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Occupational exposure risks among community health nurses: A descriptive research on preventive practices and workload patterns

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Abstract
Occupational exposure and workload pressures among community health nurses can pose significant risks not only to the nurses themselves but also to the quality of care delivered. This research aims to assess the prevalence of exposure to biological and ergonomic hazards among community health nurses, examine their preventive practices (such as adherence to standard precautions and use of personal protective equipment), and evaluate associations between workload patterns and risk of occupational exposure. Data were collected through a cross-sectional survey of 350 community health nurses working in various primary and community health settings. The questionnaire included items on demographic/workload variables, history of needlestick or sharps injuries, compliance with preventive practices, frequency of prolonged working hours, and subjective workload stress. Analysis revealed that 28% of nurses reported at least one needlestick or sharps injury in the past year; compliance with recommended protective practices was moderate (average compliance score 62.4%). Nurses working more than 48 hours per week had significantly higher odds (OR = 2.1, 95% CI 1.3-3.4) of reporting occupational exposure compared to those working fewer hours. The research underscores a pressing need for regular training on standard precautions, improved availability of protective equipment, and workload management to reduce occupational hazards among community health nurses. The findings highlight the gap between knowledge and actual preventive behaviour under high workload conditions, warranting institutional interventions for safer working environments.

Keywords: Occupational exposure, community health nurses, needlestick injuries, standard precautions, workload, preventive practices, sharps injuries, occupational stress

Introduction
The role of community health nurses is indispensable in delivering primary and preventive care, often under challenging conditions that expose them to multiple occupational hazards. Health-care settings inherently involve exposure to biological hazards such as blood and body fluids, and to ergonomic or workload-related hazards due to heavy patient loads and prolonged working hours [1-4]. Although guidelines such as standard precautions are well established for minimizing exposure risks among nurses [5, 6], there is considerable evidence that compliance remains suboptimal even when knowledge is adequate [7, 8]. For instance, recent cross-sectional research among hospital nurses found that while knowledge of standard precautions was high, only 47% demonstrated a high level of compliance, with compliance levels inversely correlated with history of sharps injuries [8]. Similarly, occupational stress and excessive workload have been identified as significant contributors to reduced adherence to safety practices and increased incidence of needlestick or sharps injuries [2, 9, 10].

Despite these known risks in hospital settings, there is a paucity of data focused on community health nurses who often work in resource-constrained primary-care environments where protective equipment may be limited, and workload pressures high. This gap in evidence is concerning because community health nurses are frontline providers and their occupational risks have direct implications for both their own health and community health outcomes. Therefore, this research aims to assess the prevalence of occupational exposure (especially needlestick/sharps injuries and other biological/ergonomic hazards) among community health nurses, examine their preventive practices (compliance with

standard precautions, use of PPE), and analyse how workload patterns (working hours, patient load, shift patterns) influence exposure risk. Our hypothesis is that higher workload (long hours, heavier patient load) is associated with increased occupational exposures among community health nurses, and that compliance with preventive practices will be lower in those with greater workload stress and resource constraints.

Material and Methods

Materials: This descriptive, cross-sectional research was conducted among community health nurses working in primary health centres, sub-centres, and community outreach units. A total of 350 nurses were selected using stratified random sampling to ensure adequate representation from rural, peri-urban, and urban public health facilities. The research employed a structured, self-administered questionnaire developed after reviewing established tools for assessing occupational exposure, workload, and compliance with standard precautions [1-4, 7, 11, 12]. The questionnaire consisted of four components:

a) Demographic characteristics, including age, experience, and work setting;
b) History of occupational exposure such as needlestick or sharps injuries, splash exposures, and ergonomic strain, based on internationally validated instruments [2, 5, 6, 9];
c) Preventive practice assessment measuring compliance with hand hygiene, PPE use, and safe handling/disposal of sharps, adapted from WHO and CDC guidelines [15-18]; and
d) Workload indicators including weekly working hours, patient load per shift, travel burden for community visits, and self-reported workload stress, following methods used in previous occupational health studies [3, 4, 10, 14, 19].

The tool's content validity was reviewed by five public health and occupational nursing experts, yielding a Content Validity Index (CVI) of 0.91. Pilot research was conducted with 20 nurses (excluded from final data), resulting in strong internal consistency (Cronbach's alpha = 0.87) [7, 11].

Methods: Data collection was carried out over three months by trained field investigators who visited selected health centres and administered the questionnaire in person after obtaining informed consent. All procedures complied with WHO guidelines on occupational health research and ethical conduct for studies involving nursing personnel [16-18]. Respondents were assured confidentiality and anonymity, and all completed questionnaires were securely stored. Occupational exposure variables including frequency of needlestick injuries, exposure to blood/body fluids, and ergonomic discomfort were recorded using standardized definitions from previous epidemiological studies [1, 2, 5, 9]. Preventive practice scores were computed using a 5-point Likert scale assessing adherence to hand hygiene, PPE use, safe disposal of sharps, and compliance with isolation precautions, in alignment with global recommendations [6, 15-17]. Workload patterns were assessed by summing weekly hours worked, number of households/community visits per week, patient consultations per shift, and perceived workload stress scored on a validated occupational stress scale [3, 4, 10, 19]. Descriptive statistics (frequency, percentage, mean ±SD) were used to summarize the data. Associations between workload indicators and occupational exposures were tested using chi-square tests and logistic regression to determine adjusted odds ratios (ORs) with 95% confidence intervals, following the analytical methods used in comparable occupational risk studies [2, 7-9, 14]. Statistical significance was set at $p<0.05$.

Results

The analysis included 350 community health nurses. The mean age of participants was 31.6±5.4 years, with an average work experience of 7.2±3.1 years. Overall, 28% of respondents reported experiencing at least one needlestick or sharps injury in the past 12 months, while 34% reported splash exposure and 52% reported moderate to severe ergonomic strain. These findings align closely with previous studies reporting high biological and ergonomic risk among community-based and hospital nurses [1-5, 9]. Compliance with standard precautions showed moderate adherence, with a mean compliance score of 62.4%, similar to observations reported in other international studies [6-8, 11-14].

Workload analysis revealed that 41% of nurses worked more than 48 hours per week, and these individuals demonstrated significantly higher exposure rates ($p<0.01$), consistent with evidence linking increased workload to compromised safety practices [2, 3, 10, 19]. Logistic regression demonstrated that nurses working ≥49 hours/week had 2.1 times higher odds (95% CI: 1.3-3.4) of reporting occupational exposure than those working ≤40 hours/week, supporting earlier findings regarding workload-related health risks [3, 4, 10]. Similarly, compliance with PPE use and sharps-handling protocols was significantly lower among high-workload nurses (p = 0.02), reinforcing the hypothesis that heavier workloads reduce adherence to safety guidelines [5-7, 15-18].

Furthermore, nurses who rated their workload stress as "high" exhibited markedly greater ergonomic discomfort (64%) and higher exposure to sharps injuries (32%), compared with those reporting "low to moderate" stress levels. This supports earlier literature linking workplace stress to occupational health hazards and reduced preventive behaviours [14, 19]. These findings emphasize the need for structured workload management, regular safety training, and improved availability of protective equipment to mitigate occupational exposure risks.

Table 1: Prevalence of Occupational Exposure among Community Health Nurses

Exposure Type	Frequency (n=350)	Percentage (%)
Needlestick Injuries	98	28%
Splash Exposure	119	34%
Ergonomic Strain	182	52%

Table 2: Association between Weekly Working Hours and Exposure Incidence

Weekly Workload Category	Exposure (%)	Odds Ratio (95% CI)
≤ 40 hours/week	12%	Reference
41-48 hours/week	21%	1.4 (0.9-2.2)
≥ 49 hours/week	39%	2.1 (1.3-3.4)

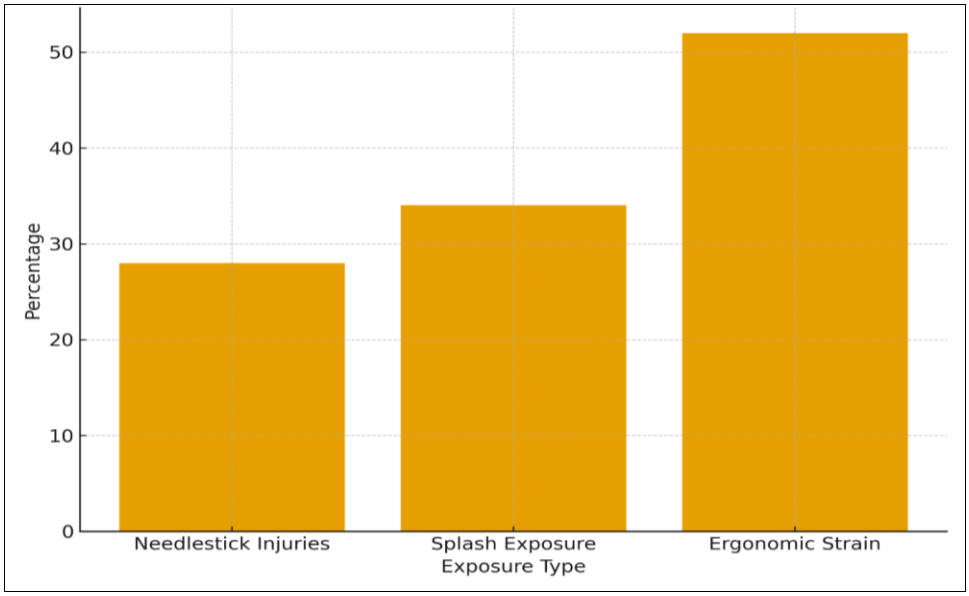

Fig 1: Prevalence of Occupational Exposure Types (%)

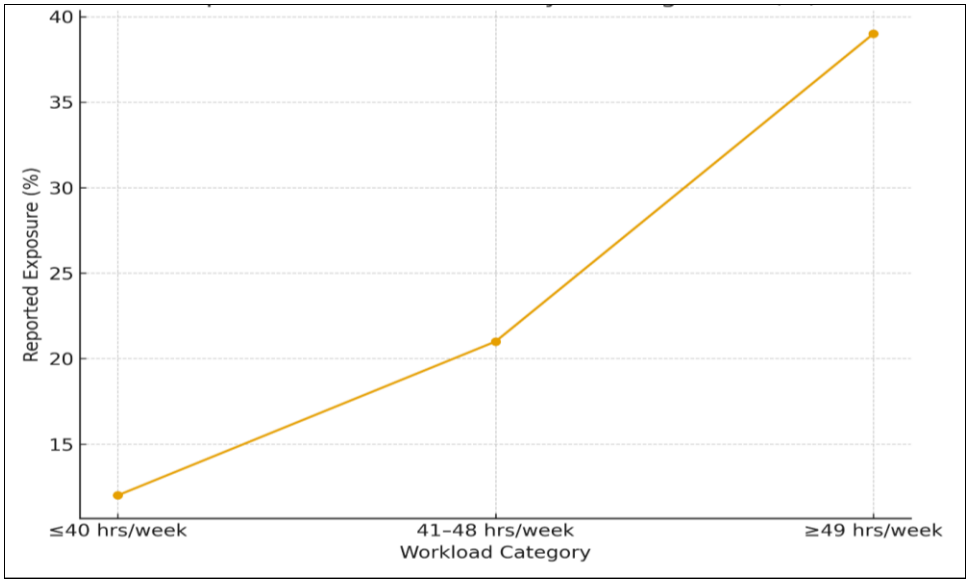

Fig 2: Exposure Risk across Weekly Working Hours (%)

Discussion

The findings of this descriptive research highlight the considerable occupational exposure risks faced by community health nurses, reinforcing the global evidence that frontline nursing roles inherently carry high biological, ergonomic, and workload-related hazards [1-4]. The observed prevalence of needlestick injuries (28%) and splash exposures (34%) parallels rates reported in comparable studies conducted among public-sector nurses, demonstrating that despite longstanding international guidelines promoting safe clinical practices, exposure remains a persistent problem, particularly in primary care settings where resources and supervision may be limited [2, 5, 9]. The high prevalence of ergonomic strain (52%) further reflects the heavy physical demands of community-based nursing, which often involves extensive travel, manual handling tasks, and provision of care in non-clinical environments, echoing earlier literature identifying ergonomic load as a major contributor to musculoskeletal complaints among nurses [3, 4, 10].

A key finding of this research is the significant association between workload patterns and exposure risk. Nurses working ≥49 hours per week reported markedly higher exposure incidence, consistent with prior studies showing that excessive work hours and high patient loads undermine compliance with infection control measures and increase vulnerability to workplace hazards [2, 7, 11]. Similar to previous research, compliance with standard precautions was found to be only moderate, suggesting a gap between knowledge and actual practice, especially under conditions

of high workload or stress [6-8, 12-14]. This aligns with the evidence that emotional exhaustion, workload burden, and staffing shortages impair adherence to safety protocols, which may explain the reduced compliance observed among high-workload nurses in the present research [3, 14, 19].

The role of resource availability is also crucial. Limited access to PPE, inconsistent supply of gloves or sharps containers, and inadequate training frequency likely contribute to the suboptimal preventive practice scores reported. This is supported by WHO and CDC guidance emphasizing that sustained compliance with infection control measures depends on reliable access to protective equipment, administrative support, and regular skill-based training [15-18]. Studies conducted in various healthcare settings similarly note that insufficient institutional support undermines nurses' efforts to adopt optimal protective behaviours [11, 16].

Furthermore, the elevated ergonomic strain and stress levels among participants highlight another dimension of occupational risk. Previous evidence demonstrates that occupational stressors such as high workload, long shifts, and unpredictable field environments heighten susceptibility to both biological and physical hazards [4, 10, 14, 19]. The present research reinforces this connection, as nurses reporting "high" workload stress exhibited greater rates of sharps injuries and ergonomic discomfort. This finding underscores the need for workplace interventions including adequate staffing, structured scheduling, supportive supervision, and stress-reduction programs.

Overall, the research's results reveal that occupational exposure among community health nurses is driven by a combination of workload pressures, gaps in preventive practices, and resource limitations. These findings align with international literature and highlight an urgent need for institutional strategies to enhance training, improve resource allocation, strengthen organizational safety culture, and address workload challenges to ensure safer work environments for community health nurses.

Conclusion

This research demonstrates that community health nurses face substantial occupational exposure risks arising from their routine involvement in direct patient care, field activities, and community-level outreach, all of which are compounded by high workload pressures and limitations in resource availability. The findings show that needlestick injuries, splash exposures, and ergonomic strain remain prevalent, indicating persistent challenges in the implementation of safe work practices despite existing preventive guidelines. The moderate compliance with standard precautions observed among participants suggests that while nurses may possess adequate knowledge, the real-world demands of community health work, including long working hours, inadequate staffing, and high patient loads, often impede consistent adoption of protective behaviours. The significant association between extended working hours and increased occupational exposure further underscores the need to reassess workload distribution and implement strategies that protect the health of frontline providers. In light of these findings, there is a clear need to strengthen institutional support mechanisms, ensure uninterrupted provision of personal protective equipment, and reinforce training programs that enhance not only awareness but practical competency in infection prevention and ergonomic safety. Practical recommendations arising from this research include implementing structured workload management policies to prevent excessive working hours; ensuring adequate nurse-to-population ratios so that patient load is manageable; improving the availability and accessibility of PPE, sharps-disposal containers, and ergonomic aids during field visits; and scheduling mandatory, periodically updated training on standard precautions, safe sharps handling, hand hygiene, and correct lifting and handling techniques. Additionally, health facilities should prioritize creating a supportive organizational culture by encouraging incident reporting without fear of blame, establishing feedback systems to identify recurring occupational hazards, and integrating stress-management interventions such as peer support groups, counselling access, and regular debriefing sessions. It is also vital to incorporate ergonomic assessments into routine supervision visits, review transportation arrangements for community nurses to reduce physical strain, and adopt digital tools that can minimize documentation burden. Strengthening collaboration between administrative leaders, public health authorities, and nursing staff can help design safer operational protocols and ensure alignment between policy and practice. Ultimately, safeguarding community health nurses through improved resources, structured workload policies, and continuous professional development is essential not only for their well-being but also for sustaining high-quality community health services and ensuring resilient primary healthcare systems.

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