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JOURNAL INDUSTRIAL SERVICESS

journal homepage: http://jurnal.untirta.ac.id/index.php/jiss

eISSN 2461-0631

Original research article

Unsafe work practices and work-related stress in motorcycle repair shops: A cross-sectional analysis

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ARTICLE INFO

Article history:
Received 8 July 2024
Received in revised form 9 September 2024
Accepted 21 October 2024
Published online 23 March 2025

Keywords:
Workplace stress
Unsafe work practices
Motorcycle repair
Presenteeism
Fatigue

Editor:
Bobby Kurniawan

Publisher's note:
The publisher remains neutral concerning jurisdictional claims in published maps and institutional affiliations.

ABSTRACT

Motorcycle repair shops in developing economies often lack proper safety standards, exposing workers to health risks. This study explored the relationship between unsafe work practices and work-related stress among motorcycle mechanics in Lombok, Indonesia. A cross-sectional study using self-administered questionnaires was conducted with 148 male motorcycle repair workers. Data were analyzed using descriptive statistics and chi-square tests. Significant associations were found between presenteeism (working while sick), working while fatigued, and elevated stress levels. However, other unsafe practices, such as improper equipment use, showed no significant relationship with stress. This suggests that additional stressors, such as job demands or interpersonal conflicts, may also contribute to workplace stress. The absence of significant associations with certain unsafe practices highlights the need to explore other potential stressors not captured in the study. Workplace factors like inadequate managerial support and high workloads may further contribute to the stress experienced by workers. Employers should implement policies such as paid sick leave and regulated work hours to reduce stress and improve worker well-being. Further research is needed to explore additional workplace stressors and employ qualitative methods for deeper insights.

1. Introduction

In many developing nations, the motorcycle serves as a lifeline—a catalyst for economic mobility, access to healthcare, and social connection. However, behind this vital industry lies a troubling reality: motorcycle repair shops frequently operate with minimal safety standards, exposing mechanics to a wide range of health and safety hazards. Exposure to hazardous substances, such as benzene in fuel, combined with physical hazards like excessive noise, heat stress, inadequate lighting, and awkward, repetitive postures, can have significant adverse effects. Studies show that benzene exposure can lead to blood abnormalities and potential inflammation [1]. Additionally, physical hazards negatively impact overall worker health [2], and awkward postures place strain on the upper arms, neck, and back [3].

Evidence suggests that workers in the broader automotive industry, including motorcycle mechanics, face an elevated risk of developing non-communicable diseases, especially those affecting the circulatory system. Simultaneous exposure to multiple occupational hazards can induce or worsen conditions like hypertension, cerebrovascular disease, and ischemic heart disease [4]. These findings highlight the critical need to enhance safety protocols, establish stricter regulations, and implement targeted interventions to safeguard the health and well-being of motorcycle mechanics in developing economies.

Unsafe practices within the automotive industry pose a substantial threat to worker well-being and product quality. While standards like ISO 26262 offer functional safety guidelines, their broad focus may not fully encompass the intricacies of integrated safety systems in cutting-edge automotive technology [5]. Automotive environments present diverse hazards, including dangerous machinery, toxic chemicals, and potential vehicle-related accidents. Without robust safeguards in place, workers in automotive manufacturing and repair sectors face elevated risks of injury, illness, or even death [6, 7]. Moreover, using defective or inadequately maintained tools compromises product quality, potentially damaging a company's reputation and financial stability. Proactive strategies, such as knowledge-based maintenance

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http://dx.doi.org/10.62870/jiss.v11i1.27423

systems, are essential to prevent these adverse outcomes [8].

Insufficient worker training poses a significant challenge to the automotive industry, hindering safety, productivity, and global competitiveness. Inadequate maintenance practices, which often stem from training deficiencies, can result in higher energy usage, defects, and reduced output, undermining energy efficiency across production processes [9, 10]. Research indicates that occupational accidents, which diminish an organization's human capital, are partially attributable to insufficient workplace safety training for manufacturing employees [11]. Thorough evaluations of training practices within the sector show gaps in areas like management support, individual attitudes, job-related factors, and training execution. Addressing these issues can improve overall effectiveness [12].

Workplace stress is a serious problem that can cause mental health issues, unhealthy behaviors, and even physical illness. Stressed workers may turn to harmful substances like tobacco, alcohol, or drugs to cope. Stressful working conditions and the way the work itself is organized can also directly lead to health problems. To protect workers, it is important to improve safety, help employees manage their emotions on the job, and organize shifts in sensible ways [4, 13]. Studies show that many workers suffer from stress-related problems. In one study, 38.8% of workers had depression, 43.6% had anxiety, and 26.9% had stress [14]. Middle-aged workers (30–39 years old) seem to be most affected. Factors such as age, family situation, job type, and years of experience influenced how likely workers were to become depressed. Surprisingly, factors like sleep quality, other health problems, substance use, and workplace support did not seem to matter much. Clearly, a positive work environment with strong support systems is crucial [13, 14].

Further research delves into the specific causes of workplace stress. An employee's position in the company, opportunities for growth, and relationships at work seem to be important factors [15]. However, how a company is structured overall does not seem as important to stress levels. One study found high rates of depression (38.92%), anxiety (44.31%), and stress (29.34%) among workers. Demographics like age, marital status, education, and whether workers liked their jobs played a role in these conditions [16]. More research is needed to understand all the causes of workplace stress and develop targeted solutions to help workers.

Cross-sectional study designs are frequently employed in occupational safety research. Recent studies validate this methodological approach, demonstrating its utility in understanding the complex relationships between safety practices and worker well-being. For instance, Sasaki et al. (2022) validated a psychological safety measure among Japanese employees, highlighting the influence of psychological workplace safety on mental health and job performance. Similarly, Vinoth et al. (2023) utilized a cross-sectional study with a semi-structured questionnaire and the DASS-21 tool to examine mental health among automobile industry workers in India. Additionally, Givehchi et al. (2023) found that safety culture within an automotive industry setting directly impacts job stress and satisfaction levels, underscoring the necessity of safety education for promoting mental well-being in the workplace. These studies underscore the importance of cross-sectional research for understanding and enhancing worker well-being in various occupational settings.

It is hypothesized that a strong correlation exists between exposure to unsafe work practices and elevated levels of work-related stress in this occupational setting. Despite the prevalence of this issue, dedicated research exploring the relationship between unsafe work practices and work-related stress within the context of motorcycle repair remains scarce. This study aims to investigate the relationship between unsafe work practices and work-related stress among motorcycle mechanics in Lombok, Indonesia. Specifically, it seeks to identify which unsafe practices are most strongly associated with stress and explore potential unmeasured workplace stressors. The findings of this study will contribute to the literature on occupational health and safety by providing insights into stress factors specific to motorcycle repair workers. These insights will help guide interventions and policies aimed at improving worker well-being in developing economies.

2. Material and method

2.1. Study design

To investigate the potential correlation between unsafe work practices and work-related stress within motorcycle repair shops, this research will employ a cross-sectional study design. This methodological approach is particularly suitable for examining the dynamics of this occupational setting. By analyzing data collected at a specific point in time, the study aims to elucidate potential associations between workers' exposure to occupational hazards and their reported stress levels. The insights generated from this study are expected to lay the groundwork for future research initiatives and the development of targeted interventions designed to enhance workplace safety and well-being.

2.2. Sample

The target population for this research comprises motorcycle repair shop workers located on the island of Lombok, Nusa Tenggara Barat (NTB) province, Indonesia. A simple random sampling method will be employed to recruit participants. Researchers will visit a diverse selection of motorcycle repair shops across Lombok and invite workers who fulfill the following inclusion criteria to participate in the study: Currently employed as a motorcycle repair worker on Lombok Island, age 18 or older, employed within the motorcycle

repair industry for a minimum of five months, willing and able to provide informed consent, and possesses sufficient proficiency in Bahasa Indonesia to understand and complete study questionnaires. The proposed sample size is 148 participants. This sample size has been deemed appropriate to facilitate reliable statistical analyses aimed at identifying potentially moderate associations between the variables of interest.

2.3. Data collection

Data will be collected primarily through self-administered questionnaires distributed to participants at their respective motorcycle repair shops during working hours. Prioritizing ethical research practices, informed consent will be obtained from each participant before their involvement. This process ensures that participants fully understand the study's nature and their voluntary participation. To ensure accessibility and comprehension, the questionnaires will be available in Bahasa Indonesia. Furthermore, the study adheres to strict protocols regarding the anonymity and confidentiality of all participant information, safeguarding their privacy and fostering trust. To ensure the research is conducted with the utmost respect for participant well-being, an independent review confirmed that all survey and data handling procedures align with the institute's ethical research policy.

This study utilizes a questionnaire-based design to examine the relationship between work-related stress (designated as "S") and a set of potential contributing factors (designated as C1–C12). These independent variables encompass various unsafe work practices and conditions within the motorcycle repair setting. The questionnaire is shown in Table A1 (see Appendices).

Participants will indicate the frequency of these behaviors or observations using the following 3-point ordinal scale:

a. Dependent variable (S)
   - Mild: I experience a low level of stress at work that is generally manageable.
   - Moderate: I experience a noticeable level of stress at work that sometimes interferes with my concentration or work performance.
   - Severe: I experience a high or debilitating level of stress at work that significantly disrupts my ability to function and negatively impacts my well-being.

b. Independent variable (C1-C13)
   - Often: This behavior or observation occurs at least once a week, or several times per month,
   - Occasionally: This behavior or observation occurs less than once a week, but at least once a month,
   - Never: This behavior or observation does not occur at all.

2.4. Data analysis

Data analysis will be conducted using SPSS statistical software. The specific steps involved are Descriptive Analysis, Validity and Reliability Tests, and the Chi-Square Test for Categorical Variables.

A descriptive analysis of participant characteristics will be performed to obtain general information about the demographic profile of the workers involved in the study. This will involve calculating frequencies and percentages for variables such as age, gender, work experience, and educational level. The goal is to provide a comprehensive understanding of the sample population and identify potential patterns or trends.

To ensure the soundness of the data, a rigorous assessment of the validity and reliability of the measures used in the study will be conducted. This will involve examining the extent to which the measures accurately reflect the constructs they are intended to assess and the consistency of their results across different administrations or samples. Established scales with known validity and reliability will be preferred, and any newly developed measures will undergo rigorous validation procedures.

The Chi-Square test of independence will be used to determine whether there are significant associations between categorical variables. This test will specifically assess whether the experience of specific unsafe work practices is related to workers' reported stress levels (e.g., mild, moderate, or severe). A significant Chi-Square statistic would indicate a non-random association between the two categorical variables.

3. Results and discussions

This study investigated the demographic characteristics of 148 participants, all of whom were male, revealing a sample predominantly composed of adults with diverse educational backgrounds, marital statuses, and work experience. The age distribution was as follows: adult (88.5%), adolescent (4.7%), and elderly (6.8%). Educational attainment was varied: vocational high school (66.2%), senior high school (22.3%), junior high school (7.4%), elementary school (2.7%), and bachelor's degree (1.4%). Most participants were either single (45.3%) or married (52.7%), with a smaller percentage being widowed (2.0%). Most participants had 0-5 years of work experience (66.9%), followed by 6-10 years (25.7%), 11-15 years (4.1%), and more than 15 years (3.4%) (Table 1).

In Table 2, a validity test was conducted to assess the strength of the relationships between the independent variables (unsafe work practices) and the dependent variable (stress levels). The validity test involved comparing the correlation coefficient (r) for each variable with the critical r-table value (0.1608). Variables with r values exceeding the r-table value were considered valid predictors of stress. The validity test revealed that nine out of the twelve unsafe work practices were valid predictors.

Table 1.
Characteristics of respondents (*N* = 148)

	Characteristics	Frequency	Percentage
Age	Adolescent	7	4.7
	Adult	131	88.5
	Elderly	10	6.8
Education	Elementary School	4	2.7
	Junior High School	11	7.4
	Senior High School	33	22.3
	Vocational High School	98	66.2
	Bachelor Degree	2	1.4
Marital Status	Single	67	45.3
	Married	78	52.7
	Widower	3	2.0
Work Experience (Years)	0-5	99	66.9
	6-10	38	25.7
	11-15	6	4.1
	15+	5	3.4

Table 2.
Validity test for independent variable (*N* = 148)

Code	Independent Variable	Validity Test		
		R-Value	R-Table	Result
C1	Fighting during work	0.171	0.1608	Valid
C2	Joking with co-workers during work	0.190	0.1608	Valid
C3	Use equipment incorrectly	0.397	0.1608	Valid
C4	Store materials improperly	0.235	0.1608	Valid
C5	Dispose of production waste improperly	0.146	0.1608	**Invalid**
C6	Smoke during work	0.107	0.1608	**Invalid**
C7	Remove PPE while work is in progress	0.343	0.1608	Valid
C8	Work while visibly sick	0.205	0.1608	Valid
C9	Use personal gadgets during work	0.096	0.1608	**Invalid**
C10	Work on tasks beyond level of expertise	0.170	0.1608	Valid
C11	Work while visibly fatigued	0.275	0.1608	Valid
C12	Lift heavy objects without assistance	0.307	0.1608	Valid

For reliability testing, a Cronbach's alpha coefficient of 0.564 was calculated for the nine remaining valid items, following the removal of three invalid items. While this coefficient suggests moderate internal consistency, there is potential for improvement. Fig. 1 reveals a concerning distribution of stress levels among motorcycle repair shop workers. A significant proportion of participants reported severe (8.8%) and moderate (39.9%) stress levels, while just over half (51.4%) reported experiencing mild stress.

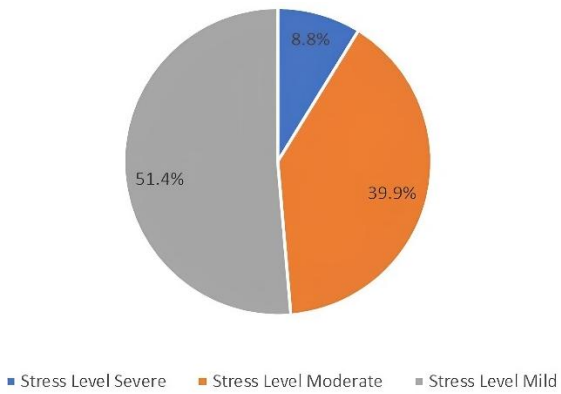

Figure 1. Prevalence of work-related stress

These findings highlight the presence of workplace factors that negatively impact worker well-being within this occupational setting. Table 3 contains an analysis of the association between unsafe work practices and work-related stress. Chi-square tests revealed no statistically significant associations between stress levels and most of the unsafe practices analyzed ($p > 0.05$). These include fighting during work, joking with co-workers, using equipment incorrectly, storing materials improperly, removing PPE while work is in progress, lifting heavy objects without assistance, and working on tasks beyond one's level of expertise.

However, two specific unsafe practices demonstrated statistically significant associations with stress levels ($p < 0.05$). Individuals who worked while visibly sick were more likely to report higher stress levels ($p = 0.026$). Of these individuals, 13.5% reported severe stress, 29.7% reported moderate stress, and 56.8% reported mild stress. Similarly, working while visibly fatigued also showed an association with increased stress levels ($p = 0.046$). Of these, 17.6% experienced severe stress, 34.5% experienced moderate stress, and 47.9% experienced mild stress.

Table 3.
Unsafe work practice and work stress (N = 148)

Unsafe work practices	Stress Level (%)				p-value (x^2)
	Severe	Moderate	Mild	Total	
Fighting during work					
Often	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.412
Occasionally	2 (1.4)	3 (2.0)	7 (4.7)	12 (8.1)	
Never	11 (7.4)	56 (37.8)	69 (46.6)	136 (91.9)	
Joking with co-workers during work					
Often	10 (6.8)	27 (18.2)	36 (24.3)	73 (49.3)	0.355
Occasionally	2 (1.4)	22 (14.9)	28 (18.9)	52 (35.1)	
Never	1 (0.7)	10 (6.8)	12 (8.1)	23 (15.5)	
Use equipment incorrectly					
Often	1 (0.7)	0 (0.0)	2 (1.4)	3 (2.0)	0.414
Occasionally	2 (1.4)	13 (8.8)	13 (8.8)	28 (18.9)	
Never	10 (6.8)	46 (31.1)	61 (41.2)	117 (79.1)	
Store materials improperly					
Often	1 (0.7)	0 (0.0)	2 (1.4)	3 (2.0)	0.464
Occasionally	3 (2.0)	12 (8.1)	16 (10.8)	31 (20.9)	
Never	9 (6.1)	47 (31.8)	58 (39.2)	114 (77.0)	
Remove PPE while work is in progress					
Often	2 (1.4)	16 (10.8)	17 (11.5)	35 (23.6)	0.305
Occasionally	2 (1.4)	10 (6.8)	23 (15.5)	35 (23.6)	
Never	9 (6.1)	33 (22.3)	36 (24.3)	78 (52.7)	
Work while visibly sick					
Often	3 (2.0)	8 (5.4)	9 (6.1)	20 (13.5)	**0.026**
Occasionally	6 (4.1)	36 (24.3)	28 (18.9)	70 (47.3)	
Never	4 (2.7)	15 (10.1)	39 (26.4)	58 (39.2)	
Work on tasks beyond level of expertise					
Often	2 (1.4)	5 (3.4)	6 (4.1)	13 (8.8)	0.592
Occasionally	1 (0.7)	16 (10.8)	21 (14.2)	38 (25.7)	
Never	10 (6.8)	38 (25.7)	49 (33.1)	97 (65.5)	
Work while visibly fatigued					
Often	5 (3.4)	9 (6.1)	12 (8.1)	26 (17.6)	**0.046**
Occasionally	4 (2.7)	42 (28.4)	44 (29.7)	90 (60.8)	
Never	4 (2.7)	8 (5.4)	20 (13.5)	32 (21.6)	
Lift heavy objects without assistance					
Often	2 (1.4)	15 (10.1)	15 (10.1)	32 (21.6)	0.123
Occasionally	3 (2.0)	25 (16.9)	21 (14.2)	49 (33.1)	
Never	8 (5.4)	19 (12.8)	40 (27.0)	67 (45.3)	

4. Managerial implications

4.1. Discussions

This study explored the relationship between unsafe work practices and stress levels among a diverse sample of male motorcycle repair shop workers. The participants exhibited a range of ages, with the majority falling within the "Adult" age group (88.5%). Vocational high school was the most common educational background (66.2%), aligning with the practical nature of the work. A substantial portion of the participants were married (52.7%), indicating that many had families and responsibilities beyond their work. Work experience varied, with the majority having between 0 and 5 years of experience (66.9%). This diverse sample provides a comprehensive understanding of the interplay between unsafe work practices, stress levels, and individual characteristics, allowing for targeted interventions and policy changes to promote worker safety and well-being in this industry.

A validity test revealed that nine of the twelve unsafe work practices had valid associations with stress. While the reliability analysis (Cronbach's alpha = 0.564) indicates moderate internal consistency, it also suggests room for improvement in the measurement scale. Surprisingly, most analyzed unsafe practices, including fighting, joking, using equipment incorrectly, storing materials improperly, removing PPE, lifting heavy objects, and working beyond expertise, did not demonstrate significant links with stress levels.

Mental health challenges are pervasive among automotive workers, highlighting a serious occupational health concern. Research reveals that 41.6% of automotive repair workers experience workplace stress, with a concerning distribution: 51.4% report mild stress, 39.9% report moderate stress, and 8.8% report severe stress [19]. This stress is fueled by multiple factors, including job demands, concerns about job security, negative interpersonal relationships, and exposure to hazardous chemicals [13, 19]. Work-related stress within the automotive industry is further exacerbated by leadership and communication shortcomings. Studies indicate that both stress levels and leadership style significantly impact employee performance, with communication gaps and inadequate leadership motivation playing key roles [20, 21]. The detrimental impact of work-related stress on automotive workers extends beyond psychological well-being. It is linked to adverse mental and physical health outcomes, reduced job satisfaction, and an increased risk of burnout [22, 23, 24]. Moreover, research suggests that stress can increase the likelihood of unsafe work practices, contributing to a higher risk of incidents and fatalities within the workplace [25, 26].

Working while visibly sick, or "presenteeism," poses a significant threat to workforce health and productivity within the automotive industry. This study revealed a troubling association between presenteeism (working while visibly sick) and heightened stress levels. The frequency of this unsafe practice, occurring occasionally for 47.3% of workers, signals a potential workplace health risk that warrants further attention (Table 3). These findings echo research by Caers et al. (2021), who found a significant link between illness and workplace stress. The detrimental impacts of work-related stress extend beyond immediate discomfort. The stress of working while ill can lead to future absences from work, as supported by other studies [28, 29]. Furthermore, physical job stressors like workplace ergonomics and conditions can exacerbate the risk of sickness presenteeism. However, research by Sikandar et al. (2022) offers hope, indicating that organizational justice can mitigate these negative health consequences by fostering a fair and supportive workplace environment. When automotive workers feel ill, they face a difficult choice. The immediate stress of working while sick must be weighed against concerns about future health and productivity declines [31, 32]. For some, the fear of increased stress from missed work can perpetuate a harmful cycle of presenteeism, despite the immediate negative consequences.

Fatigue, defined as a depletion of cognitive resources that hinders safe and effective work performance, poses a major threat to health and safety, affecting both the fatigued worker and their colleagues [33]. Working while visibly fatigued poses a severe risk to employees, significantly impairing cognitive and motor functions, decreasing alertness, and dramatically increasing the likelihood of accidents and errors. This unsafe work practice occurs occasionally (60.8%) (Table 3). This dangerous practice significantly impairs cognitive and motor functions, decreasing alertness, reducing productivity, and dramatically increasing the likelihood of accidents and errors. Research demonstrates a significant association between working while fatigued and elevated stress levels (Table 3). While related, stress and excessive fatigue are not identical. The heightened stress associated with working in a fatigued state could potentially lead to or contribute significantly to excessive fatigue [34]. Findings by Watterson et al. (2023) underscore the necessity of proactive fatigue management. The stress experienced when working while fatigued likely signals a dangerous imbalance between worker capacity and workplace demands, increasing the risk of errors or incidents.

4.2. *Limitations*

The findings of this study should be interpreted with an awareness of its limitations and implications for future research. Firstly, the focus on male workers within the motorcycle repair industry limits the generalizability of the results. Future research should explore these relationships across diverse industries and include both male and female participants to gain a broader understanding of the impact of unsafe work practices on stress. While this study highlights key associations between unsafe work practices, such as presenteeism and fatigue, and elevated stress levels, it is likely that other workplace factors—such as interpersonal conflicts, managerial support, and workload—also play a significant role in shaping worker stress. These factors may not have been fully captured by the quantitative methods used in this study. Future research would benefit from the inclusion of qualitative methods, such as interviews or focus groups, to explore the underlying reasons behind the observed associations. Such methods could provide a deeper understanding of how workers experience and manage stress, as well as how organizational culture and interpersonal relationships contribute to overall well-being. Finally, refining the measurement scale could enhance its reliability, leading to more nuanced analyses of the connection between unsafe practices and stress in future studies.

5. Conclusions

This study explored the relationship between unsafe work practices and stress levels among a sample of male motorcycle repair workers. While mild stress levels were the most prevalent, a strong association emerged between working while visibly ill (presenteeism), working while visibly fatigued, and increased stress, including notable levels of severe stress. Surprisingly, other common unsafe practices, such as improper equipment use or neglecting safety procedures, did not show similar links to stress levels. These findings suggest that factors beyond the analyzed unsafe practices may play a more significant role in this

workplace setting. The detrimental impact of presenteeism and fatigue on worker well-being is particularly concerning. Workers should prioritize proactive policies that discourage working while sick and promote adequate rest to mitigate stress and reduce fatigue-related safety risks. Further studies incorporating diverse samples, qualitative methods like interviews, and refined stress measurement tools are needed. This will allow researchers to gain a more comprehensive understanding of the complex interplay between unsafe practices, stress, and other workplace factors—such as workload or interpersonal conflicts—that affect employee well-being across various industries.

Declaration statement

Fikrihadi Kurnia: Conceptualization, Methodology, Writing - Review & Editing, Supervision, Formal Analysis. I Made Suartika: Supervision, Project Administration, Data curation, Validation.

Acknowledgement

The authors wish to thank the motorcycle repair workers in Lombok, Indonesia, for their participation in this study. Gratitude is also extended to Universitas Mataram for providing institutional support throughout the research. Special recognition is given to the research team members for their assistance and contributions.

Disclosure statement

The authors explicitly state that no conflicts of interest, financial or otherwise, influenced the design, execution, or reporting of this research.

Funding statement

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Data availability statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

AI usage statement

This manuscript utilizes generative AI and AI-assisted tools to improve readability and language. All AI-generated content has been reviewed and edited by the authors to ensure accuracy and scientific integrity. The authors take full responsibility for the content and conclusions of this work and disclose the use of AI to maintain transparency and comply with publisher guidelines.

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