Occupational health hazards among healthcare providers and ancillary staff in Ghana: a scoping review

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ABSTRACT

Objective The strict implementation of occupational health and safety policy curbs exposure to occupational hazards. However, empirical evidence is lacking in the Ghanaian context. This review primarily aimed to explore exposure to occupational hazards among healthcare providers and ancillary staff in Ghana.

Design A scoping review was conducted based on Arksey and O'Malley's methodological framework and Levac et al's methodological enhancement.

Data sources Searches were conducted of the PubMed, MEDLINE, CINAHL, Embase, PsycINFO and Scopus databases, as well as Google Scholar and websites of tertiary institutions in Ghana, for publications from January 2010 to November 2021.

Eligibility criteria Quantitative studies that were published in the English language and focused on occupational exposure to biological and/or non-biological hazards among healthcare professionals in Ghana were included.

Data extraction and synthesis Two independent reviewers extracted the data based on the type of occupational exposure and descriptive characteristics of the studies. The data are presented in tables and graphs. A narrative summary of review findings was prepared based on the review research questions.

Results Our systematic search strategy retrieved 507 publications; however, only 43 met the inclusion criteria. A little over one-quarter were unpublished theses/dissertations. The included studies were related to biological, psychosocial, ergonomic and other non-biological hazards. 55.8% of the studies were related to exposure to biological hazards and related preventive measures. In general, health workers were reported to use and comply with control and preventive measures; however, knowledge of control and preventive measures was suboptimal.

Conclusion Work is needed to address the issue of occupational health hazard exposure in Ghana's health system. More research is needed to understand the extent of these exposures and their effects on the health system.

INTRODUCTION

Healthcare providers and ancillary staff are continuously exposed to different types of biological and non-biological hazards owing to their occupational surroundings, which are documented as unsafe working environments. Undeniably, it is counterintuitive that the health workers who care for the sick work in an industry whose setting is labelled as 'high hazard'. The infection and reinfec-
tion of healthcare workers in the ongoing COVID-19 pandemic expose the vulnerability of the healthcare industry.

Exposure to biological and non-biological occupational hazards has been well established in a plethora of empirical evidence. Even so, exposure to biological hazards such as hepatitis B virus (HBV), HIV, influenza and tuberculosis (TB) has gained more attention in terms of interventions such as safety programmes, personal protective equipment (PPE) and research work. Non-biological hazard exposures emanating from formaldehyde, antineoplastic drugs, latex, ethylene oxide, and cleaning and disinfecting chemicals have been linked to asthma, unfavourable procreative outcomes and cancers. Moreover, many studies have established varying incidences of non-biological hazards...
such as burnout, stress, violence, injuries and musculoskeletal disorders in the healthcare industry.11–13

Furthermore, the issue of occupational injuries and exposures in the healthcare sector is a threat to both the high-income and low/middle-income countries. However, there has been much reduction in the occurrence of exposure and improvement in ways of mitigating the burden of the exposure in developed countries compared with developing countries, where occupational health and safety are not on the priority list.14–16 Apart from insufficient data collection systems, poor application of safety rules and regulations, political negligence and healthcare personnel’s non-adherence to universal safety precautions, a lack of data and inadequate policy implementation are among the main reasons why the subject of occupational health and safety has not been given much attention in third world countries.17 18

A data-driven approach is imperative in addressing this problem of occupational exposure in healthcare industries, especially the Ghanaian one.19 In a quest to solve this problem in Ghana, the Ghana Health Service and the Ministry of Health implemented an Occupational Health and Safety Policy in 2010, and an updated version in 2021, which was solely in the context of COVID-19.16 19 The earlier policy’s insufficient data, poor data collection systems on occupational exposure and lack of sensitisation on occupational health and safety are challenges to addressing occupational exposure, which have improved over the period. A scoping review approach based on knowledge from Arksey and O’Malley’s methodology20 and Levac et al’s21 methodology enhancement was conducted to search the body of literature on occupational exposures among health personnel in Ghana.

Although some studies have employed scoping review methodology on the subject matter, most of these were done in developed countries. The few conducted in developing countries were for low/middle-income and sub-Saharan African countries, while the others considered only exposure to biological hazards and non-biological hazards.22–24 Likewise, those reviews which were carried out in developing countries did not include primary studies that had only ancillary staff as study participants, and workers in the elementary occupations category of the WHO health workers classification such as waste handlers and laundry workers.

This scoping review summarised the type and prevalence of exposure to occupational hazards, described health workers’ knowledge of occupational exposure and available preventive measures, and explored predisposing factors of exposure to occupational hazards and utilisation of control/preventive measures.

METHODS

This scoping review was conducted based on guidance from Arksey and O’Malley’s methodology framework20 and Levac et al’s21 methodology enhancement. Six steps were followed in conducting this review: (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, (5) collating, summarising and reporting findings, and (6) consulting with relevant stakeholders. However, the Joanna Briggs Institute’s elements for scoping reviews, namely: Participants, Concepts and Context were used to define the core concept, focus participants, setting of studies and inclusion criteria of the review. Subsequently, these guided the formulation of research questions and the title of the review. The findings of this review were reported using Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.22 A detailed protocol for this scoping review has been published elsewhere.23

Research questions

To achieve a holistic view of the exposure to occupational hazards among healthcare providers and ancillary staff in Ghana, and based on the expertise of the research team and some stakeholders in the healthcare industry, the following research questions were developed for the direction of the conduct of this review:

1. What are the types and prevalence of exposure to occupational health hazards among healthcare providers and ancillary staff in Ghana?
2. What are the predisposing factors of exposure to occupational health hazards?
3. What are the available control/preventive measures for health workers?
4. What is the level of knowledge relating to the risk of exposure and control/preventive measures of occupational health hazards among health workers?
5. What is the level of adherence to these control/preventive measures?

Search strategy


those published in the English language. Due to the six databases used for the review, not more than 100 hits of Google searches were screened. Reference lists of articles included in the review were hand-screened as well as other non-electronic materials to identify other studies. Grey publications, specifically dissertations/theses, were retrieved through a search on tertiary institutions’ websites. The five major tertiary institutions searched comprised the University of Ghana, Kwame Nkrumah University of Science and Technology, University of Cape Coast, University of Development Studies and Central University.

**Study selection**

Studies included in the scoping review were those: (1) conducted among healthcare providers, healthcare students, ancillary staff or general health workers; (2) done on occupational exposures to biological and non-biological hazards; (3) carried out in healthcare facilities in Ghana; (4) based on quantitative, cross-sectional, case–control, prospective and retrospective cohort study designs; and (5) studies published from 1 January 2010 until 30 November 2021 and in the English language. Additionally, studies (1) conducted among participants not working in healthcare facilities, and (2) based on a qualitative study approach were excluded from the review.

After the removal of duplicates from extracted articles, both title and abstract screening were carried out independently by two reviewers (PAT and AB-A) against a group of minimum inclusion and exclusion criteria including participants’ characteristics, concept of the study, context or setting of the study. Any article adjudged as relevant by any of these reviewers was included for a full-text review. The full-text review was subsequently carried out by these two reviewers. Any discrepancies and disagreements in selecting a particular article were subjected to a second review and further discussion with the other two reviewers (EA-B and EA-G) to achieve a consensus and control reviewer bias.

**Data extraction**

For every article included in this scoping review, descriptive characteristics comprising of authors, year of publication, title of study, region of study, study design, study population and sample size, methodology and instrument used, and key findings were extracted. Furthermore, key outcomes were charted based on the review questions. This process was also carried out by the two independent reviewers (PAT and AB-A). A final extraction form is shown in the online supplemental appendix II.

**Synthesising review results**

The study characteristics of articles covering the study population, year of publication, number of studies published in peer-reviewed journals and region of the study were presented in graphs. Also, studies were
tabulated based on the type of occupational exposure and preventive measure. Included studies were then summarised according to their study characteristics: authors, year of publication, topic, region of study, study design, study population, sample size, methodology/instrument(s) used and key findings. Finally, using the review research questions as guidance, a narrative was used to summarise the outcome of the studies.

**Patient and public involvement**

None.

**RESULTS**

Four hundred and ninety-four publications were identified from a search involving six databases and Google Scholar (figure 1). An additional 13 were retrieved from government and university websites; thus, the total number of articles retrieved was 507. After the removal of duplicates, 270 were screened by title, followed by an abstract screening of 78 articles.

Fifty-three articles were appropriate for full-text examination; yet, 43 were eligible for the scope review (figure 1). Most of the eligible articles (n=27, 62.8%) were published within the past 3 years (2018–2021) of the review (figure 2). However, 12 (n=12, 28.0%) studies included in this review are dissertations and were not published in peer-reviewed journals (figure 2). Almost all studies included in this review were conducted using a cross-sectional study design with a relatively larger number of them (n=15, 34.9%) conducted in the Greater Accra Region (figure 2). More than half (n=24, 55.8%) of these studies employed the general health workers group as study participants (figure 2), followed by nurses (n=11, 25.6%).

Relating to the type of occupational hazard being investigated, a greater number (n=24, 55.8%) of the eligible studies (n=43) were done on biological hazards, followed by psychosocial hazards (n=14, 32.6%), both biological and non-biological hazards (n=4, 9.3%), and ergonomic hazards (n=1, 2.3%) (table 1).

Among the studies on biological hazards, the majority of them (n=9) examined exposure to blood and body fluids, and it was followed by those on infection control and prevention (n=6). The rest were conducted on post-exposure prophylaxis (PEP), hepatitis B vaccine uptake, hand hygiene and face mask compliance, and exposure to COVID-19 (table 1 and online supplemental tables 1–4). Similarly, regarding studies on psychosocial hazards, almost all (n=13) investigated stress and burnout, and one was done on workplace violence (table 1 and online supplemental tables 1–4). Likewise, relating to ergonomic hazards, only a single study was conducted on exposure to musculoskeletal disorders (table 1 and online supplemental tables 1–4). Moreover, studies on both biological and non-biological hazards were mainly related to occupational hazards and safety practices (table 1 and online supplemental tables 1–4).

**DISCUSSION**

This scoping review focused on mapping the existing empirical evidence on occupational exposure to health-care providers and ancillary staff in Ghana. Inclusive of 43 articles, this review was quite extensive and comprised of studies relating to exposure to both biological and non-biological hazards as well as their significant risk factors, availability and utilisation of control/preventive measures, and knowledge on control and preventive measures.
Blood and body fluids

Exposure to blood and body fluids among healthcare professionals has become the most prevalent means of exposure to bloodborne pathogens hence making it a problem of great concern in the healthcare industry. According to this review, most studies were conducted among the general health workers, which may include ancillary staff, but no study employing ancillary staff only as participants was done in the years considered for this review. This is alarming because these groups of workers (ancillary staff) may be more exposed than healthcare providers. Subsequently, it suggests that we have to take a closer look at this category of workers.

<table>
<thead>
<tr>
<th>Types of hazards</th>
<th>Frequency (43)</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Biological</td>
<td>24</td>
<td>55.81</td>
</tr>
<tr>
<td>Blood and body fluids</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>COVID-19</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hand hygiene and face mask compliance</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B vaccine uptake</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Post-exposure prophylaxis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Infection control and prevention</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Psychosocial</td>
<td>14</td>
<td>32.56</td>
</tr>
<tr>
<td>Stress and burnout</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Violence</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ergonomic</td>
<td>1</td>
<td>2.33</td>
</tr>
<tr>
<td>Musculoskeletal disorders</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Biological and non-biological</td>
<td>4</td>
<td>9.30</td>
</tr>
<tr>
<td>Occupational hazards and safety practices</td>
<td>4</td>
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</tbody>
</table>

The prevalence of sharp instrument-related injuries and needlestick injuries was reported in four studies, while cuts were reported in three studies. The prevalence of sharp instrument-related injuries over 1 year ranged from 7.9% in a study conducted in the Greater Accra Region to 53.7% in a study carried out in the Greater Accra Region. Besides, needlestick injury prevalence over the 12-month duration ranged from 14.0% in a study done in the Volta Region to 66.0% in a study conducted in the Northern Region. A lifetime prevalence of needlestick injuries was reported as 54.6% in a study conducted in the Northern Region. Further, two studies conducted in the Volta and Greater Accra Regions reported a 12-month prevalence of splash of blood and body fluids at 21.3% and 60.5%, respectively. Also, a 1-year prevalence of cuts was reported as 34.6%, 62.1% and 70.5% in studies conducted in Ashanti, Greater Accra and Northern Regions, respectively. A single study reported an annual prevalence of torn gloves as 32.0%.

The presence of safety guidelines, having worked for more than 5 years, being 30 years and above and working in a district-level hospital were associated with increased

Nonetheless, a greater proportion of these studies were centred on biological hazards and their preventive and control measures compared with the other types of occupational hazards. This finding was similar to a recent review by Rai et al., where more studies were related to biological hazards.

The past 3 years of this review witnessed quite a greater number of research work on occupational health and safety, but the evidence is weak since more rigorous study designs were not employed in almost all articles. Yet, the huge number of studies indicates the recognition of the subject area in Ghana’s healthcare industry and can serve as a precursor to the production of a higher form of evidence in the field. According to this review, most studies were conducted among the general health workers, which may include ancillary staff, but no study employing ancillary staff only as participants was done in the years considered for this review. This is alarming because these groups of workers (ancillary staff) may be more exposed than healthcare providers. Subsequently, it suggests that we have to take a closer look at this category of workers.

Biological hazards

Blood and body fluids

Exposure to blood and body fluids among healthcare professionals has become the most prevalent means of exposure to bloodborne pathogens hence making it a problem of great concern in the healthcare industry. Blood and body fluid exposure has been reported as a major predisposing factor to the transmission of common bloodborne infections including HIV. Accidental contact with a patient’s blood and body fluids during a medical procedure may not only affect the safety and well-being of the healthcare provider or ancillary staff but also disrupt the delivery of quality healthcare. Needles or sharp instrument-related injuries, a splash of body fluids and torn gloves are considered as some of the routes of exposure to blood and body fluids. However, sharp instrument-related or needlestick injury is highly recognized as one of the most serious occupational hazards among health workers, and it is ranked as a high-risk route for acquiring and transmitting biological hazards such as HBV, hepatitis C virus and HIV. The high prevalence of these bloodborne pathogens in low/middle-income countries, including Ghana, and the lack of safety measures to reduce their risks account for the increased transmission among healthcare providers and ancillary staff in developing countries.

Two studies included in this review investigated exposure to blood and body fluids. Both studies reported a 12-month prevalence of 50.6% and 67.5%. While adequate PPE, being trained in infection prevention and control (IPC) practices and working in the outpatient department decreased the odds of exposure to blood and body fluids, having had working experience, and moderate and high-risk perception increased the chances of exposure to blood and body fluids.

According to this review, many studies investigated sharp instrument-related injuries as a route of exposure to biological hazards. The studies included in this review reported variable prevalence of sharp instrument-related injuries including needlestick injuries and cuts. The prevalence was reported in the past 12 months for most studies with a study reporting a lifetime prevalence. The prevalence of sharp instrument injuries and needlestick injuries was reported in four studies, while cuts were reported in three studies.

The prevalence of sharp instrument-related injuries over 1 year ranged from 7.9% in a study conducted in the Volta Region to 53.7% in a study carried out in the Greater Accra Region. Besides, needlestick injury prevalence over the 12-month duration ranged from 14.0% in a study done in the Volta Region to 66.0% in a study conducted in the Northern Region. A lifetime prevalence of needlestick injuries was reported as 54.6% in a study conducted in the Northern Region.

Further, two studies conducted in the Volta and Greater Accra Regions reported a 12-month prevalence of splash of blood and body fluids at 21.3% and 60.5%, respectively. Also, a 1-year prevalence of cuts was reported as 34.6%, 62.1% and 70.5% in studies conducted in Ashanti, Greater Accra and Northern Regions, respectively. A single study reported an annual prevalence of torn gloves as 32.0%. The presence of safety guidelines, having worked for more than 5 years, being 30 years and above and working in a district-level hospital were associated with increased


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events of sharp instrument-related injuries. The female gender was negatively associated with needlestick injuries, whereas age of 30 years and above and having had infection prevention and control training in the last 5 years were positively associated with needlestick injuries. Preventive measures such as proper disposal of sharp objects, usage of PPE and training in occupational safety were highly used with usage rates of 86.6%, 85.8% and 62.2%, respectively, while the system of reporting sharp instrument injuries was not used with almost half of study participants not reporting injuries.

Additionally, in this review, some studies reported infection of bloodborne pathogens that may have resulted from exposure to blood and body fluids. One of the studies reported that 25% of the participants who were exposed to blood and body fluids tested positive for HIV. Also, other studies in this review reported a pathogen infection prevalence of 13.8% and 33.0%.

**Exposure to COVID-19**

The occupational contact of healthcare workers makes them the highest population at risk of exposure to COVID-19. This risk of exposure has resulted in numerous COVID-19 infections reported across the globe. Healthcare providers and ancillary workers are at the forefront of the fight against the pandemic and play critical roles such as clinical management of patients with COVID-19. Our review included a study that involved the risk of exposure to COVID-19 assessment among healthcare professionals. Despite the high level (80.4%) of occupational exposure to COVID-19 among health workers, 14.0% of them were at a high risk of COVID-19 infection. Workers who were involved in aerosol-generating procedures were positively associated with a high risk of COVID-19 infection, while Master’s degree holders and registered nurses were negatively associated with a high risk of COVID-19 infection.

**Hand hygiene and face mask compliance**

Hand hygiene continuously proves to be an effective way of preventing or reducing the transmission of healthcare-associated pathogens in the healthcare industry, where transmission of infection from patient to patient is mostly transferred through the hands of healthcare workers. However, low compliance with hand hygiene among healthcare professionals is reported all over the world. The combination of universal use of face mask and a comprehensive infection prevention programme has been proven to reduce healthcare-associated cases of infectious diseases including COVID-19. Nonetheless, compliance with face mask wearing among healthcare providers remains suboptimal irrespective of the recent call for universal use of face mask.

Hand hygiene compliance was investigated in four of the studies included in this review; however, one of the studies considered both hand hygiene and face mask compliance. Compliance with hand hygiene ranged from 9.2% to 88.4%. Perceived high risk, working in a children’s ward and touching a patient during procedures were positively associated with hand hygiene compliance, and afternoon and night shift, non-clinical category of worker, holder of a secondary-level certificate, and midwife and pharmacist cadres of health worker were negatively associated with hand hygiene compliance. Alcohol hand rub and liquid soap dispensers were found to be readily available at facilities for hand hygiene compliance. Face mask compliance level was reported at 73.7%.

**Hepatitis B vaccine uptake**

Though hepatitis B infection is vaccine preventable, low uptake has been reported among healthcare workers in developing countries. Studies conducted among healthcare professionals in sub-Saharan Africa have reported it between 35% and 65%, which is below the WHO’s recommended 100% coverage of hepatitis B vaccination. The uptake of the hepatitis B vaccine among healthcare personnel was explored in four studies included in this present review. The prevalence of at least one dose of hepatitis B vaccination uptake was reported within the range of 48.8%–90.4%. Nonetheless, the full hepatitis B vaccination status of health personnel ranged from 49.4% to 80.0%. Also, working for more than 16 years, daily exposure to blood and body fluids, use of sharp instruments, frequent exposure to stained linens and waste, and performing invasive procedures daily were positively associated with the vaccination status of health workers. Similarly, health workers who had no knowledge of hepatitis B being more infectious than HIV and those who do not know about the effectiveness of hepatitis B vaccine were likely not to be vaccinated. Two studies reported cost as a barrier to the coverage of hepatitis B vaccination among healthcare providers.

**Post-exposure prophylaxis**

The prevention of a possible seroconversion of HIV or hepatitis B after exposure dwells on a timely uptake of PEP; unfortunately, healthcare workers hardly adhere to the PEP protocol. Some studies looked at adherence to PEP protocol, while others investigated its knowledge and uptake in the event of occupational exposure. A single study included in this review ascertained adherence to HIV PEP protocol. The adherence to HIV PEP protocol among healthcare providers was 17.9%. Study participants who received training on PEP were likely to adhere to HIV PEP protocol, while those who had low risk or could not assess their risk of occupational exposure were less likely to adhere to HIV PEP protocol. Furthermore, uptake of HIV PEP was reported for two studies as 33.8% and 44.4%.

A plethora of studies has published a lack of knowledge regarding PEP, which subsequently leaves an information gap in the healthcare system. The insufficient knowledge of PEP has been attributed to healthcare workers’ attitudes towards PEP, fear of stigmatisation and adverse side effects of the PEP treatment. Adequate knowledge...
of HIV PEP among health workers was reported as 16.6% and 44.9%.67 68 Relating to the study on knowledge of PEP for hepatitis B, 12.1% had adequate knowledge.65

**IPC guidelines**

Compliance with IPC precautions, methods and strategies is significant in the reduction of healthcare-associated infections.72 Yet, varied compliance with IPC practices such as the use of PPE and hand hygiene has been published.72 73 Also, training and education improve IPC practices and ultimately their compliance.74 75 Five studies in this review investigated compliance with IPC guidelines. These IPC compliance studies related to PPE usage, hepatitis B infection preventive measures, TB preventive measures and general IPC compliance measures.

The general IPC compliance was reported at 54.9%76 and IPC compliance for PPE usage was 90.6%.58 Lower compliance with PPE usage was related to study participants who were separated/divorced/widowed, secondary education leavers, non-clinical staff, cleaners, pharmacists and those who reported inadequate PPE.58 Likewise, compliance with hepatitis B infection preventive measures was 16.1%.77 Besides, being in medical/obstetrics/gynaecology departments and the availability of dustbin liners were always positively associated with adherence to HBV infection preventive measures.77 Additionally, in other studies in the review, 51.0% had moderate knowledge of general infection control preventive guidelines and 69.9% had high knowledge of hepatitis B infection.76 77 There was high availability and access to IPC materials including PPE, handwashing facilities and dustbin liners.76 77

Relating to TB infection, knowledge of its IPC measures was not satisfactory.78–80 Two studies in this review looked at knowledge of TB infection prevention measures. About 59.8% of health workers had adequate knowledge of TB infection preventive measures, and a percentage mean score of knowledge (67.2%) was reported among healthcare workers. Additionaly, adequate knowledge of TB, having 2–5 years of working experience, being a holder of a certificate and other higher educational qualifications, and having had training in TB IPC practices were positively associated with TB infection prevention practices.81 Again, approximately 27.1% of doctors and nurses practised effective TB infection prevention measures.81

Low knowledge of standard precautions is recorded among healthcare personnel in developing countries including Ghana.65 68 Moreover, adequate knowledge is likely to influence compliance with standard precautions.65 68 The general knowledge of the basic concepts of standard precautions was low as reported in the only study in this review that investigated standard precautions and barriers to compliance with them.85 In the study, only 37.0%, 39.0% and 40.0% who knew that standard precaution involved hand washing before and after directly touching the patient had knowledge on cough etiquette and knew aseptic techniques regarding infection prevention measures, respectively.85 The major barriers that hindered the compliance with these precautions included lack of time, panic among patients, demands for patient care and lack of PPE. Further, sufficient knowledge of general control measures, individual protective practices and institutional culture and practices were reported as 96.0%, 82.5% and 79.2%, respectively.86

**Psychological hazards**

**Stress and burnout**

The incidence of burnout among healthcare providers, particularly physicians, has increased over time. One in every three physicians is at risk of occupational burnout.87 Low remuneration, work–life imbalance and postgraduate training challenges are prevailing risk factors for burnout.88 Additionally, burnout has an immense effect on the healthcare system such as absenteeism, decreased commitment and job satisfaction, lower effectiveness and productivity, workforce turnover, risks to patient safety and ultimately poor quality of care.89–91 Additionally, the workers in the healthcare industry are highlighted as one of the occupational groups who experienced elevated stress levels in their line of work and are at risk of developing several occupational stress symptoms.92 93 Understaffing, high job demands, insufficient resources and compassion fatigue, and risk of infection are among the prevailing reasons that lead to increased job strain, occupational stress and poor service delivery.94

In this present review, seven studies that made the inclusion criteria investigated burnout. While some of the studies reported general burnout, others reported components of burnout—depersonalisation, personal achievement and emotional exhaustion. General burnout was reported from a range of 9.9% to 47.0%.95–98 Emotional burnout was reported from a minimum of 10.8% to a maximum of 62.5%,97–101 depersonalisation burnout was reported from 5.5% to 55.0%98–101 and personal achievement burnout was reported from 7.8% to 58.4%.98–101 Nurse occupation, health workers who were 40–50 years and fear of contracting COVID-19 infection were positively associated with burnout, whereas health workers who felt prepared for COVID-19 and enjoyed support from family were negatively associated with burnout.97 98 In addition, work-to-family conflict and career dissatisfaction were positively associated with burnout.95 96 Also, extra work hours and night shifts were positively associated with emotional exhaustion and depersonalisation.98 A problem-focused coping strategy, emotional support from family/friends as a coping strategy, using humour and listening to music were suggested as ways of preventing burnout.99

About work-related stress, seven articles were included in this review. Stress levels were reported within the range of 4.0%–89.8%.97 98 102–106 However, a study reported stress as 10% above the Weiman Occupational Stress Scale.107 Being hypertensive and reporting sickness absence were positively related to work-related stress.102 104 105 Receipt of appreciation from management, enjoyment of family support and being prepared for the COVID-19 pandemic were associated with lower stress levels,98 while fear of
COVID-19 infection and absence due to sickness were related to higher stress levels.98

Violence

The issue of violence in the healthcare sector is extensively documented both in developing and developed countries.106-110 Also, healthcare professionals are 16 times more exposed to workplace-related violence.111 The cost of healthcare services, poor quality of healthcare, low knowledge of the healthcare system, no or lack of faith in the judicial system and vulnerability of healthcare facilities are factors that trigger the menace of violence.112 Workplace violence can be in the form of physical assault, verbal abuse and sexual harassment. A 12-month occurrence of sexual harassment was 12.0% and that of verbal assault was 52.2% in one of the two studies included in this review.115 The other study reported workplace violence of 24.4% over the past year, where frequent verbal abusers were relatives of patients and sexual perpetrators were doctors.40 113

Ergonomic hazards

Musculoskeletal injuries

Healthcare workers are most vulnerable to work-related musculoskeletal injuries due to their line of work.114 115 About one-third of all sick leave among healthcare personnel is attributed to musculoskeletal disorders or injuries.116 However, these injuries are under-reported, even in developed countries.117 Three studies related to musculoskeletal injuries satisfied the inclusion criteria for this current review. In one of the studies, a 1 year and a week of musculoskeletal injury prevalence of 70.1% and 44.6% were reported, respectively.118 Likewise, a 12-month prevalence of lower back pain injuries was reported in two studies as 49.5% and 51.2%.44 119

Physical hazards

Physical hazards such as radiation, slips and falls, and noise among others are also experienced by healthcare providers though many studies do not concentrate on these hazards. Physical hazards such as slips, trips and falls, and being hit by objects were examined in two studies in this review. A 1-year prevalence of slips, trips and falls, and being hit by objects were reported as 27.0% and 25.2%, respectively.40 119

Chemical hazards

Though healthcare professionals experience various forms of chemical exposure including disinfectants, latex in gloves and antineoplastic drugs, just a single study was found on chemical exposure within the year under this review. About 27.0% of health professionals in this study were found to be exposed to disinfectants, which resulted in irritation.

Finally, some studies included in this review either considered exposure to a collection of occupational hazards or some types of occupational hazards as a single variable. One such study that considered non-biological hazards as one variable found the experience of verbal assault to be positively related to non-biological hazards, whereas single marital status was negatively associated with non-biological hazards.43 Additionally, the study found that being clinical staff, experiencing extreme pressure from work and being a victim of a verbal assault were positively associated with biological hazards, while poor maintenance of hospital items was negatively related to biological hazards.43 A single study included in this current review reported a collective exposure to occupational health hazards among healthcare personnel as 44.0%.120 Furthermore, more years on the ward were positively associated with exposure to occupational health hazards.120 Finally, three studies in this review considered the knowledge of exposure to occupational health hazards. Knowledge of exposure to occupational health hazards and safety was reported within a range of 66.5%–92.7%.44 86 120 There were adequate knowledge of exposure to biological (93.5%), psychological (84.0%), ergonomic (82.0%), physical (72.0%) and chemical hazards (66.5%).40

Implications

This scoping review has depicted that healthcare providers and ancillary staff in Ghana are invariably exposed to a wide scope of both biological and non-biological occupational hazards. Exposure to biological hazards is reported to occur frequently in low/middle-income countries,22 and our review found similar findings, confirming the frequent exposure to biological hazards in healthcare settings and developing countries such as Ghana.

The risk factors of occupational exposures in this review were mainly individual and health facility related. This calls for government and non-governmental organisations to consider ways of equipping healthcare facilities with adequate resources including PPE. Also, the provision of training opportunities on these exposures for workers in the health sector can help in curbing these exposures. The review further reveals that compliance with and utilisation of control/preventive measures regarding exposure to occupational hazards were not adequate. Further, health facility managers and supervisors should enforce prevention and control measures, implement policies and increase supervisory roles. This will increase the utilisation of available preventive measures and subsequently curb non-compliance. Furthermore, low knowledge of control/preventive measures among healthcare workers was revealed in this review. A knowledge gap is a fundamental problem that can retard the fight against the control and prevention of occupational health hazards. Healthcare providers should be encouraged to undertake refresher courses to keep them updated on occupational exposures and IPC measures in healthcare settings.

Over the last 3 years, there has been an increase in the number of research work related to occupational health hazards; this is encouraging and it will bring improvement of services in the healthcare industry, if their findings are adequately implemented. However, more work needs to be done since almost all studies
were based on cross-sectional designs. To substantiate the current evidence available, prospective designs and other vigorous study designs are needed. Moreover, holistic evidence on occupational exposure in the healthcare industry of Ghana is difficult to ascertain because there was no single study that considered only ancillary staff or workers in the WHO elementary occupations category as study participants. Though the authors of this review were keen on finding studies conducted among this category of workers, none were found. Nonetheless, this group of workers was considered as part of studies that considered health workers as a whole, and most studies in this review looked at study participants from this angle.

**Strengths and limitations of the review**

This scoping review provides broad coverage of exposure to occupational health hazards among healthcare providers and ancillary staff in Ghana because it did not only consider the prevalence of these exposures but also looked at predisposing factors that are attributed to these exposures as well as knowledge and utilisation of the control/preventive measures. Research questions and search terms for this review were developed through a consultative approach. Furthermore, articles were searched in six broad databases and Google Scholar through a systematic approach. Two authors were independently involved in all screening processes of the review and all discrepancies were resolved through consultation with other two reviewers. Lastly, this review was reported according to PRISMA-ScR guidelines.

The main limitation of this review was that quality assessments of articles were not done; some unpublished theses and dissertations were included in the review. This implies that some of the eligible articles could be of poor quality. Additionally, this review was restricted to articles published in the English language and within a review period. Also, since the title and abstract screening were done separately, there could have been loss of eligible studies because some titles can be misleading. However, two independent reviewers undertook all the screening stages of this review to reduce the effect of this limitation. Finally, though a search strategy was developed and used for the review, all eligible data may not have been captured by it. The review was comprehensive enough irrespective of these limitations.

**CONCLUSION**

Quite a considerable number of healthcare providers and ancillary staff are exposed to both biological and non-biological occupational health hazards. The predisposing factors of these exposures were primarily individual and facility related. The compliance and utilisation of control/preventive measures were not adequate. The knowledge level of control/preventive measures relating to occupational hazard exposure was also suboptimal. Though studies that examined occupational health hazards have increased over the last 3 years, there is still a lack of recognition and knowledge gap of the exposures in the Ghana healthcare system. Apart from exposure to biological hazards and their preventive measures, which have received some research attention, all the other exposures have not been extensively studied. An urgent call is required to study occupational exposure in the Ghanaian healthcare system using rigorous study designs such as prospective studies.

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**Contributors** PAT and EA-B conceived of the idea, developed the research question and study methods and contributed meaningfully to the drafting and editing. They also approved the final manuscript. AB-A, ESE, GA-F, MEA, RAK and EA-G aided in developing the research question and study methods; contributed meaningfully to the drafting and editing, and approved the final manuscript. PAT acts as guarantor for this study.

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**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not required.

**Ethics approval** The methodology of scoping reviews involved the collection and reviewing of existing materials in the public domain. Therefore, this study did not require ethical approval.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as supplemental information. Not applicable.

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41 Ibrahim I. Occupational exposure to needle stick injuries among health care workers at the Tamale teaching hospital, 2015.
44 Nyame-Annan EKP. Occupational hazards and safety practices among hospital workers at greater Accra regional Hospital, ridge, 2011.


Codjoe A. Assessment of tuberculosis infection control and practices among healthcare workers in Tema General Hospital, 2012.


Ahassan AR. Nurses hand hygiene compliance: an observational study in Tamale teaching Hospital, Ghana. ARC Journal of Nursing and Health Care 2020;8:28–34.


Egunwu CC. Work-Related stress and hypertension among nurses at ridge Hospital, Accra Ghana, 2015.


Appendix I: Search strategy

A search conducted in PubMed on October 4, 2021.

Table 1: Preliminary search

<table>
<thead>
<tr>
<th>SEARCH</th>
<th>QUERY</th>
<th>RECORDS RETRIEVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>&quot;Health Personnel&quot;[MeSH Terms] OR &quot;health care workers&quot;[All Fields] OR &quot;health professionals&quot;[All Fields] OR &quot;nurse*&quot;[All Fields] OR &quot;healthcare workforce&quot;[All Fields] OR &quot;doctors&quot;[All Fields] OR &quot;laboratory workers&quot;[All Fields] OR &quot;midwives&quot;[All Fields] OR &quot;students&quot;[All Fields] OR &quot;kitchen staff&quot;[All Fields] OR ((&quot;canteen&quot;[All Fields] OR &quot;canteens&quot;[All Fields]) AND (&quot;occupational groups&quot;[MeSH Terms] OR (&quot;occupational&quot;[All Fields] AND &quot;groups&quot;[All Fields]) OR &quot;occupational groups&quot;[All Fields] OR &quot;worker&quot;[All Fields] OR &quot;workers&quot;[All Fields] OR &quot;worker s&quot;[All Fields]) OR &quot;laundry workers&quot;[All Fields] OR &quot;Waste handlers&quot;[All Fields]) OR &quot;clean*&quot;[All Fields]</td>
<td>1,311,477</td>
</tr>
<tr>
<td>#3</td>
<td>&quot;Ghana&quot;[MeSH Terms] OR (&quot;Ghana&quot;[MeSH Terms] OR &quot;Ghana&quot;[All Fields] OR (&quot;republic&quot;[All Fields] AND &quot;Ghana&quot;[All Fields]) OR &quot;republic of ghana&quot;[All Fields] OR &quot;ghana*&quot;[Title/Abstract]</td>
<td>19,506</td>
</tr>
<tr>
<td>#4</td>
<td>#1 AND #2 AND #3</td>
<td>151</td>
</tr>
</tbody>
</table>

Limitations to search

1. Language: Only studies published in English language will be included.
2. Publication date: All studies from the inception of the database.
Appendix II: Data extraction instrument

This review extraction instrument composed of two sections;

1. General background information of studies

Table 1: General information

<table>
<thead>
<tr>
<th>General information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author and date</td>
</tr>
<tr>
<td>Title of study</td>
</tr>
<tr>
<td>Aim of study</td>
</tr>
<tr>
<td>Study setting</td>
</tr>
<tr>
<td>Study design/study population</td>
</tr>
<tr>
<td>Sample size/sampling method</td>
</tr>
<tr>
<td>Methodology/instrument</td>
</tr>
<tr>
<td>Outcomes/key findings</td>
</tr>
</tbody>
</table>

2. Key questions posed by the review was tabulated as follows:

Table 2: Review considerations

<table>
<thead>
<tr>
<th>Review considerations</th>
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</thead>
<tbody>
<tr>
<td>Author and date</td>
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<tr>
<td>Category of health personnel</td>
</tr>
<tr>
<td>Type of exposure</td>
</tr>
<tr>
<td>Risk of exposure</td>
</tr>
<tr>
<td>Knowledge on exposures/preventive measures</td>
</tr>
<tr>
<td>Predisposing factors of exposures</td>
</tr>
<tr>
<td>Utilization of universal precautions</td>
</tr>
</tbody>
</table>
Table 1: Studies (n = 28) on biological hazards (arranged in chronological order according to the year of publication)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Topic</th>
<th>Region</th>
<th>Design</th>
<th>Participants</th>
<th>Instrument</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appiagyei et al. (40)</td>
<td>2021</td>
<td>Occupational injuries among health care workers at a public hospital in Ghana</td>
<td>Ashanti</td>
<td>Cross-sectional</td>
<td>246 HCW consented to partake in the study.</td>
<td>A self-administered questionnaire was used to gather data for the study.</td>
<td>The prevalence of occupational injuries was 29.7% over a year. Prevailing mechanisms of injuries were needlestick (35.4%), cut from sharp objects (34.6%), hit by objects (25.2%) and violence (24.4%). Adherence to properly disposing of sharps and using protective equipment was found to be 86.6% and 85.8%, respectively. Although the majority, 62.2% had training in occupational safety, few HCWs knew officers in charge of post-exposure prophylaxis (5.3%) and the hospital occupational safety unit (26.4%). Stress at work and being a laboratory worker was significantly associated with the occurrence of injuries.</td>
</tr>
<tr>
<td>Tawiah et al. (35)</td>
<td>2020</td>
<td>Occupational exposure to blood and body fluids among medical laboratory science students of the University of Health and Allied Sciences during Vocational Internship in the Volta Region of Ghana</td>
<td>Volta</td>
<td>Cross-sectional</td>
<td>178 medical laboratory science students were selected for the study through random sampling.</td>
<td>A self-administered questionnaire was designed for the study.</td>
<td>More than half (50.6%) of participants experienced at least one exposure to blood and body fluids. Work experience increased the odds of being exposed to BBF while adequate PPE reduced the odds of being exposed. Torn gloves were experienced most, followed by a splash of blood and body fluids, needlestick and sharp injury.</td>
</tr>
<tr>
<td>Obirikorang et al. (42)</td>
<td>2019</td>
<td>Awareness and occupational exposures to needlestick injuries among healthcare workers: A quantitative assessment in a Ghanaian Metropolis</td>
<td>Ashanti</td>
<td>Cross-sectional</td>
<td>540 HCWs were recruited through a stratified random sampling method.</td>
<td>A close-ended questionnaire was used to gather data.</td>
<td>All study participants were aware of NSI and its associated infectious diseases acquisition. However, the prevalence of NSI was 47%. NSI occurrence was high at the bedside (28.5%) and in clinical laboratories (26.4%). Working more than 5 years and above, being 30 years and above and working in a District Hospital were associated with increased events of NSI.</td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Setting</td>
<td>Design</td>
<td>Sample Size</td>
<td>Data Collection Method</td>
<td>Key Findings</td>
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<tr>
<td>Apetorgbor (36)</td>
<td>2018</td>
<td>Occupational exposure to blood and body fluids among health workers: The case of Shai-Osudoku District Hospital.</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>171 health care workers were selected through simple random sampling.</td>
<td>A self-administered structured questionnaire was used. The majority (67.5%) of B/BF exposures were experienced in the past 12 months. About 70.5% did not report their exposures. PPE availability, risk reception, exposure reporting training, being a midwife, IPC training and attending to more patients per shift were closely related to exposures. Approximately 75% of tests done on exposed respondents were positive for HIV infection and PEP was given consequently.</td>
<td></td>
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<tr>
<td>Hippolyt (39)</td>
<td>2017</td>
<td>Determinants of sharp injuries among clinical care workers in the Kintampo Municipal Hospital, Brong Ahafo Region, Ghana</td>
<td>Brong Ahafo</td>
<td>Cross-sectional</td>
<td>A total of 152 HCWs were recruited through a simple random sampling method.</td>
<td>A closed-ended structured questionnaire was developed for the study. About 15.1% of HCW reported sharp injuries. Major determinants of sharp injuries were lack of workplace supervision, health and safety training, alcohol consumption, job stress, sleeping difficulties and failure to use PPE.</td>
<td></td>
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<tr>
<td>Kommogldomo (37)</td>
<td>2016</td>
<td>Needlestick and sharp injuries among health care workers at the 37 Military Hospital</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>297 HCWs were recruited into the study through the random sampling method.</td>
<td>A self-administered structure was used to gather data for the study. About 53.7% of participants experienced sharp injuries. These injuries frequently occurred through needle pricks (35.5%), cuts (62.1%), bruises (2.0%) and abrasions (0.7%).</td>
<td></td>
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<tr>
<td>Lori et al. (6)</td>
<td>2016</td>
<td>Sharps injuries among emergency department nurses in one tertiary care hospital in Ghana</td>
<td>Ashanti</td>
<td>A mixed-method study</td>
<td>Exactly 45 nurses took part in the study.</td>
<td>A structured questionnaire made up of both close and open-ended questions was used for the study. There was a high incidence of sharp-related injuries and it was associated with exposure to bloodborne pathogens. About 28.9% of participants reported experiencing a sharp injury in the past 12 months. Nearly 50% of participants were aware of the protocol to report a sharp-related injury; however, less than 10% could list all three components of this protocol. Most, 93.0% of nurses could correctly list all the immediate steps to follow if a sharp injury occurs.</td>
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</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Design</td>
<td>Participants</td>
<td>Method</td>
<td>Results/Findings</td>
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<tr>
<td>Ibrahim et al. (41)</td>
<td>2015</td>
<td>Cross-sectional</td>
<td>250 HCW were recruited into the study. Stratified proportion to the size and convenience sampling methods were used.</td>
<td>A questionnaire was used to gather data for the study.</td>
<td>About 66.0% of participants were involved in needlestick injuries (NSI). Needlestick injuries were significantly associated with gender, age category, and training in infection prevention and control. Majority, 54.6% of injured health workers had experienced 1-2 times in their professional life. Administration of injection to patients was responsible for a greater portion, 36.4% of exposures. Nurses were more injured than any other group. Female workers and those who had training had significantly lower injuries. Also, 48.5% of injured HCWs did not report their injuries.</td>
<td></td>
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<tr>
<td>Ashinyo et al. (48)</td>
<td>2020</td>
<td>Cross-sectional</td>
<td>408 HCWs were conveniently selected to participate in the study.</td>
<td>WHO COVID-19 risk assessment tool was used to collect data.</td>
<td>Although there was a high level (80.4%) of occupational exposure to the COVID-19 virus, only 14.0% of the exposed HCW were at high risk of COVID-19 virus infection. HCW who were involved in aerosol-generating procedures (AGP) were likely to be exposed compared to those absent. The high risk of COVID-19 virus infection was less likely among registered nurses, HCW who performed AGP or were present during any AGP, and HCW with Master’s degree qualifications.</td>
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</tr>
<tr>
<td>Alhassan et al. (56)</td>
<td>2020</td>
<td>Cross-sectional</td>
<td>156 participants including aesthetes and orderlies were recruited through stratified random sampling methods.</td>
<td>A structured questionnaire</td>
<td>Hand hygiene and facemask compliance among participants were 49.4% and 73.7%, respectively. Occupational category, educational level, IPC in-service training/workshop and hospital monitoring to staff adherence to IPC were significantly associated with hand hygiene compliance. Also, occupation, age group, educational level, and hospital monitoring of staff adherence to IPC were significantly related to face mask compliance.</td>
<td></td>
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</tbody>
</table>
### Table 1 continued

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Title</th>
<th>Design</th>
<th>Setting</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alhassan (57)</strong></td>
<td>Nurses Hand Hygiene Compliance: an observational study in Tamale Teaching Hospital, Ghana</td>
<td>Cross-sectional</td>
<td>Northern</td>
<td>All nurses (410) working in the paediatric department. A census was conducted.</td>
</tr>
<tr>
<td><strong>Yawson and Hesse (55)</strong></td>
<td>Hand hygiene (HH) practices and resources in a teaching hospital in Ghana</td>
<td>Cross-sectional</td>
<td>Greater Accra</td>
<td>Conducted among nurses and doctors. An IP checklist and health worker HH compliance form based on the WHO guidelines were used for data collection.</td>
</tr>
<tr>
<td><strong>Botchway et al. (64)</strong></td>
<td>Prevalence and attitude towards hepatitis B vaccination among healthcare workers in a tertiary hospital in Ghana</td>
<td>Cross-sectional</td>
<td>Central</td>
<td>A stratified sampling method was used to recruit 303 HCWs including health assistants. A structured self-administered questionnaire was used.</td>
</tr>
</tbody>
</table>

**Hepatitis B vaccine uptake**

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Title</th>
<th>Design</th>
<th>Setting</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Botchway et al. (64)</strong></td>
<td>Prevalence and attitude towards hepatitis B vaccination among healthcare workers in a tertiary hospital in Ghana</td>
<td>Cross-sectional</td>
<td>Central</td>
<td>A stratified sampling method was used to recruit 303 HCWs including health assistants. A structured self-administered questionnaire was used.</td>
</tr>
</tbody>
</table>

The hand hygiene compliance level was 80.2%. Ward of the participant, duty shift (afternoon and night shift), occupation (RM and RGN), and type of hand hygiene indication were significantly associated with hand hygiene non-compliance.

Care-related HH compliance was low, it ranged from 9.2% to 57.0% and 9.6 – 54.0% among doctors and nurses, respectively. Where risk was perceived to be higher HH compliance was higher. Health workers in the neonatal unit showed the highest form of compliance. Alcohol hand rub and liquid soap dispensers were found to be deficient in facilities for HH.

Mean knowledge was 4.73±0.97 out of 7.00. Out of the 90.4% of participants that had been vaccinated, about 80% of HCW had received 3 doses of HBV vaccine. Those who did not know HBV vaccine was effective and those who did not know that HBV was more infectious than HIV were more likely to be unvaccinated. The cost was a major barrier to the unvaccinated health care workers. Also, 59.12% of participants had not tested for post-vaccination seroprotection.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Study Title</th>
<th>Location</th>
<th>Study Type</th>
<th>Sample Size</th>
<th>Sampling Method</th>
<th>Data Collection Tool</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ansa et al.</td>
<td>2019</td>
<td>Hepatitis B vaccine uptake among healthcare workers in a referral hospital, Accra</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>161</td>
<td>A structured questionnaire was used.</td>
<td></td>
<td>53.4% of HCW have taken the hepatitis B vaccination while 79.1% of this number had completed full vaccination. Working more than 16 years, daily exposure to blood and body fluids, and sharp instruments, performing invasive procedures daily and frequent exposure to blood-stained linens and waste were associated with vaccination.</td>
</tr>
<tr>
<td>Aniaku et al.</td>
<td>2019</td>
<td>Assessment of knowledge, attitude and vaccination status of hepatitis B among nursing training students in Ho, Ghana</td>
<td>Volta</td>
<td>Cross-sectional</td>
<td>358</td>
<td>A self-administered questionnaire.</td>
<td></td>
<td>Age group and level of study were associated with knowledge score. Though 66.8% of nurses had been vaccinated, only 49.4% have taken the full three doses of vaccines. There was a significant association between the program of study, year of study, knowledge and vaccination status. About half of the nurses claimed the hepatitis B vaccine was expensive.</td>
</tr>
<tr>
<td>Suglo et al.</td>
<td>2021</td>
<td>Predictors of adherence to HIV post-exposure prophylaxis protocol among frontline healthcare workers at the Ho Teaching Hospital, Ghana</td>
<td>Volta</td>
<td>Cross-sectional</td>
<td>199</td>
<td>A closed-ended question was used to assess adherence to PEP, knowledge of PEP, socio-demographic characteristics and perception of risk of occupational exposure.</td>
<td></td>
<td>91.5% were at risk of occupational exposure and 36.4% has experienced at least one exposure in the last 12 months before the study. 51.3% of respondents did not report an injury. Non-reporting was due to not knowing whom to report to (10.0%), being unaware of the availability of PEP (13.3%), and the source of exposure being an HIV-negative patient (48.3%). Among those exposed to the virus, 44.4% received PEP. 16.6% of participants had an overall adequate knowledge of PEP. Among those exposed, 40.4% were assessed as having low risk whereas 17.5% were assessed at high-risk exposure. Overall adherence to PEP was 17.9%. Participants who had received training on PEP were likely to adhere to PEP protocol. Very low-risk, low-risk participants and those who could not assess their risk were 96%, 94% and 95%, respectively, and they were less likely to adhere to the PEP protocol.</td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Study Title</td>
<td>Study Setting</td>
<td>Study Design</td>
<td>Sample Size (Method)</td>
<td>Main Findings</td>
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</tr>
<tr>
<td>Babanawo et al. (68)</td>
<td>2018</td>
<td>Assessment of knowledge and usage of HIV post-exposure prophylaxis among healthcare workers in a regional hospital in Ghana</td>
<td>Eastern</td>
<td>Cross-sectional</td>
<td>185 healthcare workers were recruited through a random sampling method.</td>
<td>96.8% of HCW considered themselves at risk of occupational exposure. 83.2 reported occupational exposure within the last 12 months. 33.8% reported taking PEP though 51.9% were eligible. Only 44.9% had good knowledge of HIV PEP.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Konlan et al. (65)</td>
<td>2017</td>
<td>The level of nurses’ knowledge on occupational post-exposure to hepatitis B infection in the Tamale metropolis, Ghana</td>
<td>Northern</td>
<td>Cross-sectional</td>
<td>108 nurses were selected for the study through simple random sampling.</td>
<td>94.4% of participants considered themselves susceptible to occupational infection of hepatitis B. Only 23.4% were able to mention all the key elements of post-exposure management. About 12.1% had adequate knowledge of post-exposure prophylactic treatment against HBV infection. 44.8% of nurses were vaccinated while of those immunized, 75.0% had received the full three doses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ashinyo et al. (58)</td>
<td>2021</td>
<td>Infection prevention and control compliance among healthcare workers in COVID-19 treatment centres in Ghana: A descriptive cross-sectional study.</td>
<td>Greater Accra and Ashanti</td>
<td>Cross-sectional</td>
<td>408 HCWs including nursing assistants, catering staff, cleaners and other administrative workers were conveniently selected to participate in the study.</td>
<td>The study found IPC compliance during healthcare interactions was 88.4% for hand hygiene and 90.6% for PPE usage and IPC compliance while performing aerosol-generating procedures was 97.5% for both hand hygiene and PPE usage. Hand hygiene during healthcare interactions and lower compliance were seen among non-clinical staff and holders of secondary level qualifications. Midwives and pharmacists had lower compliance with hand hygiene compared to registered nurses. Relating to PPE usage during healthcare interactions, lower compliance was observed among HCW who were separated/divorced/widowed and those with secondary level qualifications, nonclinical staff, cleaners, pharmacists and among HCW who reported insufficiency of PPE.</td>
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<tr>
<td>Author</td>
<td>Year</td>
<td>Study Title</td>
<td>Location</td>
<td>Design</td>
<td>Sample Size</td>
<td>Data Collection Method</td>
<td>Conclusion</td>
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<tr>
<td>Osei-Yeboah</td>
<td>2019</td>
<td>Knowledge and practice of tuberculosis infection prevention and control measures among nurses and doctors in selected government hospitals in Accra, Ghana.</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>403 doctors and nurses were selected through a proportionate stratified sampling method.</td>
<td>Structured questionnaire</td>
<td>About 59.8% of doctors and nurses had adequate knowledge of tuberculosis infection prevention practices. Only 27.1% of doctors and nurses practised effective tuberculosis infection preventive measures. Working years, knowledge about TBIPC, and ever attending TBIPC training were key predictors of effective TBIPC practices.</td>
<td></td>
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<tr>
<td>Kporngor</td>
<td>2018</td>
<td>Practices relating to hepatitis B virus infection prevention and its determinants among health care workers in the Ho Municipality, Ghana</td>
<td>Volta</td>
<td>Cross-sectional</td>
<td>273 HCWs including health assistants and housekeeping staff were randomly selected.</td>
<td>A self-administered questionnaire and direct observational checklist were used for data collection.</td>
<td>Only 16.12% of HCW followed standard preventive measures for hepatitis B. Department of participants and availability of dustbins were associated with the proper practice of hepatitis preventive measures. A majority, 69.6% had high knowledge of hepatitis B infection; however, knowledge of HBV infection and preventive measures were not associated. There was high availability of PPE (85.4%), handwashing facilities (97.8%) and dustbin liners (72.2).</td>
<td></td>
</tr>
<tr>
<td>Akagbo et al.</td>
<td>2017</td>
<td>Knowledge of standard precautions and barriers to compliance among healthcare workers in the Lower Manya Krobo District, Ghana</td>
<td>Eastern</td>
<td>Cross-sectional</td>
<td>100 HCWs including ward orderlies took part in the study. And they were sampled through the quota and random sampling methods.</td>
<td>A structured questionnaire was developed based on two previous studies.</td>
<td>General knowledge of the basic concepts of standard precautions was low. Half of the participants always protect themselves against the BBF of patients. Major barriers to SP compliance include lack of time, panic among patients, demands for patient care and lack of PPE.</td>
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<tr>
<td>Hayeh &amp; Esena</td>
<td>2013</td>
<td>Infection prevention and control practices among health workers at Ridge Regional Hospital in Accra, Ghana</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>Exactly 204 Health care workers, participants were recruited for the study</td>
<td>Self-administered questionnaires and observational guides were used to collect data from participants.</td>
<td>Compliance with IPC guidelines was 54.9% while 51.0% had moderate knowledge of IPC. The availability and access to materials for IPC practices was 58.0%.</td>
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<tr>
<td>Codjoe</td>
<td>2012</td>
<td>Assessment of Tuberculosis infection prevention and control practices among healthcare workers in Tema General Hospital</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>229 health workers were randomly selected.</td>
<td>54-item self-administered questionnaire was used for data collection.</td>
<td>The mean knowledge score was 13.44 out of a maximum of 20. Knowledge of tuberculosis infection prevention and control was significantly related to participant’s sex, current ward of work and job title. Practices by health workers included hand washing hygiene, education of tuberculosis patients and use of information and communication materials.</td>
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<tr>
<td>Study Authors</td>
<td>Year</td>
<td>Study Title</td>
<td>Participants</td>
<td>Study Design</td>
<td>Stress/ Burnout Measurement</td>
<td>Findings</td>
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<tr>
<td>Boateng et al. (100)</td>
<td>2021</td>
<td>Causes of burnout syndrome and coping strategies among high dependency unit nurses of an institution in the Greater Accra region of Ghana</td>
<td>40 nurses working in high dependency units</td>
<td>Cross-sectional</td>
<td>Maslach Burnout Inventory</td>
<td>About 62.5%, 55.0% and 52.5% scored high emotional exhaustion, depersonalization and personal achievement, respectively, on the Maslach Burnout Inventory. A majority, 77.5% of respondents pointed out that poor conditions of work, work overload, low wages, emotional upsetting situations, handling a large number of patients, lack of breaks during shifts and inadequate nursing staff were causes of burnout. Most, 42.5% indicated that problem-focused coping strategy, emotional support from family/friends coping strategy, using humour and listening to music and emotion-focused strategy best-relieved burnout.</td>
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<tr>
<td>Odonkor and Adams (106)</td>
<td>2021</td>
<td>Predictors of stress and associated factors among healthcare workers in Western Ghana</td>
<td>400 HCW including radiographers</td>
<td>Cross-sectional</td>
<td>The stress cause-related aspect of the questionnaire was adapted from Cohen et al. (1983).</td>
<td>65.5% of respondents were stressed. The prevalence of stress was higher among females compared to males. 40.4 of respondents intend to change jobs due to stress. Respondents who are 56 years and below were more likely to be stressed than the other age groups. There was a significant relationship between age, marital status, workload and educational background, and stress levels among respondents.</td>
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<tr>
<td>Afulani et al. (98)</td>
<td>2021</td>
<td>Inadequate preparedness for response to COVID-19 is associated with stress and burnout among healthcare workers in Ghana.</td>
<td>414 and 409 healthcare workers</td>
<td>Cross-sectional</td>
<td>Stress was measured with 10-item Cohen perceived stress scale while burnout was assessed with a 14-item Shirom-Melamed Burnout measure. Both questionnaires assessed stress and burnout in the past month. A 15-item was developed for researchers to assess perceived preparedness.</td>
<td>The average stress score was 16.3 (SD = 5.9) with 64% experiencing moderate stress and 4% high stress. The average burnout was 37.4 (SD =15.5) with 47% experiencing low burnout and 20% high burnout. About 33%, 15% and 23%, respectively, had values for physical exhaustion, emotional exhaustion and cognitive weariness. Average preparedness was 24 (SD = 8.8) with 56.9% somewhat prepared and 27.5% prepared. Healthcare workers who felt somewhat prepared and prepared had lower scores of stress and burnout compared to those who felt not prepared. Appreciation from management and family support was associated with lower stress and burnout, while fear of infection was associated with higher stress and burnout.</td>
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Table 2 continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Setting</th>
<th>Design</th>
<th>Methodology</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Odonkor and Frimpong (97)</td>
<td>2020</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>Stratified sampling/proportionate size methods were used to recruit 365 HCW.</td>
<td>The total score for burnout among HCW ranged from good (71.50%), alarming (12.60%), acute crisis (6.02%) and burnout (9.90%). Nurses had the highest percentage of burnout. Burnout was significantly associated with age, gender, educational qualification, occupation, years of work experience, marital status and parenthood.</td>
</tr>
<tr>
<td>Nkyi and Blay (99)</td>
<td>2020</td>
<td>Central</td>
<td>Cross-sectional</td>
<td>A census survey was carried out that included 115 nurses through purposive and convenience sampling methods.</td>
<td>Maslach’s Burnout Inventory Human Services Survey was used for data collection</td>
</tr>
<tr>
<td>Ayisi-Boateng et al. (101)</td>
<td>2020</td>
<td>Ashanti</td>
<td>Cross-sectional</td>
<td>Exactly 60 Physicians responded to the study.</td>
<td>Maslach Burnout Inventory questionnaire was used to gather data.</td>
</tr>
<tr>
<td>Kaburi et al. (105)</td>
<td>2019</td>
<td>Northern</td>
<td>Institutional-Cross-sectional</td>
<td>All 167 nurses in the study area were recruited to partake in the study.</td>
<td>Psychological working conditions survey and nurse stress index</td>
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</tbody>
</table>

Reporting sickness absence was associated with high to extreme stress levels. Sources of occupational stress included the manual lifting of patients and pieces of equipment, risk of acquiring infections, receiving feedback on unsatisfactory performance and inadequate opportunities for continuous professional development.
<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Title</th>
<th>Location</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Methods</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abubakari et al. (104)</td>
<td>2018</td>
<td>Shift work, work-related stress, and hypertension among healthcare workers at the 37 Military Hospital, Accra Ghana</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>300 HCW were recruited including ward assistants using a random sampling method. A structured questionnaire was used for the study. An OMRON digital sphygmomanometer was used to measure blood pressure.</td>
<td>The prevalence of hypertension was 7% and 48% of healthcare workers were on shift work schedules. Work-related stress (high job strain) was found to be 41.7% and was significantly related to hypertension. 89.6% of healthcare workers had adequate knowledge of the risk factors of hypertension.</td>
<td></td>
</tr>
<tr>
<td>Asiedu et al. (96)</td>
<td>2018</td>
<td>Juggling family and professional caring: Role demands. Work-family conflict and burnout among registered nurses in Ghana</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>134 registered nurses were selected through the convenience sampling method. Work-family conflict was measured with a 10-item scaled questionnaire. Burnout was measured with 17 items adapted from the Maslach Burnout Inventory General Survey (MBI-GS).</td>
<td>The mean of burnout was 1.73 out of a maximum of 6. The family-to-work conflict was positively related to burnout.</td>
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<tr>
<td>Adzakpah et al. (107)</td>
<td>2016</td>
<td>Occupational stress among nurses in a hospital setting in Ghana</td>
<td>Eastern</td>
<td>Cross-sectional</td>
<td>A purposive sampling technique was used to recruit 73 nurses. A self-administered questionnaire based on Weiman Occupational Stress Scale and other measuring tools on occupational stress was used to gather data.</td>
<td>Nurses experience above-the-average occupational stress. Group and the individual mean score of 37.01 and 2.47, respectively were 10% higher than the established Weiman Occupational Stress Scale score.</td>
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</tr>
<tr>
<td>Egungwu (102)</td>
<td>2015</td>
<td>Work-related stress and hypertension among nurses at Ridge Hospital, Accra, Ghana</td>
<td>Greater Accra</td>
<td>Cross-sectional</td>
<td>Two hundred and eight (208) nurses were selected randomly to participate in the study. A job content questionnaire was adapted to measure work-related stress and a digital sphygmomanometer was used to measure blood pressure.</td>
<td>The prevalence of work-related stress was 68.0% whereas hypertension was 19.5%. After adjusting for some confounders, the adjusted relative risk between work-related stress and hypertension was 5.57 (95% CI: 2.25, 13.76)</td>
<td></td>
</tr>
<tr>
<td>Ashong et al. (103)</td>
<td>2015</td>
<td>Effects of occupational stress and coping mechanisms adopted by radiographers in Ghana</td>
<td>Across the country</td>
<td>Cross-sectional</td>
<td>Through purposive sampling, the study recruited 122 radiographers. A five-point Likert scale questionnaire was used to gather data.</td>
<td>Most radiographers were stressed with 63.0% showing high levels of stress. The most effects of stress were sick absence, depression and job dissatisfaction. Participants employed primary coping mechanisms in reducing stress.</td>
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Table 2 continued

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<tr>
<th>Authors</th>
<th>Year</th>
<th>Study Title</th>
<th>Design</th>
<th>Sample Size</th>
<th>Methods</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opoku and Apenteng (95)</td>
<td>2014</td>
<td>Career satisfaction and burnout among Ghanaian physicians</td>
<td>Cross-sectional</td>
<td>Two hundred (200)</td>
<td>Physician work-life study survey and Maslach’s Burnout Inventory were used to gather data.</td>
<td>Physicians showed overall moderate (mean of 3.2 out of 5) career satisfaction. Averagely, burnout was low, mean of 2.2 out of 5. Career satisfaction was negatively associated with burnout components of depersonalization, emotional exhaustion and personal accomplishment.</td>
</tr>
<tr>
<td>Boafo et al. (113)</td>
<td>2016</td>
<td>Sources, incidence and effects of non-physical workplace violence against nurses in Ghana</td>
<td>Cross-sectional</td>
<td>592 nurses</td>
<td>The health sector violence question was adapted for the study.</td>
<td>Twelve per cent of participants experienced one incident of sexual harassment while 52.2 were exposed to verbal abuse. Relatives of patients were the most frequent abusers whereas most sexual violence perpetrators were doctors. There were significant associations between gender and workplace voice, workplace violence and intention to quit.</td>
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Table 3: Ergonomic hazards

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<tr>
<th>Authors</th>
<th>Year</th>
<th>Study Title</th>
<th>Design</th>
<th>Sample Size</th>
<th>Methods</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abledu and Offei (118)</td>
<td>2015</td>
<td>Musculoskeletal disorders among first-year Ghanaian students in a nursing college</td>
<td>Cross-sectional</td>
<td>157 nursing students</td>
<td>A standardized Nordic Musculoskeletal Questionnaire was used to gather data.</td>
<td>About 70.1% of students reported having MSDs in the past 12 months. Again, 44.6% of students reported experiencing MSDs in the past 7 days.</td>
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Table 4: Biological and Non-biological hazards

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<th>Study</th>
<th>Year</th>
<th>Design</th>
<th>Setting</th>
<th>Sample Size</th>
<th>Sampling Method</th>
<th>Data Collection Method</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alhassan and Poku (120)</td>
<td>2018</td>
<td>Cross-sectional</td>
<td>Greater Accra</td>
<td>296</td>
<td>Stratified random sampling</td>
<td>A structured questionnaire was used. Administrative records were also used.</td>
<td>OHH knowledge level was high, 92% and 81% among nurses and nurse-assistants, respectively. Only 44% of participants reported exposure to occupational health hazards. Physical hazards were the most reported with the least being psychosocial hazards. More years onwards was associated with a higher likelihood of exposure while the frequency of exposure on daily basis was associated with work schedules, particularly those on a routine day, and those who alternate day and night schedules.</td>
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<tr>
<td>Awudu (43)</td>
<td>2018</td>
<td>Cross-sectional</td>
<td>Northern Metropolis</td>
<td>200</td>
<td>Purpose and simple random sampling</td>
<td>A self-administered questionnaire was developed for the study.</td>
<td>Being a clinical staff, poor maintenance of hospital items, victims of verbal assault, and extreme pressure from work was significantly associated with exposure to biological hazards whereas marital status, and extreme pressure from work was significantly associated with exposure to non-biological hazards. The most frequently experienced biological hazards were cuts and wounds (70.5%), pathogens/agents (33.0%) and irritation from disinfectants (26.0%). Non-biological hazards mostly experienced were lower back pain (49.5%), and slips, trips and falls (27.0%).</td>
</tr>
<tr>
<td>Duodu (86)</td>
<td>2018</td>
<td>Cross-sectional</td>
<td>Greater Accra</td>
<td>216</td>
<td>Stratified random sampling</td>
<td>Data was collected through a validated standardized questionnaire.</td>
<td>Participants showed a high level of knowledge of biological (93.5%), a moderate level of knowledge of psychological hazards (84.0%) and ergonomic hazards (82%) and a low level of physical (72%) and chemical hazards (66.5%). Age, educational level, income level and profession had a significant effect on knowledge of psychological, chemical and ergonomic hazards. Knowledge of control measures by employers was high (96%) among participants, followed by individual protective practices (82.5%) and institutional culture and practices (79.2%).</td>
</tr>
<tr>
<td>Nyame-Annan (44)</td>
<td>2017</td>
<td>Cross-sectional</td>
<td>Greater Accra</td>
<td>246</td>
<td>Simple random sampling</td>
<td>A structured questionnaire was employed for the study.</td>
<td>About 92.7% of hospital workers had high knowledge and awareness of occupational hazards and safety. Workers had a positive attitude towards occupational safety practices. 13.8% of hospital workers claimed to have acquired infection from the hospital. A majority, 54.6% and 51.2% of respondents experienced back pain and physical injuries (needlestick and leg injury), respectively.</td>
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