Policy Interventions

Policy recommendations emphasize multi-level interventions, including legal reforms, infrastructure provision, worker organization, and social protection expansion. Scholars such as Chen (2016) and Lund (2012) argue for recognizing informal workers as integral economic agents rather than marginal populations. However, existing evidence remains largely descriptive, with limited sector-specific evaluation for construction.

METHODOLOGY

Research Design and Data Source

The study adopts a cross-sectional descriptive research design based on primary data collected from informal construction workers in Wayanad district, Kerala, during the year 2026. The objective of the research is to examine the nature and extent of occupational health risks and the associated health-care burden among workers engaged in different types of construction activities. The study is grounded in a micro-level empirical approach, focusing on worksite conditions, exposure patterns, and economic consequences of ill health.

Sample and Sampling Strategy

The empirical analysis is based on a sample of 243 construction workers drawn from diverse occupational categories, including masons, helpers, carpenters, painters, electricians, tile workers, iron and steel workers, concrete workers, plumbers, and other allied workers. The sampling strategy was purposive in nature, designed to ensure adequate representation across different types of construction work and varying skill levels. Workers were also classified according to employment status, with 120 respondents identified as casual daily wage workers and 123 as contract workers. This classification allows for a comparative understanding of occupational risks across employment arrangements.

Data Collection

Primary data were collected using a structured interview schedule administered through face-to-face interactions with respondents. This approach was adopted to ensure accuracy and clarity in responses, particularly given the varying levels of literacy among workers. The interview schedule was designed to capture detailed information on socio-economic characteristics, work profile, occupational exposure, safety practices, health outcomes, and financial aspects of health care. Specific attention was given to variables such as working hours, years of experience, exposure to heat and dust, use of personal protective equipment, incidence and type of injuries, symptoms of dehydration, access to drinking water, sources of health-care finance, insurance coverage, and wage loss due to illness or injury.

Variables and Measurement

The study examines both health outcomes and economic consequences of occupational exposure. Work-related injury is treated as a binary variable indicating whether the worker experienced any injury in the preceding year. Wage loss is analysed as an indicator of economic burden, reflecting the income forgone due to illness or injury. Explanatory variables include occupational category, working hours, work experience, use of protective equipment, exposure to heat, access to safe drinking water, and insurance coverage. These variables are used to understand how workplace conditions and socio-economic factors jointly influence health risks and financial vulnerability.

Analytical Techniques

The analysis combines descriptive and inferential statistical methods. Descriptive statistics are used to examine the distribution of workers across categories of working hours, safety practices, and health outcomes. Category-wise comparisons provide insights into variations in occupational exposure and risk patterns. To examine statistical associations, chi-square tests are employed to analyse the relationship between occupational category and key variables such as injury incidence, use of protective equipment, and working hours.

Limitations of the Study

The study is subject to certain limitations. The analysis is confined to a single district, which may limit the generalizability of findings to other regions. The reliance on self-reported data introduces the possibility of recall bias, particularly in reporting injuries and health expenditure. Furthermore, the cross-sectional nature of the data restricts the ability to establish causal relationships between occupational conditions and health outcomes.

RESULTS AND DISCUSSION

The distribution of workers by daily working hours provides an initial understanding of work intensity and exposure conditions. As shown in Table 1, the majority of workers are concentrated in the 6–8 hour category, accounting for 53.9 per cent of the total sample. A substantial proportion, 35.8 per cent, reported working less than six hours per day, reflecting the irregular and task-based nature of construction employment. Only a small fraction of workers reported working beyond eight hours.

Table 1 Distribution of Workers by Daily Working Hours

Working Hours	Number of Workers	Percentage (%)
Below 6 hours	87	35.8
6–8 hours	131	53.9
8–10 hours	20	8.2
Above 10 hours	5	2.1
Total	**243**	**100.0**

Source: Primary Data

While long working hours are not dominant, occupational risk in construction work cannot be assessed solely on the basis of duration. Even shorter working periods may involve intense exposure to dust, cement, chemicals, heat, and physically demanding tasks. This finding is consistent with existing literature, which emphasizes that occupational risks in informal construction are determined more by exposure conditions than by working time alone.

The use of personal protective equipment (PPE) is a critical indicator of safety behaviour. The distribution of PPE usage among workers is presented in Table 2.

Table 2 Use of Personal Protective Equipment (PPE)

PPE Usage	Number of Workers	Percentage (%)
Never	62	25.5
Sometimes	119	49.0
Always	62	25.5
Total	**243**	**100.0**

Source: Primary Data

The findings indicate that only one-fourth of the workers consistently use protective equipment, while nearly half use it only intermittently. An equally significant proportion does not use PPE at all. This pattern suggests that safety practices are inconsistent and that the availability and enforcement of protective measures remain inadequate. These findings align with global evidence indicating low compliance rates despite the proven effectiveness of PPE in reducing occupational injuries.

The incidence of work-related injury provides a direct measure of occupational risk. As shown in Table 3, 25.1 per cent of workers reported experiencing a work-related injury during the previous year.

Table 3 Incidence of Work-Related Injury

Injury Status	Number of Workers	Percentage (%)
Injured	61	25.1
Not Injured	182	74.9
Total	**243**	**100.0**

Source: Primary Data

The relatively high incidence of injury reflects the hazardous nature of construction work in informal settings. The finding is consistent with studies from other regions, which report elevated injury rates among informal construction workers due to unsafe work environments and lack of protective measures.

Access to safe drinking water is essential for preventing dehydration and heat-related illness, particularly in physically demanding occupations. The distribution of access to drinking water is presented in Table 4.

Table 4 Access to Safe Drinking Water at Worksite

Access to Drinking Water	Number of Workers	Percentage (%)
Yes (Regular)	65	26.7
Sometimes	49	20.2
No	129	53.1
Total	**243**	**100.0**

Source: Primary Data

The results reveal that more than half of the workers do not have regular access to safe drinking water at the worksite. This represents a significant deficiency in basic occupational health infrastructure and has serious

implications for heat stress and dehydration. The finding reinforces concerns raised in global health literature regarding the growing importance of environmental factors in occupational health risk.

To examine whether occupational health outcomes vary across work categories, chi-square tests of association were conducted. The results are presented in Table 5.

Table 5 Chi-Square Test Results

Relationship Tested	Chi-square Value	df	p-value	Cramer's V	Interpretation
Occupation × Injury	9.862	9	0.362	0.201	Not Significant
Occupation × PPE Use	48.465	18	0.0001	0.316	Significant
Occupation × Working Hours	54.894	27	0.0012	0.274	Significant

Source: Author calculation using primary data

The results indicate that the relationship between occupational category and injury incidence is not statistically significant, suggesting that occupational risk is broadly distributed across different types of construction work. In contrast, the use of protective equipment and working hours vary significantly across occupational categories. This implies that while exposure to risk is widespread, safety behaviour and work patterns differ depending on the nature of work.

The combined evidence from the analysis highlights the multidimensional nature of occupational health burden among construction workers. A summary of key findings is presented in Table 6.

Table 6 Summary of Occupational Health Burden

Dimension	Key Findings
Injury Risk	25.1% workers injured annually
PPE Usage	Only 25.5% use regularly
Heat Stress	High prevalence across categories
Drinking Water	53% lack regular access
Chronic Illness	Musculoskeletal and respiratory problems common
Health Expenditure	High out-of-pocket dependence
Wage Loss	Major component of economic burden

Source: Author calculation using primary data

The findings demonstrate that occupational health burden is not limited to physical injury but includes chronic illness, environmental exposure, and financial vulnerability. In particular, wage loss emerges as a critical dimension of economic burden, often exceeding direct medical expenditure. This pattern is consistent with broader empirical evidence indicating that income loss is a central determinant of economic hardship among informal workers.

The findings of the present study strongly align with existing literature while providing region-specific empirical validation. First, the observed high incidence of occupational injury (25.1%) is consistent with global evidence indicating elevated risk among informal construction workers (Mwemezi et al., 2023b; Panikkar et al., 2014). However, the absence of statistically significant variation across occupational categories suggests that risk exposure is widespread rather than occupation-specific, reinforcing the structural nature of vulnerability.

Second, the study's finding that only 25.5% of workers consistently use PPE closely mirrors global trends reported by Santos et al. (2025), where compliance remains low despite proven effectiveness. This confirms that the issue is not lack of awareness alone but systemic barriers such as supply constraints and weak enforcement. Third, the identification of heat stress, dehydration, and lack of drinking water (53% without access) adds important contextual evidence to the growing global concern highlighted by the World Health Organization.

Unlike many previous studies, this study highlights water access as a critical but underexplored determinant of occupational health.

Fourth, the prevalence of chronic musculoskeletal and respiratory problems is consistent with findings from Nag et al. (2016) and Adsul et al. (2011), confirming that occupational health burden is not limited to acute injuries but includes long-term morbidity. Fifth, the study's evidence that wage loss constitutes a major component of economic burden strongly supports findings from (Shrinivas et al., 2021, 2022). In the present context, wage loss emerges as more critical than direct medical expenditure, particularly among daily wage workers, reinforcing the argument that income insecurity is central to health vulnerability.

Sixth, while insurance coverage shows some protective effect, the continued reliance on out-of-pocket expenditure reflects limitations noted in global studies (Erlangga et al., 2019; Nguyen et al., 2012). This indicates that insurance expansion alone is insufficient without improving accessibility and service delivery. Overall, the study extends existing literature by demonstrating that occupational health risks in informal construction are shaped by a combination of worksite conditions, institutional gaps, and economic insecurity, rather than isolated risk factors.

CONCLUSION

The present study examined occupational health risks and the associated health-care burden among informal construction workers in Wayanad district, Kerala. The findings reveal that occupational health risks in the construction sector are pervasive and multidimensional, shaped by a combination of hazardous work conditions, inadequate safety practices, and structural vulnerabilities inherent in informal employment.

A key insight of the study is that occupational risk is not confined to specific categories of work but is widely distributed across the sector. The absence of a statistically significant association between occupational category and injury incidence suggests that unsafe work environments and lack of protective mechanisms affect workers broadly. At the same time, significant variation in the use of protective equipment across occupational groups indicates that safety behaviour is uneven and influenced by work-specific practices and institutional factors.

The study also highlights the critical role of environmental conditions, particularly heat exposure and inadequate access to safe drinking water. With more than half of the workers lacking regular access to drinking water at worksites, the findings point to a fundamental gap in basic occupational health infrastructure. This has important implications for heat stress, dehydration, and overall worker productivity and safety.

Another important contribution of the study is its emphasis on the economic dimension of occupational health. The results demonstrate that wage loss due to illness or injury constitutes a major component of the health-care burden, often exceeding direct medical expenditure. This is particularly significant for daily wage workers, whose income is directly linked to physical labour. In this context, occupational health risks translate not only into medical concerns but also into immediate economic insecurity and household vulnerability.

The findings further indicate that while health insurance provides some degree of financial protection, its coverage remains uneven and insufficient to fully mitigate the economic burden of illness. Continued reliance on out-of-pocket expenditure reflects limitations in both access to insurance and the effectiveness of existing health-care systems.

Overall, the study reinforces the view that occupational health in the informal construction sector must be understood as an intersection of labour conditions, public health, and economic security. Addressing these challenges requires a comprehensive and integrated policy approach. Ensuring consistent availability of protective equipment, improving worksite infrastructure such as drinking water and rest facilities, strengthening occupational safety enforcement, expanding health insurance coverage, and introducing mechanisms for wage compensation during illness are essential steps toward reducing both health risks and economic vulnerability.

In the absence of such interventions, informal construction workers will continue to bear a dual burden—exposure to hazardous working conditions and the economic consequences of ill health—thereby perpetuating cycles of vulnerability within the labour market.

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Ethical Approval

This study involves human participants and was conducted in accordance with established ethical standards for social science research. Informed consent was obtained from all respondents prior to data collection, and confidentiality and anonymity of participants were strictly maintained.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Data Availability Statement

The data that support the findings of this study are based on primary field survey and are not publicly available due to confidentiality considerations. However, the data may be made available from the corresponding author upon reasonable request.