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Research Article

Assessment of Occupational Hazards in Healthcare Facilities in Benghazi, Libya-2024: A Cross-Sectional Study

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ABSTRACT

Healthcare workers are constantly exposed to a variety of occupational hazards, including biological, chemical, and physical hazards, which can compromise their health and safety. Understanding the extent of these hazards is crucial for improving working conditions and strengthening preventive measures within healthcare facilities. A cross-sectional study was conducted to evaluate occupational risk exposures and associated health outcomes among 253 healthcare workers (HCWs) from five healthcare facilities in Benghazi, Libya, over four months. Data were collected via structured questionnaires and analyzed using bivariate and multivariate methods, with statistical significance set at $p < 0.05$. Findings revealed a high prevalence of psychological distress (62.8%), musculoskeletal disorders (61.3%), and biological exposures (55.7%), alongside a significant gap between risk awareness (73.1%) and formal training (46.6%). Multivariate analysis identified a lack of safety training as a significant independent predictor for multiple adverse outcomes: musculoskeletal disorders (a OR=1.85), work absenteeism (a OR=2.18), and accidental exposure to biological materials (a OR=2.85). Work absenteeism was also associated with psychological distress (a OR=3.05), and accidental biological exposure was strongly linked to inconsistent glove use (a OR=4.25). The results underscore the urgent need for ergonomic interventions, mental health support, and, most critically, comprehensive safety training to protect healthcare workers in Benghazi.

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1. Introduction

Healthcare workers (HCWs) are the cornerstone of effective health systems. The term "health workers" encompasses all individuals involved in activities aimed at enhancing health. Regardless of funding, no health system can function effectively or achieve its goals without an adequate, skilled, and motivated health workforce. (1)

Healthcare workers face numerous occupational risks that can affect their health, ranging from ergonomic and biological to physical, chemical, and psychosocial. Increased levels of stress at the workplace lead to adverse mental health outcomes, including anxiety and depression, among healthcare workers. Consequently, recognizing these hazards and implementing targeted prevention strategies is essential for protecting the health workforce. (2,3)

Healthcare facilities face various problems in maintaining an ideal workplace environment. One of these difficulties is the biological hazard, particularly pest infestations. These infestations, which spread pathogens and contaminate critical areas, become more likely with factors such as high staff mobility, the introduction of external objects, and inadequate waste management and sanitation practices. (4)

Globally, healthcare workers constitute approximately 12% of the working population. Healthcare workers operate in one of the most dangerous occupational environments. Beyond typical workplace exposures, they encounter numerous hazards during their duties. Reports indicate that the annual prevalence of back pain among healthcare workers is 77%, which is higher than in other occupational groups. Ergonomic-related injuries, in particular, represent a significant health risk and are the most common type of occupational injury within healthcare services. Illness among healthcare workers has a negative effect on healthcare services. Understanding the risk factors related to occupational hazards in this field is essential for developing effective protective strategies and interventions. (5)

Despite the critical role of HCWs, there is a lack of recent, comprehensive data on occupational hazards within the Libyan healthcare system, particularly in the context of Benghazi. Therefore, this study aims to provide an updated and comprehensive assessment of occupational hazards among HCWs in Benghazi, identify risk factors associated with health outcomes, and guide the strategies for workplace safety improvement.

Aim and objectives

Aim: To evaluate occupational hazards among healthcare workers in healthcare facilities in Benghazi, Libya.

Objectives

1. To identify the occupational risks faced by healthcare providers.
2. To assess the associations between occupational exposures and health outcomes.
3. To determine the specific occupational factors that significantly predict poor health outcomes and work absenteeism among healthcare workers.
4. To formulate evidence-based recommendations for enhancing occupational safety in Libyan healthcare facilities.

2. Methodology

2.1. Study Design and Setting

A cross-sectional study was conducted over four months, from September to December 2024, in five major public healthcare facilities in Benghazi, Libya: Diabetes and Treatment Center, Ibn Zuhur Center, Al-Hawari General Hospital Outpatient Clinic, Al-Sabri Center, and Chest Hospital Outpatient Clinic.

2.2. Study Population and Eligibility Criteria

The study population consisted of healthcare workers (HCWs) directly engaged in patient care, including physicians, nurses, laboratory technicians, and pharmacists. Eligibility required current employment in a healthcare role, presence at the facility during data collection, and provision of verbal informed consent. Individuals were excluded if they were non-clinical staff or employed on temporary or short-term contracts.

2.3. Sample Size Calculation and Sampling Procedure

The minimum required sample size was calculated using the single population proportion formula for cross-sectional studies. Based on previous literature indicates a 20% prevalence of occupational hazards in healthcare settings. (6,7) The calculation used a 95% confidence level (Z = 1.96) and a 5% margin of error (d = 0.05), as shown below:

$$n = (Z^2 \times p \times (1-p)) / d^2 = (1.96^2 \times 0.20 \times 0.80) / 0.05^2 = 246$$

A purposive sampling technique was employed. This method was necessary because a complete list of all healthcare workers across the five facilities was unavailable, making random sampling unfeasible. Recruitment was conducted in person during working hours. All eligible healthcare workers present in clinical and diagnostic areas, such as outpatient clinics, laboratories, and pharmacies, were invited to take part. This approach ensured the inclusion of the study's target population: workers directly engaged in patient care and likely to face occupational hazards. A total of 280 eligible healthcare workers were invited to participate. Of these, 253 provided complete responses and were successfully enrolled, yielding a final response rate of 90.4%. Non-participation was primarily due to a lack of time during the clinic hours. The final sample exceeded the calculated minimum requirement.

2.4. Data Collection Instrument: Questionnaire Development

A structured questionnaire was developed to assess occupational hazards, health outcomes, and safety practices. Its design was informed by a literature review and aligned with the framework from A Guide to the Collection of Occupational Data for Health (National Institute for Occupational Safety and Health, 2021). [8] Core domains were adapted from validated instruments, including the World Health Organization Health and Work Performance Questionnaire (Kessler et al., 2003). [9]

2.5. Questionnaire Adaptation, Translation, and Validation

The English-language questionnaire framework was first adapted for the Libyan healthcare context by modifying examples of hazards and protocols to reflect local clinical environments. The adapted version underwent forward translation into Arabic by two independent bilingual translators. A reconciled Arabic version was created and then back-translated into English to verify conceptual accuracy, with any discrepancies resolved by a panel of investigators. Content validity was assessed by an expert in occupational health and epidemiology, followed by a pilot test with 20 healthcare workers to evaluate comprehension and flow. Minor wording adjustments were made based on feedback. The internal consistency of multi-item scales was confirmed via Cronbach's alpha, with coefficients ranging from 0.86 to 0.94, indicating good reliability.

The final questionnaire comprises four sections:

(A) Sociodemographic characteristics.

(B) Occupational hazard exposure.

(C) Health outcomes and work status.

(D) Safety practices and awareness.

2.6. Statistical Analysis

Data were analyzed using SPSS software, version 25. Descriptive Statistics: Presented as numbers and percentages.

Inferential Statistics: Chi-squared tests were used to assess associations, with $p < 0.05$ considered significant. For multivariate analysis, all exposure variables significant at the bivariate level ($p < 0.05$) were entered into a logistic regression model adjusted for the potential confounders of age, gender, and years of experience.

2.7. Ethical Considerations

The study received ethical approval from the Ethics Committee Board of the Higher Institute of Engineering Techniques, Benghazi (Ref: 2024-03-015). Administrative approval was obtained from all participating facilities. Verbal informed consent was obtained from all participants after explaining the study aims. Data were anonymized, and participants were assured of voluntary participation and confidentiality.

3. Result

3.1. Sociodemographic characteristics of participants

The sample consisted of 253 healthcare workers.

Table 1 demonstrates that the distribution of participants across the five healthcare centers was as follows: Al-Sadriya OPD (35.6%), Al-Sabri center (27.3%), Benghazi diabetes center (17.4%), Al-Hawari OPD (11.9%), and Ibn Zhur center (7.9%).

Table 2 shows the distribution of participants by years of experience as follows: 11-15 years (39.1%), 5 years or less (19.0%), 6-10 years (16.6%), and 16-20 years (7.9%). Additionally, 21-25 years accounts for 9.1%, while more than 25 years represents 8.3%.

Table 1: Distribution of the study group according to the health care facilities

Health care center	**N**	**%**
Benghazi diabetes center	44	17.3
Ibn zuhur center	20	7.9
Al-Hawari OPD	30	11.9
Al-Sabri center	69	27.3
Al-Sadriya OPD	90	35.6
Total	253	100

Table 2: Distribution of the study group according to years of experience

Years of experience	**N**	**%**
≤ 5 years	48	19
6 to 10 years	42	16.6
11 to 15 years	99	39.1
16 to 20 years	20	7.9
21 to 25 years	23	9.1
> 25 years	21	8.3
Total	253	100

As shown in Table 3, the majority of participants were female (75.5%) and of Libyan nationality (96.4%). The largest proportion of the sample was aged between 26 and 45 years (68.8%). Most participants were married (59.3%), and their educational attainment was a Bachelor's degree (40.7%).

3.2 Health conditions and work statuses among participants

Table 4 shows the distribution of the participants according to their health conditions and work statuses. The results indicate several key health trends among the healthcare workers, including a high prevalence of musculoskeletal problems, with 61.3% of healthcare workers having work-related back or joint pain and over a third reporting injuries from lifting or repetitive tasks (33.6%). Psychological well-being was also a significant concern, as 62.8% of participants experienced work-related stress, anxiety, or burnout. Furthermore, a high proportion (67.2%) had taken sick leave due to medical illness. Reported exposures and related symptoms included skin rashes from chemical exposure (38.0%), work-related breathing difficulties (19.4%), and perceived hearing damage from noise (20.6%). Notably, only about half of the participants underwent periodic health check-ups (49.8%).

Table 3: Distribution of the study group according to sociodemographic profile

Sociodemographic profile		
Age group	**No.**	**%**
≤ 25 years	12	4.7
26 - 35 years	82	32.4
36 - 45 years	92	36.4
46 - 55 years	60	23.7
>55 years	7	2.8
Gender		
Male	62	24.5
Female	191	75.5
Marital status		
Single	86	34
Married	150	59.3
Divorced	7	2.7
Widowed	10	4.0
Educational level		
Secondary School	19	7.5
Bachelor's Degree	103	40.7
Intermediate Diploma	50	19.7
Higher Diploma	72	28.5
Master degree	9	3.6
Nationality		
Libyan	244	96.4
Others	9	3.6

3.3. Occupational safety awareness, training, and practices

Table 5 indicates that 73% of healthcare workers were aware of health risks; however, fewer than half had received adequate training (46.6%). Comprehensive adherence to using a complete set of personal protective equipment was limited to less than half of the sample (45.8%). Familiar with emergency protocols (47.4%). Additionally, only about half knew the procedures for injury reporting, and a small proportion (17%) reported experiencing a recent safety incident.

3.4. Occupational hazard exposures

The distribution of occupational hazard exposures is presented in Table 6. The data reveal that exposure to physical hazards was common, with over half of participants reporting exposure to noise (55.3%) and inadequate lighting (53.0%), and nearly half were exposed to extreme temperatures (49.8%), and 30.0% to X-rays or radiation.

For mechanical hazards, patient handling was the most prevalent exposure (65.2%), followed by lifting heavy objects or repetitive movements (41.9%). Exposure to chemical

Table 4: Distribution of the study group according to health conditions

	Questions regarding health conditions and work statuses.	Yes (%)	No (%)
1	Did you undergo a medical examination before starting work?	58.5	41.5
2	Do you undergo periodic check-ups/examinations?	49.8	50.2
3	Have you been absent from work due to medical illnesses?	67.2	32.8
4	Do you suffer from any lung problems?	7.9	92.1
5	Do you experience breathing difficulties that may be related to the work?	19.4	80.6
6	Have you been diagnosed with any occupational lung diseases, such as Silicosis or Asbestosis?	3.2	96.8
7	Do you have symptoms, such as wheezing or shortness of breath, during work?	12.3	87.7
8	Do you suffer from back pain or joint pain due to the physical demands of your job?	61.3	38.7
9	Do you have any injuries from lifting heavy objects or repetitive movements at work?	33.6	66.4
10	Have you developed a skin rash or irritation due to exposure to chemicals in your workplace?	38.0	62.0
11	Do you have any exposure to toxins or solvents at work?	10.7	89.3
12	Do you think the noise at work has affected your hearing?	20.6	79.4
13	Have you ever been stuck by a needle or splashed with bodily fluids at work?	14.6	85.4
14	Do you experience high levels of work-related stress, anxiety, or symptoms of burnout?	62.8	37.2

Table 5: Distribution of the study group based on awareness of occupational risk

	Questions regarding awareness of occupational risks	Yes (%)	No (%)
1	Are you aware of the potential health hazards associated with the type of work you do?	73.1	26.9
2	Have you received any training or education regarding occupational health and safety in your workplace?	46.6	53.4
3	Are you aware of the common occupational diseases and injuries that can arise from the tasks and exposures in your job?	77.1	22.9
4	Are you aware of the preventive measures to minimize occupational risk?	77.1	22.9
5	Have you been informed of the correct reporting procedures if you suspect an occupational disease or injury related to your job?	52.6	47.4
6	Do you regularly use protective equipment at your workplace?	45.8	54.2
7	Have you had any accidents or near-miss incidents related to safety in the past year?	17.0	83.0
8	Are you aware of the emergency evacuation procedures?	47.4	52.6
9	Are safety and warning signs clear and well-maintained?	54.5	45.5
10	Are there sufficient engineering controls (e.g., ventilation, safety devices) in the workplace?	56.5	43.5

Table 6: Distribution of the study group according to exposure to occupational hazards

Exposure to occupational hazards	Yes (%)	No (%)
Exposure to Physical hazards	**Yes (%)**	**No (%)**
Noise	55.3	44.7
Inadequate lighting	53.0	47.0
Extreme temperatures	49.8	50.2
Exposure to X-rays or radiation	30.0	70.0
Exposure to Mechanical hazards	**Yes (%)**	**No (%)**
Lifting heavy objects or repetitive movements	41.9	58.1
Patient Handling	65.2	34.8
Exposure to Chemical hazards	**Yes (%)**	**No (%)**
Disinfectants and detergents	47.4	52.6
Medications and hazardous materials	35.6	64.4
Laboratory chemicals	33.2	66.8
Exposure to Biological hazards	**Yes (%)**	**No (%)**
Blood and body fluids	55.7	44.3
Infectious patients or samples	54.5	45.5
Sharps (needles, surgical blades, etc.)	14.6	85.4
Contaminated medical equipment	50.2	49.8

hazards was also reported, particularly to disinfectants and detergents (47.4%), medications and hazardous materials (35.6%), and laboratory chemicals (33.2%). Biological hazard exposure was widespread, with over half of the participants exposed to blood and body fluids (55.7%) and infectious patients or samples (54.5%), and half of the workers exposed to contaminated medical equipment (50.2%) and sharps injury reported in (14.6%).

3.5. Utilization of personal protective equipment (PPE)

Daily use patterns, detailed in Table 7, reveal that gloves were the most routinely used protective item (70.0%), while masks were used by only 49.8% of participants. Utilization rates for other essential equipment were substantially lower: goggles (23.7%), head covers (22.9%), and safety shoes (23.3%)

3.6. Bivariate Analysis: Associations between exposures and outcomes

The results of the bivariate analysis, presented in Table 8, revealed several significant associations between occupational exposures and health outcomes. Musculoskeletal disorders (MSDs) showed strong associations with patient handling, repetitive movements, and a lack of safety training (all p=0.001). A lack of safety training was a common risk factor, also showing significant associations with work absenteeism and accidental exposure to biological materials (both p=0.001). Finally, inconsistent glove use was strongly associated with accidental exposure to biological materials (p=0.001).

3.7. Multivariate Analysis: Independent predictors of adverse outcomes

The results of the multivariate logistic regression analysis, presented in Table 9, confirm that several occupational exposures were significant independent predictors of adverse health outcomes. For musculoskeletal disorders (MSDs), both patient handling (aOR=4.12, 95% CI 2.38-7.14, p<0.001) and

repetitive movements (aOR=3.25, 95% CI 1.89-5.58, p<0.001) were strong predictors, while a lack of training was also independently associated (aOR=1.85, 95% CI 1.08-3.16, p=0.025). Work absenteeism was significantly associated with psychological distress (aOR=3.05, 95% CI 1.82-5.10, p<0.001) and a lack of training (aOR=2.18, 95% CI 1.30-3.65, p=0.003). Finally, accidental exposure to biological materials was most strongly predicted by inconsistent glove use (aOR=4.25, 95% CI 2.31-7.81, p<0.001), followed by a lack of training (aOR=2.85, 95% CI 1.52-5.34, p<0.001). Notably, a lack of training emerged as a consistent independent risk factor across all three adverse outcomes, even after controlling for other variables in the model.

Table 7: Distribution of participants according to use of protective equipment

Utilization of personal protective equipment	Yes (%)	No (%)
Gloves	70.0	30.0
Goggles / Protective Glasses	23.7	76.3
Mask	49.8	50.2
Head Cover	22.9	77.1
Safety Shoes	23.3	76.7

4. Discussion

This study assessed occupational hazards and associated health outcomes among healthcare workers (HCWs) in selected centers in Benghazi. The findings reveal a multifactorial risk environment that is alarmingly prevalent yet critically under-managed. The data indicate that HCWs operate under sustained exposure to a confluence of physical, ergonomic, chemical, and biological hazards, compounded by significant psychosocial strain.

4.1. Patterns of hazard exposure

Our results demonstrate that occupational exposure is routine rather than exceptional. The high prevalence of physical hazards, such as noise (55.3%) and inadequate lighting (53.0%), points to fundamental infrastructural deficits. These findings are strongly correlated with reports from similar regional settings. A study among HCWs in Tanta University Hospitals, Egypt, found that while awareness of physical hazards was generally high, adherence to safety protocols was inconsistent, a disconnect attributed to inadequate resources and enforcement. [10] This pattern is further reinforced by research in government hospitals in Saudi Arabia, which noted widespread physical hazards resulting from suboptimal work environments and equipment. [11]

Similarly, the high rate of mechanical and ergonomic hazards, with patient handling (65.2%) being the most common, mirrors findings from Lahore, Pakistan, where musculoskeletal disorders from patient lifting were highly prevalent. [12] This ergonomic burden is a global concern, as confirmed by a systematic review from Taiwan that identified patient transfer as a primary risk factor for injuries among HCWs. [13]

The chemical and biological hazard profile is equally concerning. Exposure to disinfectants (47.4%) and laboratory chemicals (33.2%) indicates routine contact with harmful substances. Most critically, the widespread biological exposure to blood and body fluids (55.7%) and infectious patients (54.5%) represents a direct threat of pathogen transmission. This prevalence is not unique to our setting. Studies from Nigeria have documented similarly high rates of biological risks, particularly sharps injuries. [14] Furthermore, a broader scoping review across Low- and Middle-Income Countries (LMICs) confirms that these dangers are widespread, and the measures in place to reduce them are frequently insufficient. [15] The sharps injury rate in our study was 14.6%, while lower than some reports, but remains a significant and preventable risk, echoing concerns raised in studies from Pakistan and Nigeria. [12,14]

4.2. The awareness-practice gap

Perhaps the most critical finding is the stark gap between recognized risk and consistent protective behavior, epitomized by the low rate of consistent PPE use (45.8%). This reveals a failure not of individual knowledge but of systemic support. Our data on inadequate training programs provide a clear explanatory factor, a finding consistent with a previous local assessment in a Benghazi pediatric hospital. [16]

Table 8: Association between occupational exposures and health outcomes

Health Outcome	Occupational Exposure	p-value
Musculoskeletal disorders (MSDs)	Patient handling	0.001
	Lack of safety training	0.001
	Repetitive movements	0.001
Work absenteeism	Lack of safety training	0.001
	Psychological distress	0.001
Accidental exposure to biological materials	Inconsistent glove use	0.001
	Lack of safety training	0.001

Table 9: Multivariate analysis of factors associated with health outcomes in healthcare workers

Outcome & Predictors	(aOR)	95% CI	P value
Musculoskeletal disorders			
Patient handling	4.12	2.38 -7.14	0.001
Repetitive movements	3.25	1.89 -5.58	0.001
Lack of training	1.85	1.08 -3.16	0.025
Work absenteeism			
Psychological distress	3.05	1.82 -5.10	0.001
Lack of training	2.18	1.30 -3.65	0.003
Accidental exposure to biological materials			
Inconsistent glove use	4.25	2.31 -7.81	0.001
Lack of training	2.85	1.52 -5.34	0.001

This knowledge practice gap is a well-documented phenomenon, as demonstrated in the Egyptian context, where high awareness did not ensure safe practice. [10]

A study from a Nigerian tertiary facility explicitly found that while HCWs possessed high knowledge of hazards, their safety practices were inconsistent, primarily due to a lack of equipment and training. [17] Research from Uganda further identified the lack of PPE as a key predictor of hazard exposure. [18]

The stark difference from the 80.6% compliance rate reported in Saudi Arabia. [11] is telling. It suggests that our setting faces a significant gap in the institutional support that enables safe practices. This likely points to a lack of prioritized funding, inconsistent availability of equipment, and weak enforcement of safety rules. When the right equipment is guaranteed and safety is deeply woven into the daily culture, using protection becomes a natural reflex for healthcare workers. Our environment, however, like many Low- and Middle-Income Countries [15], seems

to lack this foundational support. Consequently, poor PPE use is not a matter of personal failure, but a clear sign of a system that is failing its workers.

4.3. Work absenteeism

The significant association found between psychological distress and work absenteeism highlights a cascading consequence of the hazardous work environment. Burnout and stress among healthcare staff aren't personal weaknesses; they are warning signs of an overburdened system. This emotional strain doesn't just hurt individuals; it wears down the team's ability to function safely and effectively. Our finding aligns with international evidence. Research in Australia established a strong link between psychological distress, work overload, and increased absenteeism. [19] Similarly, a Romanian study demonstrated how chronic work stress transforms into burnout, directly resulting in higher sick leave rates. [20] The contributing factors are evident in our context and others: the constant risk of exposure, understaffing, and high workload. Studies from Uganda and the Philippines explicitly link job pressures and overtime to psychosocial distress. [18,21] When HCWs are absent due to stress-related illness, the burden on remaining staff intensifies, creating a vicious cycle that exacerbates both psychosocial and physical risks.

4.4. Intervention for safety improvement

The data presented, contextualized within the global body of literature, point toward specific, interdependent domains for intervention to mitigate the documented risks. A shift from isolated measures to an integrated, system-wide strategy is imperative. Evidence consistently underscores the critical role of comprehensive and continuous training. As demonstrated in a study from Ghana, targeted educational programs can directly bridge the gap between hazard awareness and safe practice. [22] This result is parallel with existing evidence from Egypt and Nigeria, underscoring the urgent need to bridge identified training deficiencies. [10,17] The persistent reporting of inadequate PPE access as a fundamental barrier, from Pakistan to Nigeria, establishes its provision as an essential foundation for safety. This mandates that healthcare administrations prioritize and guarantee a consistent, reliable supply chain. [12,14] A systematic review from Taiwan conceptualizes this effectively within the hierarchy of controls, advocating for a layered defense combining engineering, administrative, and PPE-based strategies. [13] Keeping healthcare workers safe means changing how the system works. It starts with making sure they always have protective equipment, get hands-on training, and work under clear safety policies. But the real key to lasting safety is tackling the root causes of exhaustion and stress. The evidence shows there's no way around it: we must invest in hiring more staff and ensuring their workloads are actually manageable. This is the essential foundation for a strong, healthy team. [20-22]

4.5Limitations

The interpretation of these findings must consider several limitations. First, the cross-sectional design establishes associations but cannot infer causality between exposures and outcomes. Second, the use of purposive sampling within selected Benghazi facilities may limit the generalizability of prevalence estimates to all healthcare workers in Libya. Third, data were based on self-reports, which are susceptible to recall bias and social desirability bias. Despite these limitations, this study provides timely, evidence-based insights into a severe occupational health crisis and identifies clear, actionable targets for intervention.

5. Conclusion

Healthcare workers in Benghazi deal with significant occupational hazards, including physical, chemical, mechanical, psychological, and biological risks. key modifiable risk factors for adverse health outcomes among healthcare workers: A pervasive lack of safety training emerged as a major independent risk factor for multiple adverse health outcomes, significantly associated with musculoskeletal disorders, work absenteeism, and accidental biological exposure. Furthermore, specific exposures were strongly linked to specific harms: patient handling and repetitive movement to musculoskeletal disorders, psychological distress to absenteeism, and inconsistent glove use to accidental biological

exposure.

This study's key strengths lie in generating new evidence from the context of Benghazi, derived from five local healthcare facilities, and in its analytical application of multivariate regression to pinpoint specific and modifiable risk factors. These combined methodological and analytical contributions establish a robust, evidence-based foundation for designing targeted occupational health interventions.

Recommendation

1. Ensure Immediate Access to personal protective equipment & Training: Guarantee a reliable supply of personal protective equipment, especially gloves, and implement mandatory, practical safety training for all staff to close the critical knowledge-practice gap.
2. Conduct a Workload & Staffing Assessment: Systematically review and adjust staffing levels and shift patterns to create sustainable workloads and directly reduce the primary driver of work overload and burnout.
3. Implement Physical and Mental Health Programs: Create a prevention program for musculoskeletal injuries and provide confidential psychological support services to combat stress and burnout.
4. Develop a leadership-driven safety culture: Make safety a fundamental part of work by supporting leaders, holding everyone accountable, and rewarding safe behaviors, so that safety becomes a daily habit for all.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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