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

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Systematic Review

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Abstract

Background The safety of healthcare workers is a pathway to providing safe care to patients and their relatives, and yet healthcare providers and ancillary staff in developing countries such as Ghana are continuously exposed to occupational health hazards. The strict implementation of occupational health and safety policies seeks to curb these exposures. However, empirical evidence including reviews that are needed to affirm these policies is lacking in Ghana. This review primarily explored the types and prevalence of exposure to occupational health hazards among health workers in Ghana.

Methods A scoping review design was employed for this study. A systematic search strategy was used to identify articles in PubMed, MEDLINE, CINAHL, Embase, PsycINFO, Scopus and Google scholar databases and search engines covering the period of 1 January 2010 to 30 November 2021. Additionally, key studies reference lists, and sources of grey literature were also searched to identify relevant articles. The articles were screened, and data of included articles were extracted and subsequently synthesized. The review considered only quantitative studies. An extensive protocol to this review has already been published elsewhere.

Results Our systematic search strategy retrieved 507 publications; however, only 43 met the inclusion criteria. Healthcare professionals in Ghana were exposed to non-biological occupational hazards (stress, burnout, musculoskeletal injuries and violence), biological occupational hazards (sharp-related injuries, blood and body fluids and COVID-19 infection). But studies on exposure to non-biological hazards (34.9%) were more compared to biological hazards (20.9%). Averagely, health care workers utilized and complied to control/preventive measures (compliance to hand hygiene, face mask, infection prevention and control guidelines, hepatitis B vaccine uptake, adherence to HIV post-exposure prophylaxis protocol). Further, there was suboptimal knowledge of control/preventive measures (post-exposure prophylaxis, standard precautions, tuberculosis infection prevention and control measures, risk of exposure to occupational health hazards) among the healthcare personnel.

Conclusion The menace of occupational health hazards in the health care sector of Ghana needs more attention. Though this review supports the existing data for occupational health and safety policy, more research is needed to understand the extent of these exposures and their effects on the health system.

Key Messages

What is already known about this subject?

Health workers in low-middle-income countries including Ghana are continuously exposed to occupational health hazards compared to those in developed countries. Exposure to numerous forms of biological and non-biological hazards among healthcare providers and ancillary in the Ghanaian health industry has been reported in single original studies but not scoping or systematic reviews.

What are the new findings?

We present the first scoping review mapping out literature on exposure to biological and non-biological hazards, adherence and knowledge of control/preventive measures among the healthcare providers and ancillary staff in Ghana, after more than a decade of the implementation of the first occupational health and safety policy for the health care workers of Ghana.

How might this impact on policy or clinical practice in the foreseeable future?

The development of policy centres on empirical evidence in the form of original research studies, scoping reviews, and systematic reviews and metanalysis. Since there is no form of reviews on the subject matter in Ghana, this present scoping review can serve as an empirical evidence in the creation of future policy by identifying areas that needs attention and amendment.

Introduction

Healthcare providers and ancillary staff continuously experience exposures to several types of biological and non-biological hazards owing to their occupational surroundings, which is documented as one of the unsafe working environments (1–3). Undeniably, it is counter-intuitive that the health workers that care for the sick work in an industry whose setting is labelled as ‘high-hazard’. The infection and reinfection of healthcare workers in the ongoing Coronavirus disease 2019 (COVID-19) pandemic expose the flaws in the health care industry (4).

Besides, the 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), Human Immunodeficiency Virus (HIV), influenza and tuberculosis (TB) has gained more attention in terms of interventions such as safety programmes, personal protective equipment and research works (5). Non-biological hazard exposures emanating from formaldehyde, antineoplastic drugs, latex, ethylene oxide, cleaning and disinfecting chemicals have been linked to asthma, unfavourable procreative outcomes and cancers (6–10). Again, many studies have established varying incidences of burnout, stress, violence, injuries and musculoskeletal disorders in the health care industry (11–13).

Further, the issue of occupational injuries and exposures in the health care 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 to developing countries such as Ghana, where occupational health and safety is not on the priority list (14–16). Lack of data and inadequate policies implementation are among the main reasons why the subject of occupational health and safety have not been given much attention in the third world countries, apart from insufficient data collection systems, poor application of safety rules and regulations, political negligence, and healthcare personnel's not adhering to universal safety precautions (17, 18).

A data-driven approach is imperative in addressing the problem of occupational health and safety in health care industries especially in Ghana, where inadequate data and data collection systems is a fundamental challenge (16). In a quest to solve this problem in Ghana, the Ghana Health Service (GHS) and the Ministry of Health (MoH) implemented an Occupational Health and Safety Policy in 2010 and an updated one in 2021, which was solely in the context of COVID-19 (16, 19). The earlier policy details the lack of data and poor data collection systems on occupational exposures and lack of sensitization on occupational health and safety issues among the workers of the health service, which have improved over the period. Therefore, this scoping review based on knowledge from Arksey and O'Malley methodology (20) was conducted to scope the body of literature on occupational exposures among health personnel in Ghana.

Although some studies have employed scoping reviews 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 not non-biological hazards (21–23). Again, those reviews which were done in developing countries did not include primary studies that had among only ancillary staff as study participants; workers in the elementary occupations category of the WHO health worker classification.

This scoping review summarized the type and prevalence of exposure to occupational health hazards, described health workers' knowledge on occupational exposures and available preventive measures, explored predisposing factors of exposure to occupational health hazards and utilization of occupational health hazards control/preventative measures.

Methods

This scoping review was conducted based on guidance from the Arksey and O'Malley methodology framework (20) and Levac et al. (24) 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 of findings and 6) consulting with relevant stakeholders. However, the Joana Briggs Institute (JBI) elements for scoping reviews, namely: Participants, Concepts and Context (PCC) was used to define the core concept, focus participants, setting of studies and inclusion criteria of the scoping review. Subsequently, it guided in the formulation of research questions and title of the review. The findings of this review were reported using Preferred Items for Systematic reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) guidelines (25). A detailed protocol for this scoping review has been published elsewhere (26).

Research questions

To achieve a wholistic view of the exposure to occupational health 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, and they subsequently guided the conduct of this scoping 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 the health workers to use?
4. What is the level of knowledge relating to the risk of exposure and control/preventive measures of occupational health hazards among health care workers?
5. What is the level of adherence to these control/preventive measures?

Search strategy

The MeSH terms and key words including 'Occupational Exposure', 'occupational hazards', 'occupational risks', 'occupational diseases', 'occupational injuries', 'occupational accidents', 'occupational stress', 'sharp injuries', 'needle pricks', 'Cuts', 'wounds', 'airborne diseases', 'infectious diseases', 'physical abuse', 'sexual abuse', 'verbal abuse', 'musculoskeletal injuries', 'slips', 'trips', 'falls', 'chemical spill', 'fractures', 'noise', 'burns', 'radiations', 'burnout', 'Health Personnel', 'health care workers', 'health professionals', 'nurse*', 'healthcare workforce', 'doctors', 'laboratory workers', 'midwives', 'students', 'kitchen staff', 'canteen workers', 'laundry workers', 'Waste handlers', clean*, 'Ghana', 'Ghana*' were identified from the research questions and initial search to develop a search strategy (Search strategy is shown in online supplementary Appendix I). The search strategy was used to identify articles in Embase, CINAHL, PsycINFO, PubMed, MEDLINE, Scopus and Google Scholar databases from 1 January

2010 until 30 November 2021, over a decade after the implementation of the occupational health and safety policy for the Ghana health sector. And it was limited to articles published in the English Language. Additional articles were included by a hand-screening reference list of relevant articles and non-electronic materials. Grey publications, specifically dissertations/thesis were retrieved through a search on tertiary institutions' websites.

Study selection

Studies included in the scoping review were 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) conducted in health care 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 English Language. Also, studies 1) conducted among participants not working in health care facilities, 2) based on qualitative study approach were excluded from the review.

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

Data extraction

For every article included in this scoping review, descriptive characteristics comprising of authors, year of publication, the 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. A final extraction form is shown in online supplementary Appendix II).

Synthesizing 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. The number of studies based on occupational exposures and preventive measures was tabulated. Included studies were then summarized according to study characteristics; authors, year of publication, topic, region of study, study design, study population, sample size, methodology/instrument(s) used and key findings. Finally, the outcome of the studies was summarized along with review research questions.

Results

Four hundred and ninety-four (494) publications were identified from a search involving seven databases (Fig. 1). An additional thirteen (13) were retrieved from government and university websites; thus, the total number of articles retrieved was 507. After removal of duplicates, two hundred and seventy (270) were subjected to screening by title, followed by an abstract screening of seventy-eight (78) articles.

Fifty-three (53) articles were appropriate for full-text examination; yet, forty-three (43) were eligible for the scoping review (Fig. 1). Most of the eligible articles (n = 27, 62.8%) were published within the past three years (2018–2021) of the review (Fig. 2). However, twelve (n = 12, 28.0%) studies included in this review are thesis work and were not published in peer-reviewed journals (Fig. 5). 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 (Fig. 3). More than half (n = 24, 55.8%) of these studies employed the general health workers group as study participants (Fig. 4), followed by nurses (n = 11, 25.6%).

Relating to the occupational exposures and preventive measures, a greater number (n = 15) of the eligible studies (n = 43) were done on exposure to non-biological hazards, followed by control/preventive measures to occupational health hazards (n = 10), exposure to biological hazards (n = 9), knowledge on control/preventive measures (n = 5), and exposure to both biological and non-biological hazards (n = 4) (Table 1).

Among the studies on exposure to non-biological hazards, the majority of them, two-fifth (2/5) each examined stress and burnout (Table 3). Also, relating to studies on exposure to biological hazards, the majority, two-thirds (2/3) investigated sharps-related injuries (Table 2). Again, with regards to research works on control/preventive measures, one-third (1/3) each inquired into hand hygiene, hepatitis B vaccine uptake, and infection prevention and control (Table 5). Additionally, concerning studies on knowledge on control/preventive measures, two-fifth (2/5) each explored post-exposure prophylaxis and tuberculosis infection and prevention (Table 6).

Discussion

This scoping review focused on mapping the existing empirical evidence on occupational exposure to healthcare providers and ancillary staff in Ghana. Inclusive of forty-three (43) articles, this review was quite extensive and comprised of studies relating to exposures to both biological and non-biological hazards, alongside their risk factors, availability and utilization of control/preventive measures, and knowledge on control and preventive measures. Nonetheless, a greater proportion of these studies were conducted on exposures to non-biological hazards compared to biological hazards; this was contrary to a recent review by Rai et al. (21), where more studies were rather on exposure to biological hazards.

The past 3 years of this review witnessed quite a greater number of researches on occupational health and safety but the evidence is weak since more rigorous study designs were not employed in almost all articles. Yet, this still indicates an increase in the recognition of subject areas in Ghana's health care industry and can serve as a precursor to the production of a higher form of evidence in the field (19). 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 calls for alarm since these groups of workers (ancillary staff) may be more exposed than the healthcare providers. Subsequently, it suggests that we have to take a closer look at this category of workers.

Exposure to biological hazards

Sharp-related injuries

Many pieces of literature according to this review, investigated sharp-related injuries as a route of exposure to biological hazards. Sharp-related or needle-stick injury is highly recognized as one of the most serious occupational health hazards among health workers (27). And it is ranked as a high-risk route of acquiring and transmitting biological hazards such as Hepatitis B Virus (HBV), Hepatitis C Virus (HBV) and Human Immunodeficiency Virus (HBV) (27,28). The high prevalence of these blood borne pathogens in low-middle-income countries including Ghana, and the lack of safety measures to reduce their risks accounts for the increased risk of transmission among healthcare providers and ancillary staff in developing countries (29,30).

The studies included in this review reported variable prevalence of sharp-related injuries, 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 injuries and needlestick injuries was reported in four (4) studies while cuts were reported in two (3) studies. The prevalence of sharps-related injuries over one year ranged from 15.13% in a study conducted in the Brong Ahafo region to 53.7% in a study done in the Greater Accra region (31–34). Also, needlestick prevalence over a 12 months duration ranged from 34.5% in a study done in the Ashanti region to 66.0% in a study conducted in the Northern region (31,34–36). A lifetime prevalence of needlestick injuries was reported as 54.6% in a study conducted in the Northern region (35). Also, a 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 (31,34,37).

Lack of workplace supervision, health and safety training, alcohol consumption, job stress, sleeping difficulties, failure to use PPE and type of facilities were predisposing factors associated with sharp-related injuries (33,36). Gender, age category, training in infection prevention and control, working experience, type of facility were factors associated with needlestick injuries (35,36). Preventive measures such as proper disposal of sharps, usage of PPE and training in occupational safety were highly utilized as reported in a study (34) included in the review while the system of reporting sharp injuries was not utilized, which ended up in some injuries not reported and subsequently not treated (35). Knowledge on the protocol to report a sharp-related injury, needlestick injuries and associated diseases acquisition, and appropriate quarters to assess PEP and other occupational safety issues were reported (32,34,36).

To sum up, the occurrence of sharp-related injuries through needlestick injuries and cuts is still common in Ghana. Though individual-related factors have been associated with these exposures, facility-related factors have also been mentioned.

Blood and Body fluids

The exposure to blood and body fluids among healthcare professionals has become the most prevalent means of exposure to blood-borne pathogens; hence, making it a major problem of great concern in the health care industry (23,38). Blood and body fluid exposure has been reported as a major predisposing factor to the transmission of common blood-borne infections including HIV (39). The accidental contact of a patient's blood and body fluids during a medical procedure does not only affects the safety and wellbeing of the healthcare provider or ancillary staff but also disrupts the delivery of quality health care (40,41).

Two studies included in this review investigated exposure to blood and body fluids. Both studies reported a 12-month prevalence of 50.6% (42) and 67.5% (43). One of the studies (43) reported that 25% of the participants who were exposed to blood and body fluids tested positive for HIV; however, all of them utilized the post-exposure prophylaxis (PEP) for HIV. Also, other studies in this review reported a pathogen infection prevalence of 13.8% and 33.0% (37,44). The most prevalent ways of exposure were torn gloves, a splash of blood and body fluids, sharp injury and needle pricks (42). PPE availability, risk perception, exposure reporting, infection prevention training, being a midwife, attending to more patients per shift and work experience were associated with exposure to blood and body fluids.

Exposure to COVID-19 virus

The occupational contact of healthcare workers makes them the highest population at risk of exposure to the COVID-19 disease (45). This risk of exposure has resulted in numerous COVID-19 infections reported across the globe (46). Healthcare providers and ancillary workers are at the forefront of the fight against the pandemic and play critical roles such as clinical management of COVID-19 patients (45,47). Our review included only a study that involved the risk of exposure to COVID-19 assessment among healthcare professionals. About 80.4% of these professionals were at a high level of occupational exposure to the COVID-19 virus. Furthermore, approximately 14.0% were at a high risk of COVID-19 virus infection. Workers who performed aerosol-generating procedures held a Master's degree and were registered were associated with the risk of exposure to COVID-19 virus infection.

In another study in this review, clinical staff, poor maintenance of hospital items and victims of verbal assault were related to biological hazards, marital status was associated with non-biological hazards (37).

Exposure to non-biological hazards

Burnout

The incidence of burnout among healthcare providers, particularly, physicians have increased over time and one in every three physicians is at risk of occupational burnout (48). Low remuneration, imbalance work-life, postgraduate training challenges are prevailing risk factors to burnout (49). Again, 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 care (50–52).

In this present review, seven studies that made the inclusion criteria investigated burnout. While some of the studies reported general burnout, others reported the component of burnouts – depersonalization, personal achievement and emotional exhaustion. General burnout was reported from a range of 9.90 to 47.0% (53–56). Emotional burnout was reported from a minimum of 10.8% to a maximum of 62.5% (56–59), depersonalization burnout was reported from 5.5% to 55.0% (56–59) and personal achievement burnout was reported from 7.8% to 58.4% (56–59).

Age, gender, educational qualification, occupation, years of work experience, marital status, parenthood, COVID-19 preparedness, fear of infection, appreciation from management and family support were associated with burnout (55,56). Also, work-to-family conflict, career satisfaction, extra work hours, night shifts were related to burnout (53,54,57). Problem-focused copying strategy, emotional support from family/friends coping strategy, using humour and listening to music were suggested ways of preventing burnout (58).

In summary, burnout was prevalent in Ghana; however, emotional burnout is on the rise compared to the other forms of burnout. Support from family and management was fundamental in coping with burnout.

Stress

The workers of health care industries are highlighted as one of the occupational groups that experienced elevated stress levels in their line of work and are at risk of developing several occupational stress symptoms (60,61). Understaffing, high job demands, insufficient resources and compassion fatigue, risk of infection are among the prevailing reasons that lead to increased job strain and occupational stress and finally poor service delivery (62).

This review included seven articles that studied work-related stress among healthcare workers. Stress levels were reported within the range of 4.0 – 89.8% (55,56,63–66). However, a study reported stress reported as 10% above the Weiman occupational stress scale (67). Work-related stress was associated with hypertension, age, marital status, work overload and educational background, manual lifting of patients and equipment, risk of acquiring infection, receipt of feedback on unsatisfactory performance and inadequate opportunities for continuous professional development (55,63,65,66). Appreciation from management, family support, being prepared for the COVID-19 pandemic was associated with lower stress levels (56) whilst fear of infection and absence due to sickness was related to higher stress levels (56). There was adequate knowledge of hypertension as a risk factor of stress (65).

Taken all together, stress was high among the healthcare providers and ancillary staff in Ghana. Also, work load related factors like moving equipment or patients, and fear of receiving unsatisfactory feedback from supervisors were prevalent risk factors.

Musculoskeletal injuries and violence

Health care workers are most vulnerable to work-related musculoskeletal injuries due to their line of work routine (68,69). About a third of all sick leave among healthcare personnel are attributed to musculoskeletal disorders or injuries (70). However, these injuries are underreported, even in developed countries (71). The issues of violence in the healthcare sector are extensively documented both in developing and developed countries (72–74). Also, healthcare professionals are 16 times more exposed to workplace-related violence (75). The huge cost and poor healthcare

services, 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 (76). A single study on musculoskeletal injuries and another on violence satisfied the inclusion criteria for this current review. A one year and a week musculoskeletal injuries prevalence of 70.1% and 44.6%, were reported, respectively (77). The occurrence of sexual harassment was 12.0% and verbal assault was documented as 52.2% (78). Violence was related to gender and intention to quit the job. Whereas frequent verbal abusers were relatives of patients, sexual perpetuators were doctors (78).

Physical hazards, irritation from disinfectants, lower back pain, slips, trips and falls were reported in other studies included in this review (37,44,79). Also, extreme pressure from work was related to both exposure to biological and non-biological hazards (37).

Exposure to general occupational health hazards

A single study included in this current review reported a collective exposure to occupational health hazards among healthcare personnel as 44.0% (79). Again, more years on the ward was associated with exposure while the frequency of exposure was related to healthcare personnel on the routine day and those that alternate day and night (79).

Control/preventive measures regarding exposures to occupational hazards

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 health care industry, where transmission of infection from patient to patient is mostly transferred through the hands of healthcare workers (80,81). However, low compliance of hand hygiene are reported all over the world (82). The combination of universal face masking and comprehensive infection prevention programme has proven to reduce healthcare-associated cases of infectious diseases including COVID-19 (83,84). Nonetheless, compliance to face masking among healthcare providers remains suboptimal irrespective of the recent call for universal face masking (85).

Hand hygiene compliance was investigated in four of the studies included in this review and one of the studies considered hand and face mask compliance. Compliance with hand hygiene ranged from 9.2 – 88.4% (86–89). Perceived risk, occupational category, educational level, IPC in-service training, hospital monitoring, staff adherence to IPC, ward of a health care worker, duty shift, occupation and type of hand hygiene indication were associated with hand hygiene compliance (86–88). Alcohol hand rub and liquid soap dispensers were found to be readily available at facilities for hand hygiene compliance (86). Face mask compliance level was reported as 73.7% (87). Also, occupation, age group, educational level and hospital monitoring of adherence to IPC were related to face mask compliance (87).

Hepatitis B vaccine uptake

Though hepatitis B infection is vaccine-preventable, low uptake has been reported among healthcare workers in developing countries (90). Studies conducted among healthcare professionals in sub-Saharan Africa have reported between 35 to 65% (90–92), which is below the World Health Organization recommended 100% coverage of hepatitis B vaccination. The uptake of the hepatitis B vaccine among healthcare providers and the ancillary staff was explored in three studies included in this present review. The prevalence of hepatitis B vaccination was reported within a range of 44.8-90.4% (93–96). Nonetheless, the full vaccination status of health personnel ranged from 49.4 to 80.0% (93–96). Again, working more than sixteen years, daily exposure to blood, body fluids, sharp instruments, stained linens and waste, performing invasive procedures daily, a program of study, year of study, knowledge on hepatitis B, and hepatitis B vaccine effectiveness was associated with vaccination status (93–95).

Adherence to HIV post-exposure prophylaxis protocol

The prevention of a possible seroconversion of HIV after an exposure dwells on a timely uptake of post-exposure prophylaxis; unfortunately, health care workers hardly adhere to the post-exposure prophylaxis protocol (97,98). A single study included in this review ascertained the adherence of HIV post-exposure prophylaxis protocol. The adherence to HIV post-exposure prophylaxis protocol among healthcare providers was 17.9% (98). While the risk of occupational exposure was 91.5%, exposure in the past year was 51.3%, out of those exposed only 44.4% received HIV PEP. Also, adherence to HIV PEP protocol was associated with the risk of assessment of participants and training on HIV PEP. Again, only 16.6% had adequate knowledge of PEP.

Compliance with infection prevention and control guidelines

Compliance with IPC precautions, methods and strategies are significant in the reduction of healthcare-associated infections (99). Yet, varied compliance to IPC practices such as the use of PPE and hand hygiene has been published (99,100). Also, training and education improves IPC practices and ultimately its compliance (101,102). Three studies in this review investigated compliance with infection prevention and control guidelines. These IPC compliance studies were conducted concerning hand hygiene and PPE usage, hepatitis B infection preventive measures, and general IPC compliance measures. A general IPC compliance was reported as 54.9% (103), IPC compliance for hand hygiene was 88.4% while that for PPE usage was 90.6% (89). Compliance with hand hygiene was associated with a category of staff, educational level while PPE usage

was related to marital status, educational level, type of staff and category of staff (89). Also, compliance to hepatitis B infection preventive measures was 16.1% (104). Again, the type of department and availability of dustbins were associated with adherence to HBV infection preventive measures (104), and there was high knowledge of hepatitis B infection and general infection control preventive guidelines (103,104). There was high availability and access to IPC materials including PPE, handwashing facilities and dustbin liners (103,104).

Knowledge of control/preventive measures

Post-exposure prophylaxis

A plethora of studies has published a lack of knowledge regarding post-exposure prophylaxis, which leaves an information gap in the health care system (105,106). The insufficient knowledge on PEP has been attributed to health care workers' attitude towards PEP, fear of stigmatization and adverse side effects of the treatment using PEP (107). Two studies included in this review assessed knowledge of post-exposure prophylaxis among healthcare personnel; one was one HIV post-exposure prophylaxis and the other on HBV post-exposure prophylaxis. Relating to the study on HIV PEP, only 44.9% had good knowledge while 12.1% had adequate knowledge on HBV PEP (96,108). Though about 51.9% of the study participants were eligible for HIV PEP, only 33.8% took the PEP (108).

Standard precautions

Low knowledge of standard precautions is recorded among health care personnel in developing countries including Ghana although adequate knowledge is likely to influence compliance to standard precautions (96,109,110). 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 to them. (111). The major barriers that hindered the compliance to these precautions included lack of time, panic to patients, demands to patient care and lack of PPE. Also, sufficient knowledge was reported on general control measures, individual protective practices and institutional culture and practices (112).

Tuberculosis infection prevention and control measures

The tuberculosis disease is well understood by healthcare providers; however, knowledge on its infection prevention and control measures are not satisfactory (113–115). Two studies in this review looked at knowledge of tuberculosis infection prevention measures. However, one of these studies partly considered tuberculosis infection prevention practices. About 59.8% adequate knowledge on tuberculosis infection preventive measures and knowledge mean percentage of 67.2% were reported among health care workers (116,117). Also, sex, current ward of work, job title, practices by health workers and use of information and communication materials were associated with knowledge on tuberculosis infection prevention measures. Again, approximately 27.1% of doctors and nurses practised effective tuberculosis infection prevention measures (116). And working years, knowledge of TBIPC, ever attending TBIPC training were key predictors of effective TBIPC practices (117).

Risk of exposure to occupational health hazards

Finally, three studies in this review considered the knowledge of the risk of occupational health hazards. Knowledge of risk of occupational health hazards and safety were reported within a range of 66.5 - 92.7% (44,79,112). There was adequate knowledge on the risk of exposure to biological, psychological, ergonomic, physical and chemical hazards (112). Also, age, educational level, income and profession had an association with knowledge of the risk of exposure to psychological, chemical and ergonomic hazards.

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 health hazards. Though exposure to biological hazards is reported to occur frequently in low-middle-income countries (21), this review revealed that more studies are conducted in the area of exposure to non-biological hazards, implying that assessment of biological hazards may not have been adequately assessed in Ghana.

The risk factors of occupational exposures were mainly individual and health facility-related. This calls for government and non-government organizations to consider ways of improving the quality of services provided by healthcare facilities since factors related to health facilities have a direct bearing on the exposures to occupational hazards among workers in the health sector. The review further reveals that compliance to and utilization of control/preventive measures regarding exposure to occupational hazards was not adequate; it is necessary to provide prevention and control facilities, implement policies and increase supervisory roles to curb non-compliance to these control or precautionary measures and increase the utilization of available preventive measures. Further, low knowledge of control/preventive measures among health care 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.

The popularity of occupational health hazards research works over the last three (3) years is highly recommended; this will in a long run 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. Again, a wholistic occupational exposure in the health care industry of Ghana is difficult to ascertain because there was no single study that considered only ancillary staff, workers in the WHO elementary occupations category as study participants. Although this review was keen on finding studies done among only this category of workers, none was found. Nonetheless, they were 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. Again, this review has shown that more studies have been conducted on occupational exposure to stress, burnout and sharp-related injuries. This implies that some key other exposures in the healthcare industry have not received sufficient research focus.

Strengths and Limitations of the Review

This scoping review provides comprehensive 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 utilization of the control/preventive measures. Also, articles were searched in seven (7) broad databases through a systematic approach.

The main limitation to this review was that quality assessment of articles was not done and it even included unpublished thesis and dissertations. Another limitation is that the review was restricted to articles published in the English Language and within a review period. Although 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 are primarily healthcare providers and facility-related. The compliance and utilization of control/preventive were not desirable. The knowledge level of control/preventive measures relating to occupational hazards exposure was also suboptimal. Though research that examined occupational health hazards has increased over the last three years, there is still a lack of recognition and knowledge gap of the exposures in the Ghana health care system. Apart from sharps-related injuries, stress and burnout which have received some research attention, all the other exposures have not been extensively studied. An urgent call is required to wholistically research the exposures in the Ghana health system using rigorous study designs including prospective studies.

Declarations

Patient and public involvement

No patient was involved.

Ethics and Dissemination

The study is geared towards providing an overview of occupational health hazards among healthcare providers and ancillary staff in Ghana. Again, it is aimed at providing relevant inputs in the modification of the existing occupational health and safety policy and guidelines for the health sector in Ghana. Therefore, the findings of the study will be shared among key stakeholders like the Ghana Health Service and Ministry of Health. It will also be made public to the Universities that are into the training of public health, occupational and environmental health specialists. The study will also be published in a peer-reviewed journal, presented at conferences and stakeholders meetings. Since the methodology of scoping reviews involves the collection and reviewing of already available materials in the public space, the study does not require ethical approval. However, this study will involve a consultative approach of key stakeholders that will guide the research objectives and facilitate the knowledge transition and translation process.

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References

1. Moore RM, Kaczmarek RG. Occupational hazards to health care workers: Diverse, ill-defined, and not fully appreciated. American Journal of Infection Control. 1990 Oct;18(5):316–27.
2. Crutcher JM, Lamm SH, Hall TA. Procedures to protect health-care workers from hiv infection: category i (health-care) workers. American Industrial Hygiene Association Journal. 1991 Feb;52(2):A-100-A-103.
3. World Health Organization. Occupational health [Internet]. 2021 [cited 2021 Sep 11]. Available from: https://www.who.int/health-topics/occupational-health
4. The Lancet. COVID-19: protecting health-care workers. The Lancet. 2020 Mar;395(10228):922.
5. McDiarmid MA. Hazards of the Health Care Sector: Looking Beyond Infectious Disease. Annals of Global Health. 2014 Nov 25;80(4):315.
6. Arif AA, Delclos GL. Association between cleaning-related chemicals and work-related asthma and asthma symptoms among healthcare professionals. Occup Environ Med. 2012 Jan;69(1):35–40.
7. Ratner PA, Spinelli JJ, Beking K, Lorenzi M, Chow Y, Teschke K, et al. Cancer incidence and adverse pregnancy outcome in registered nurses potentially exposed to antineoplastic drugs. BMC Nurs. 2010 Dec;9(1):15.
8. Trapé M, Schenck P, Warren A. Latex gloves use and symptoms in health care workers 1 year after implementation of a policy restricting the use of powdered gloves. American Journal of Infection Control. 2000 Oct;28(5):352–8.
9. Coggon D. Mortality of workers exposed to ethylene oxide: extended follow up of a British cohort. Occupational and Environmental Medicine. 2004 Apr 1;61(4):358–62.
10. Vaughan TL. Occupational exposure to formaldehyde and wood dust and nasopharyngeal carcinoma. Occupational and Environmental Medicine. 2000 Jun 1;57(6):376–84.
11. Maslach C. Burnout in health professionals. In: Ayers S, Baum A, McManus C, Newman S, Wallston K, Weinman J, et al., editors. Cambridge Handbook of Psychology, Health and Medicine [Internet]. 2nd ed. Cambridge University Press; 2001 [cited 2021 Sep 11]. p. 427–30. Available from: https://www.cambridge.org/core/product/identifier/CBO9780511543579A106/type/book_part
12. Davis KG, Kotowski SE. Prevalence of Musculoskeletal Disorders for Nurses in Hospitals, Long-Term Care Facilities, and Home Health Care: A Comprehensive Review. Hum Factors. 2015 Aug;57(5):754–92.
13. Phillips JP. Workplace Violence against Health Care Workers in the United States. Longo DL, editor. N Engl J Med. 2016 Apr 28;374(17):1661–9.
14. Centers for Disease Control and Prevention. National Institute of Occupational Health and Safety. State of the Sector: Healthcare and Social Assistance. Atlanta, GA, USA; 2009.
15. Liese B, Dussault G. The State of the Health Workforce in Sub-Saharan Africa: Evidence of Crisis and Analysis of Contributing Factors. Washington, DC, USA: The World Bank; 2004.
16. Ministry of Health, Ghana Health Service. Occupational Health and Safety Policy and Giudelines for the Health Sector. Ghana; 2010.
17. Patwary MA, O'Hare WT, Sarker MH. Assessment of occupational and environmental safety associated with medical waste disposal in developing countries: A qualitative approach. Safety Science. 2011 Oct;49(8–9):1200–7.
18. Nuwayhid IA. Occupational Health Research in Developing Countries: A Partner for Social Justice. Am J Public Health. 2004 Nov;94(11):1916–21.
19. Ministry of Health, Ghana Health Service. Occupational Health, Safety & Environmental Management in the Context of COVID-19: A Guide for Health Care Workers. 2021.
20. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. International Journal of Social Research Methodology. 2005 Feb;8(1):19–32.
21. Rai R, El-Zaemey S, Dorji N, Rai BD, Fritschi L. Exposure to Occupational Hazards among Health Care Workers in Low- and Middle-Income Countries: A Scoping Review. IJERPH. 2021 Mar 5;18(5):2603.
22. Mossburg S, Agore A, Nkimbeng M, Commodore-Mensah Y. Occupational Hazards among Healthcare Workers in Africa: A Systematic Review. Annals of Global Health. 2019 Jun 6;85(1):78.
23. Auta A, Adewuyi EO, Tor-Anyiin A, Aziz D, Ogbole E, Ogbonna BO, et al. Health-care workers' occupational exposures to body fluids in 21 countries in Africa: systematic review and meta-analysis. Bull World Health Organ. 2017 Dec 1;95(12):831-841F.
24. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. Implementation Sci. 2010 Dec;5(1):69.

25. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018 Oct 2;169(7):467–73.
26. Tawiah PA, Baffour-Awuah A, Appiah-Brempong E, Afriyie-Gyawu E. Identifying occupational health hazards among healthcare providers and ancillary staff in Ghana: a scoping review protocol. BMJ Open. 2022 Jan;12(1):e058048.
27. Kermode M, Jolley D, Langkham B, Thomas MS, Crofts N. Occupational exposure to blood and risk of bloodborne virus infection among health care workers in rural north Indian health care settings. American Journal of Infection Control. 2005 Feb;33(1):34–41.
28. Norsayani MY, Hassim IN. Study on Incidence of Needle Stick Injury and Factors Associated with this Problem among Medical Students. Jrnl of Occup Health. 2003 May;45(3):172–8.
29. Sagoe-Moses C, Pearson RD, Perry J, Jagger J. Risks to health care workers in developing countries. N Engl J Med. 2001 Aug 16;345(7):538–41.
30. Elmiyeh B, Whitaker IS, James MJ, Chahal CAA, Galea A, Alshafi K. Needle-stick injuries in the National Health Service: a culture of silence. JRSM. 2004 Jul 1;97(7):326–7.
31. Kommogldomo ED. Needle stick and sharps injuries among health care workers at the 37 Military Hospital [Master's Thesis]. [Ghana]: University of Ghana; 2016.
32. Lori JR, McCullagh MC, Krueger A, Oteng R. Sharps injuries among emergency department nurses in one tertiary care hospital in Ghana. Int Emerg Nurs. 2016 Sep;28:14–9.
33. Hippolyt K. Determinants of Sharp Injuries among Clinical Care Workers in the Kintampo Municipal Hospital, Brong Ahafo Region, Ghana [Master's Thesis]. [Ghana]: University of Ghana; 2017.
34. Appiagyei H, Nakua EK, Donkor P, Mock C. Occupational injuries among health care workers at a public hospital in Ghana. Pan Afr Med J. 2021;39:103.
35. Ibrahim I. Occupational Exposure To Needle Stick Injuries Among Health Care Workers At The Tamale Teaching Hospital [Master's Thesis]. [Ghana]: University of Ghana; 2015.
36. Obirikorang C, Opoku S, Obirikorang Y, Acheampong E, Yorke J, Donkoh E, et al. Awareness and occupational exposures to needlestick injuries among healthcare workers: A quantitative assessment in a Ghanaian Metropolis. Glob J Qual Saf Healthc. 2019;2(3):70.
37. Awudu L. Occupational health and safety practices among healthcare workers in some selected hospitals in tamale metropolis. [Tamale, Ghana]: University of Development Studies; 2018.
38. Sepkowitz KA. Occupationally Acquired Infections in Health Care Workers: Part II. Ann Intern Med. 1996 Dec 1;125(11):917.
39. Hutin Y, Hauri A, Chiarello L, Catlin M, Stilwell B, Ghebrehiwet T, et al. Best infection control practices for intradermal, subcutaneous, and intramuscular needle injections. Bull World Health Organ. 2003;81(7):491–500.
40. Cooke CE, Stephens JM. Clinical, economic, and humanistic burden of needlestick injuries in healthcare workers. MDER. 2017 Sep;Volume 10:225–35.
41. Awases M, Bary A, Nyoni J, others. Migration of health professionals in six countries: a synthesis report. In: Migration of health professionals in six countries: a synthesis report. 2004. p. 68p–68p.
42. Tawiah PA, Oppong K, Effah ES, Abaka-Yawson A, Arhin-Wiredu K. 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. The Scientific World Journal. 2020 Jun 1;2020:1–7.
43. Apetorgbor V. Occupational Exposure to Blood and Body Fluids among Health Workers, The Case of Shai-Osudoku District Hospital [Master's Thesis]. [Ghana]: University of Ghana; 2018.
44. Nyame-Annan EK. Occupational Hazards And Safety Practices Among Hospital Workers At Greater Accra Regional Hospital, Ridge [Master's Thesis]. [Ghana]: University of Ghana; 2017.
45. Sabetian G, Moghadami M, Hashemizadeh Fard Haghighi L, Shahriarirad R, Fallahi MJ, Asmarian N, et al. COVID-19 infection among healthcare workers: a cross-sectional study in southwest Iran. Virol J. 2021 Dec;18(1):58.
46. International Council of Nurses. 90,000 healthcare workers infected with COVID-19 [Internet]. 2020 [cited 2022 Feb 4]. Available from: https://www.aa.com.tr/en/europe/90-000-healthcare-workers-infected-with-covid-19-icn/1831765
47. World Health Organization. Protocol for assessment of potential risk factors for coronavirus disease 2019 (COVID-19) among health workers in a health care setting [Internet]. 2020 [cited 2022 Feb 4]. Available from: https://apps.who.int/iris/handle/10665/332071
48. Shanafelt TD, Boone S, Tan L, Dyrbye LN, Sotile W, Satele D, et al. Burnout and Satisfaction With Work-Life Balance Among US Physicians Relative to the General US Population. Arch Intern Med. 2012 Oct 8;172(18):1377.
49. Naicker S. Burden of end-stage renal disease in sub-Saharan Africa. Clin Nephrol. 2010 Nov;74 Suppl 1:S13-16.
50. Klein J, Grosse Frie K, Blum K, von dem Knesebeck O. Burnout and perceived quality of care among German clinicians in surgery. Int J Qual Health Care. 2010 Dec;22(6):525–30.

51. Maslach C, Leiter MP. Understanding the burnout experience: recent research and its implications for psychiatry. World Psychiatry. 2016 Jun;15(2):103–11.
52. Toh SG, Ang E, Devi MK. Systematic review on the relationship between the nursing shortage and job satisfaction, stress and burnout levels among nurses in oncology/haematology settings. Int J Evid Based Healthc. 2012 Jun;10(2):126–41.
53. Opoku ST, Apenteng BA. Career satisfaction and burnout among Ghanaian physicians. Int Health. 2014 Mar;6(1):54–61.
54. Asiedu EEA, Annor F, Amponsah-Tawiah K, Dartey-Baah K. Juggling family and professional caring: Role demands, work-family conflict and burnout among registered nurses in Ghana. Nurs Open. 2018 Oct;5(4):611–20.
55. Odonkor ST, Frimpong K. Burnout among Healthcare Professionals in Ghana: A Critical Assessment. Biomed Res Int. 2020;2020:1614968.
56. Afulani PA, Gyamerah AO, Nutor JJ, Laar A, Aborigo RA, Malechi H, et al. Inadequate preparedness for response to COVID-19 is associated with stress and burnout among healthcare workers in Ghana. PLoS One. 2021;16(4):e0250294.
57. Nkyi AK, Blay M. Occupational burnout among nurses working in Cape Coast Metropolitan Hospital Ghana. Indian Journal of Health and Wellbeing. 2020;11(10–12):459–65.
58. Boateng YA, Osei SA, Aboh IK, Druye AA. Causes of burnout syndrome and coping strategies among high dependency unit nurses of an institution in the greater Accra region of Ghana. Nurs Open. 2021 Sep 1;
59. Ayisi-Boateng NK, Bankah EM, Ofori-Amankwah GK, Egblewogbe DA, Ati E, Opoku DA, et al. A cross-sectional self-assessment of burnout amongst a sample of doctors in Ghana. Afr J Prim Health Care Fam Med. 2020 Aug 19;12(1):e1–6.
60. Mason SL. Radiography student perceptions of clinical stressors. Radiol Technol. 2006 Aug;77(6):437–50.
61. Thomas LS, Valli A. Levels of occupational stress in doctors working in a South African public-sector hospital. S Afr Med J. 2006 Nov;96(11):1162–8.
62. Whatmore L. Stress in health professionals. Jenny Firth-Cozens and Roy Payne, John Wiley & Sons, Chichester, 1999, pp. xviii + 264. 0-471-99876-1 (paper), 0-471-99875-2 (cloth). Stress Med. 2000 Oct;16(5):327–9.
63. Egungwu CC. Work-Related Stress and Hypertension among Nurses at Ridge Hospital, Accra, Ghana. 2015;
64. Ashong G, Rogers H, Botwe BO, Anim-Sampong S. Effects of occupational stress and coping mechanisms adopted by radiographers in Ghana. Radiography. 2015;22(2):112–7.
65. Abubakari M. Shift Work, Work-Related Stress, and Hypertension among Healthcare Workers at the 37 Military Hospital, Accra Ghana [Master's Thesis]. [Ghana]: University of Ghana; 2018.
66. Kaburi BB, Bio FY, Kubio C, Ameme DK, Kenu E, Sackey SO, et al. Psychological working conditions and predictors of occupational stress among nurses, Salaga Government Hospital, Ghana, 2016. Pan Afr Med J. 2019;33:320.
67. Adzakpah G, Laar A, Fiadjoe H. Occupational stress among nurses in a hospital setting in Ghana. Clin Case Rep Rev. 2016;2(2):333–8.
68. Thornton LJ, Barr AE, Stuart-Buttle C, Gaughan JP, Wilson ER, Jackson AD, et al. Perceived musculoskeletal symptoms among dental students in the clinic work environment. Ergonomics. 2008 Apr;51(4):573–86.
69. Smith DR, Leggat PA. Musculoskeletal disorders among rural Australian nursing students. Aust J Rural Health. 2004 Dec;12(6):241–5.
70. Alexopoulos EC, Stathi I-C, Charizani F. Prevalence of musculoskeletal disorders in dentists. BMC Musculoskelet Disord. 2004 Dec;5(1):16.
71. Salik Y, Özcan A. Work-related musculoskeletal disorders: A survey of physical therapists in Izmir-Turkey. BMC Musculoskelet Disord. 2004 Dec;5(1):27.
72. WHO. Stopping attacks on health care [Internet]. 2021 [cited 2022 Feb 23]. Available from: https://www.who.int/activities/stopping-attacks-on-health-care
73. Hills DJ, Joyce CM, Humphreys JS. A national study of workplace aggression in Australian clinical medical practice. Medical Journal of Australia. 2012 Sep;197(6):336–40.
74. Elston MA, Gabe J. Violence in general practice: a gendered risk? Sociol Health Illn. 2016 Mar;38(3):426–41.
75. Najafi F, Fallahi-Khoshknab M, Dalvandi A, Ahmadi F, Rahgozar M. Workplace violence against Iranian nurses: A systematic review. JHPM. 2014 Apr 1;3(2):72–85.
76. Nagpal N. Incidents of violence against doctors in India: Can these be prevented? Natl Med J India. 2017 Apr;30(2):97–100.
77. Abledu JK, Offei EB. Musculoskeletal disorders among first-year Ghanaian students in a nursing college. African health sciences. 2015 Jun;15(2):444–9.
78. Boafo IM, Hancock P, Gringart E. Sources, incidence and effects of non-physical workplace violence against nurses in Ghana. Nurs Open. 2016 Apr;3(2):99–109.
79. Alhassan RK, Poku KA. Experiences of frontline nursing staff on workplace safety and occupational health hazards in two psychiatric hospitals in Ghana. BMC Public Health. 2018 Jun 6;18(1):701.

80. Scott BE, Lawson DW, Curtis V. Hard to handle: understanding mothers' handwashing behaviour in Ghana. Health Policy Plan. 2007 Jul;22(4):216–24.
81. Mathur P. Hand hygiene: Back to the basics of infection control. Indian J Med Res. 2011;134(5):611.
82. Jumaa PA. Hand hygiene: simple and complex. International Journal of Infectious Diseases. 2005 Jan;9(1):3–14.
83. Rhee C, Baker M, Vaidya V, Tucker R, Resnick A, Morris CA, et al. Incidence of Nosocomial COVID-19 in Patients Hospitalized at a Large US Academic Medical Center. JAMA Netw Open. 2020 Sep 9;3(9):e2020498.
84. Seidelman JL, Lewis SS, Advani SD, Akinboyo IC, Epling C, Case M, et al. Universal masking is an effective strategy to flatten the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) healthcare worker epidemiologic curve. Infect Control Hosp Epidemiol. 2020 Dec;41(12):1466–7.
85. Datta R, Glenn K, Pellegrino A, Tuan J, Linde B, Kayani J, et al. Increasing face-mask compliance among healthcare personnel during the coronavirus disease 2019 (COVID-19) pandemic. Infect Control Hosp Epidemiol. 2021 May 3;1–7.
86. Yawson AE, Hesse AAJ. Hand hygiene practices and resources in a teaching hospital in Ghana. J Infect Dev Ctries. 2013 Apr 17;7(4):338–47.
87. Alhassan AR, Kuugbee ED, Der EM. Surgical Healthcare Providers' compliance To Hand Hygiene and Facemask Use: A Case of Tamale Teaching Hospital, Ghana. 2020;
88. Alhassan AR. Nurses Hand Hygiene Compliance: An Observational Study in Tamale Teaching Hospital, Ghana. ARC Journal of Nursing and Healthcare. 2020;6(2):28–34.
89. Ashinyo ME, Dubik SD, Duti V, Amegah KE, Ashinyo A, Asare BA, et al. Infection prevention and control compliance among exposed healthcare workers in COVID-19 treatment centers in Ghana: A descriptive cross-sectional study. Tu W-J, editor. PLoS ONE. 2021 Mar 9;16(3):e0248282.
90. Malewezi B, Omer SB, Mwagomba B, Araru T. Protecting health workers from nosocomial Hepatitis B infections: A review of strategies and challenges for implementation of Hepatitis B vaccination among health workers in Sub-Saharan Africa. JEGH. 2016;6(4):229.
91. Aaron D, Nagu TJ, Rwegasha J, Komba E. Hepatitis B vaccination coverage among healthcare workers at national hospital in Tanzania: how much, who and why? BMC Infect Dis. 2017 Dec;17(1):786.
92. Abeje G, Azage M. Hepatitis B vaccine knowledge and vaccination status among health care workers of Bahir Dar City Administration, Northwest Ethiopia: a cross sectional study. BMC Infect Dis. 2015 Dec;15(1):30.
93. Ansa GA, Ofori KNA, Houphouet EE, Amoabeng AA, Sifa JS, Amenuveve CK, et al. Hepatitis B vaccine uptake among healthcare workers in a referral hospital, Accra. Pan Afr Med J. 2019;33:96.
94. Aniaku JK, Amedonu EK, Fusheini A. Assessment of Knowledge, Attitude and Vaccination Status of Hepatitis B among Nursing Training Students in Ho, Ghana. Ann Glob Health. 2019 Feb 28;85(1).
95. Botchway ET, Agyare E, Seyram L, Owusu KK, Mutocheluh M, Obiri-Yeboah D. Prevalence and attitude towards hepatitis B vaccination among healthcare workers in a tertiary hospital in Ghana. Pan Afr Med J. 2020;36:244.
96. Konlan KD, Aarah-Bapuah M, Kombat JM, Wuffele GM. TOPIC: "The level of nurses' knowledge on occupational post exposure to hepatitis B infection in the Tamale metropolis, Ghana". BMC Health Serv Res. 2017 Apr 5;17(1):254.
97. Mponela MJ, Oleribe OO, Abade A, Kwesigabo G. Post exposure prophylaxis following occupational exposure to HIV: a survey of health care workers in Mbeya, Tanzania, 2009–2010. Pan African Medical Journal. 2015;21(1).
98. Suglo RE, Aku FY, Anaman-Torgbor JA, Tarkang EE. Predictors of adherence to HIV Post-Exposure Prophylaxis protocol among frontline healthcare workers at the Ho Teaching Hospital, Ghana. Int J Infect Dis. 2021;106:208–12.
99. Haile TG, Engeda EH, Abdo AA. Compliance with Standard Precautions and Associated Factors among Healthcare Workers in Gondar University Comprehensive Specialized Hospital, Northwest Ethiopia. Journal of Environmental and Public Health. 2017;2017:1–8.
100. Ganczak M, Szych Z. Surgical nurses and compliance with personal protective equipment. Journal of Hospital Infection. 2007 Aug;66(4):346–51.
101. Safdar N, Abad C. Educational interventions for prevention of healthcare-associated infection: A systematic review: Critical Care Medicine. 2008 Mar;36(3):933–40.
102. Ward DJ. The role of education in the prevention and control of infection: A review of the literature. Nurse Education Today. 2011 Jan;31(1):9–17.
103. Hayeh PA, Esena RK. Infection prevention and control practices among health workers at Ridge regional hospital in Accra Ghana. International Journal of health science research. 2013;3(8):47–55.
104. Kporngor JA. Practices Relating to Hepatitis B Virus Infection Prevention and Its Determinants among Health Care Workers in the HO Municipality, Ghana [Master's Thesis]. [Ghana]: University of Ghana; 2018.
105. Van der Maaten G, Nyirenda M, Beadsworth M, Chitani A, Allain T, Van Oosterhout J. Post exposure prophylaxis of HIV transmission after occupational injuries in Queen Elizabeth Central Hospital, Blantyre, Malawi, 2003–2008. Mal Med J [Internet]. 2010 Jun 28 [cited 2022 Feb 25];22(1). Available from: http://www.ajol.info/index.php/mmj/article/view/55903

106. Tebeje B, Hailu C. Assessment of HIV post-exposure prophylaxis use among health workers of governmental health institutions in Jimma Zone, Oromiya Region, Southwest Ethiopia. Ethiop J Health Sci [Internet]. 2011 Sep 9 [cited 2022 Feb 25];20(1). Available from: http://www.ajol.info/index.php/ejhs/article/view/69429
107. Taegtmeyer M, Suckling RM, Nguku PM, Meredith C, Kibaru J, Chakaya JM, et al. Working with risk: Occupational safety issues among healthcare workers in Kenya. AIDS Care. 2008 Mar;20(3):304–10.
108. Babanawo F, Ibrahim A, Bahar OS, Adomah-Afari A, Maya E. Assessment of knowledge and usage of HIV post exposure prophylaxis among healthcare workers in a regional hospital in Ghana. Journal of Global Health Reports. 2018;2.
109. Amponsah-Tawaih K, Adu MA. Work Pressure and Safety Behaviors among Health Workers in Ghana: The Moderating Role of Management Commitment to Safety. Safety and Health at Work. 2016 Dec;7(4):340–6.
110. Hesse A, Adu-Aryee N, Entsua-Mensah K, Wu L. Knowledge, attitude and practice universal basic precautions by medical personnel in a teaching hospital. Ghana Med J. 2006 Jun;40(2):61–4.
111. Akagbo SE, Nortey P, Ackumey MM. Knowledge of standard precautions and barriers to compliance among healthcare workers in the Lower Manya Krobo District, Ghana. BMC Res Notes. 2017 Dec;10(1):432.
112. Duodu F. Assessment of the Knowledge of Occupational Hazards and Safety Practices among Healthcare Workers in Police Hospital, Accra, Ghana [Master's Thesis]. [Ghana]: University of Ghana; 2018.
113. Kanjee Z, Catterick K, Moll AP, Amico KR, Friedland GH. Tuberculosis infection control in rural South Africa: survey of knowledge, attitude and practice in hospital staff. Journal of Hospital Infection. 2011 Dec;79(4):333–8.
114. Woith WM, Volchenkov G, Larson JL. Russian health care workers' knowledge of tuberculosis and infection control. Int J Tuberc Lung Dis. 2010 Nov;14(11):1489–92.
115. Shrestha A, Bhattarai D, Thapa B, Basel P, Wagle RR. Health care workers' knowledge, attitudes and practices on tuberculosis infection control, Nepal. BMC Infect Dis. 2017 Dec;17(1):724.
116. Osei-Yeboah EA. Knowledge and Practice of Tuberculosis Infection Prevention and Control Measures among Nurses and Doctors in Selected Government Hospitals in Accra, Ghana [Master's Thesis]. [Ghana]: University of Ghana; 2019.
117. Codjoe A. Assessment of Tuberculosis Infection Prevention and Control Practices Among Healthcare Workers in Tema General Hospital [Master's Thesis]. [Ghana]: University of Ghana; 2012.
118. Ashinyo ME, Dubik SD, Duti V, Amegah KE, Ashinyo A, Larsen-Reindorf R, et al. Healthcare Workers Exposure Risk Assessment: A Survey among Frontline Workers in Designated COVID-19 Treatment Centers in Ghana. J Prim Care Community Health. 2020 Dec;11:2150132720969483.
119. Odonkor ST, Adams S. Predictors of stress and associated factors among healthcare workers in Western Ghana. Heliyon. 2021 Jun;7(6):e07223.

Tables

Table 1: Studies summarized according to occupational exposures and preventive measures

Studies on scoping review	Frequency (43)	Percentage (%)
Exposure to biological hazards	9	20.93
Exposure to non-biological hazards	15	34.88
Exposure to both biological and non-biological hazards	4	9.30
Control/preventive measures to occupational health hazards	10	23.26
Knowledge on control/preventive measures	5	11.63

Table 2: Studies (n = 9) on exposure to biological hazards

Authors	Year	Topic	Region of study	Study design	Participants/ Sample size	Methodology/ Instrument	Key findings
Blood and Body fluids							
Tawiah et al. (42)	2020	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	Volta	Cross-sectional	178 medical laboratory science students were selected for the study through random sampling.	A self-administered questionnaire was designed for the study.	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.
Apetorgbor (43)	2018	Occupational exposure to blood and body fluids among health workers: The case of Shai-Osudoku District Hospital.	Greater Accra	Cross-sectional	171 health care workers were selected through simple random sampling.	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 25% of tests done on exposed respondents were positive for HIV infection and PEP were given consequently.
COVID-19							
Ashinyo et al. (118)	2020	Healthcare workers exposure risk assessment: a survey among frontline workers in designated COVID-19 treatment centres in Ghana	Greater Accra and Ashanti	Cross-sectional	408 HCW were conveniently selected to participate in the study.	WHO COVID-19 risk assessment tool was used to collect data.	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 qualification.
Sharp-related Injuries							
Appiagyei et al. (34)	2021	Occupational injuries among health care workers at a public hospital in Ghana	Ashanti	Cross-sectional	246 HCW consented to partake in the study.	A self-administered questionnaire was used to gather data for the study.	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 HCW knew officers in charge of post-exposure prophylaxis (5.3%) and hospital occupational safety unit (26.4%). Stress at work and being a laboratory worker was significantly associated with the occurrence of injuries.
Obirikorang et al. (36)	2019	Awareness and occupational exposures to needlestick injuries among healthcare workers: A quantitative assessment in a Ghanaian Metropolis	Ashanti	Cross-sectional	540 HCW were recruited through a stratified random sampling method.	A close-ended questionnaire was used to gather data.	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 bedside (28.5%) and 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.
Hippolyt (33)	2017	Determinants of sharp injuries among clinical care workers in the Kintampo Municipal Hospital, Brong Ahafo Region, Ghana	Brong Ahafo	Cross-sectional	A total of 152 HCW were recruited through a simple random sampling method.	A closed-ended structured questionnaire was developed for the study.	About 15.13% 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.
Kommogldomo (31)	2016	Needle stick and sharp injuries among health care workers at the 37 Military Hospital	Greater Accra	Cross-sectional	297 HCW were recruited into the study through the random sampling method.	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%).
Lori et al. (6)	2016	Sharps injuries among emergency department nurses in one tertiary care hospital Ghana	Ashanti	A mixed-method study	Exactly 45 nurses took part in the study.	A structured questionnaire made up of both close and open-ended questions	There was a high incidence of sharp-related injuries and it was associated with exposure to blood borne pathogens. About 28.9% of participants reported experiencing a sharp

						was used for the study.	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 the three components of this protocol. Most, 93.0% of nurses could correctly list all the immediate steps to follow if a sharp injury occurs.
Ibrahim (35)	2015	Occupational exposure to needle stick injuries among health care workers at the Tamale Teaching Hospital	Northern	Cross-sectional	250 HCW were recruited into the study. Stratified proportion to the size and convenience sampling methods were used.	A questionnaire was used to gather data for the study.	About 66.0% of participants were involved in needle stick injuries (NSI). Needlestick injuries were significantly associated with gender, age category, 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 HCW did not report their injuries.

Table 3: Studies (n = 15) on exposure to non-biological hazards

Authors	Year	Topic	Study setting	Study design	Participants/ Sample size	Methodology/ Instrument	Outcomes Key findings
				Burnout			
Boateng et al. (58)	2021	Causes of burnout syndrome and coping strategies among high dependency unit nurses of an institution in the Greater Accra region of Ghana	Greater Accra	Cross-sectional	40 nurses working in high dependency units were purposely and conveniently sampled to partake in the study.	Maslach Burnout Inventory was adopted to assess burnout among respondents	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.
Nkyi and Blay (57)	2020	Occupational burnout among nurses working in Cape Coast Metropolitan Hospital, Ghana	Central	Cross-sectional	A census survey was carried out that included 115 nurses through purposive and convenience sampling methods.	Maslach's Burnout Inventory Human Services Survey was used for data collection	The study reported low levels of burnout relating to emotional exhaustion (2.35 out of 7) and depersonalization (0.77 out of 7). However, a mean score of burnouts relating to personal accomplishment was 4.09/7. Extra work hours were significantly associated with emotional exhaustion burnout. Depersonalization burnout was also significantly related to night shifts.

Odonkor and Frimpong (55)	2020	Burnout among healthcare professionals in Ghana: A critical assessment.	Greater Accra	Cross-sectional	Stratified sampling/ proportionate size methods were used to recruit 365 HCW.	A standardized questionnaire developed by Pine et.al was used.	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 for burnout. Burnout was significantly associated with age, gender, educational qualification, occupation, years of work experience, marital status and parenthood.
Ayisi-Boateng et al. (59)	2020	A cross-sectional self-assessment of burnout amongst a sample of doctors in Ghana	Ashanti	Cross-sectional	Exactly 60 Physicians responded to the study.	Maslach Burnout Inventory questionnaire was used to gather data.	5.5%, 7.8% and 10.8% of respondents experienced depersonalization, lack of personal achievement and emotional exhaustion, respectively. However, high-level burnout for emotional exhaustion, depersonalization and personal achievement was found to be 8.3%, 20% and 10% respectively. Age, sex, years of practice and clinical speciality was not significantly associated with burnout.
Asiedu et al. (54)	2018	Juggling family and professional caring: Role demands. Work-family conflict and burnout among registered nurses in Ghana	Greater Accra	Cross-sectional	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).	The mean of burnout was 1.73 out of a maximum of 6. The family-to-work conflict was positively related to burnout.
Opoku and Apenteng (53)	2014	Career satisfaction and burnout among Ghanaian physicians	Across the country	Cross-sectional	Two hundred (200) physicians took place in the study.	Physician work-life study survey and Maslach's Burnout Inventory were used to gather data.	Physicians showed overall moderate (mean of 3.2 out of 5) career satisfaction. Averagely, burnout was low, mean of 2.2 out of 5. The career

							satisfaction was negatively associated with burnout components of depersonalization, emotional exhaustion and personal accomplishment.
Stress							
Odonkor and Adams (119)	2021	Predictors of stress and associated factors among healthcare workers in Western Ghana	Western	Cross-sectional	400 HCW including radiographers partook in the study. The study employed stratified and proportion to size sampling techniques to determine the number of people to be interviewed.	The stress causes-related aspect of the questionnaire was adopted from Cohen et al. (1983).	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.
Kaburi et al. (66)	2019	Psychological working conditions and predictors of occupational stress among nurses, Salaga Government Hospital	Northern	Institutional-Cross-sectional	All 167 nurses of the study area were recruited to partake in the study.	Psychological working conditions survey and nurse stress index	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.
Abubakari (65)	2018	Shift work, work-related stress, and hypertension among healthcare workers at the 37 Military Hospital, Accra Ghana	Greater Accra	Cross-sectional	300 HCW were recruited including ward assistants using random sampling method,	A structured questionnaire was used for the study. An OMRON digital sphygmomanometer was used to measure blood pressure.	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.
Adzakpah et al. (67)	2016	Occupational stress among nurses in a hospital setting in Ghana	Eastern	Cross-sectional	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.	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.
Egungwu (63)	2015	Work-related stress and hypertension among nurses at Ridge Hospital, Accra, Ghana	Greater Accra	Cross-sectional	Two hundred and eight (208) nurses were selected randomly to participate in the study.	Job content questionnaire was adapted to measure work-related stress and a digital sphygmomanometer was used to measure blood pressure.	The prevalence of work-related stress was 68.0% whereas hypertension was 19.5%. After adjusting for some confounders, the adjusted relative risk in between work-related stress and hypertension was 5.57 (95% CI: 2.25, 13.76)
Ashong et al. (64)	2015	Effects of occupational stress and coping mechanisms adopted by radiographers in Ghana	Across the country	Cross-sectional	Through purposive sampling, the study recruited 122 radiographers.	A five-point Likert scale questionnaire was used to gather data.	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 scoping mechanisms in reducing stress.
Stress and burnout							
Afulani et al. (56)	2021	Inadequate preparedness for response to COVID-19 is associated with stress and burnout among healthcare workers in Ghana.	Across the country	Cross-sectional	414 and 409 healthcare workers including disease control officers, nutritionists and other allied health workers completed stress and burnout questions.	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.	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.
Musculoskeletal injuries							
Abledu and Offei (77)	2015	Musculoskeletal disorders among first-	Eastern	Cross-sectional	157 nursing students were	A standardized Nordic Musculoskeletal	About 70.1% of students reported having MSDs in

		year Ghanaian students in a nursing college			recruited for the study.	Questionnaire was used to gather data.	the past 12 months. Again, 44.6% of students reported experiencing MSDs in the past 7 days.
Violence							
Boafo et al. (78)	2016	Sources, incidence and effects of non-physical workplace violence against nurses in Ghana	Across the country	Cross-sectional	592 nurses were recruited across the country through a multi-stage sampling method.	The health sector violence question was adapted for the study.	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.

Table 4: Studies (n = 4) on exposure to general occupational health hazards (arranged in chronological order according to the year of publication)

Authors	Year	Topic	Study setting	Study design	Participants/ Sample size	Methodology/ Instrument	Key findings
General Occupational Health Hazards							
Alhassan and Poku (79)	2018	Experiences of frontline nursing staff on workplace safety and occupational health hazards in two psychiatric hospitals in Ghana	Greater Accra	Cross-sectional	296 nurses and nurse assistants were selected from the two hospitals through a proportional stratified sampling technique.	A structured questionnaire was used. Administrative records were also used.	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 on wards 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.
Awudu (37)	2018	Occupational health and safety practices among healthcare workers in some selected hospitals in Tamale Metropolis	Northern	Cross-sectional	Purpose and simple random sampling were used to select 200 study participants including administrative officers.	A self-administered questionnaire was developed for the study.	Being a clinical staff, poor maintenance of hospital items, victims of verbal assault, extreme pressure from work was significantly associated with exposure to biological hazards whereas marital status, 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%).
Duodu (112)	2018	Assessment of the knowledge of occupational hazards and safety practices among healthcare workers in Police Hospital, Accra, Ghana	Greater Accra	Cross-sectional	216 HCW including nurse assistants and orderlies were selected through stratified random sampling.	Data was collected through a validated standardized questionnaire.	Participants showed a high level of knowledge of biological (93.5%), moderate level of knowledge of psychological hazards (84.0%) and ergonomic hazards (82%) and 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 on control measures by employers was high (96%) among participants, followed by individual protective practices (82.5%) and institutional culture and practices (79.2%).
Nyame-Annan (44)	2017	Occupational hazards and safety practices among hospital workers at Greater Accra Regional Hospital, Ridge.	Greater Accra	Cross-sectional	A simple random sampling was used to recruit 246 heath care workers including orderlies and mortuary staff.	A structured questionnaire was employed for the study.	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.

Table 5: Studies (n = 10) on control/preventive measures on occupational hazards (arranged in chronological order according to the year of publication)

thors	Year	Topic	Study setting	Study design	Participants/ Sample size	Methodology/ Instrument	Outcomes Key findings
				Hand hygiene			
an et)	2020	Surgical Healthcare Providers' compliance To Hand Hygiene and Facemask Use: A Case of Tamale Teaching Hospital, Ghana	Northern	Cross-sectional	156 participants including aesthetics and orderlies were recruited through stratified random sampling methods.	A structured questionnaire	Hand hygiene and facemask compliance among participants was 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, hospital monitoring of staff adherence to IPC was significantly related to face mask compliance.
an (88)	2020	Nurses Hand Hygiene Compliance: an observational study in Tamale Teaching Hospital, Ghana	Northern	Cross-sectional	All nurses (410) working in the paediatric department. A census was conducted.	A method of observation was used to gather data. The WHO checklist for five moments of hand hygiene in the healthcare facility was adopted and used for the study.	The hand hygiene compliance level was 80.2%. Ward of the participant, duty shift (afternoon and night shift), occupation (RM and RGN), type of hand hygiene indication was significantly associated with hand hygiene non-compliance.
n and (86)	2013	Hand hygiene (HH) practices and resources in a teaching hospital in Ghana	Greater Accra	Cross-sectional	Conducted among nurses and doctors.	An IP checklist and health worker HH compliance form based on the WHO guidelines were used for data collection.	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.
				Hepatitis B vaccine uptake			
vay et)	2020	Prevalence and attitude towards hepatitis B vaccination among healthcare workers in a tertiary hospital in Ghana	Central	Cross-sectional	A stratified sampling method was used to recruit 303 HCWs including health assistants.	A structured self-administered questionnaire was used.	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 seroprotection post-vaccination.

t al. (93)	2019	Hepatitis B vaccine uptake among healthcare workers in a referral hospital, Accra	Greater Accra	Cross-sectional	161 Clinical and non-clinical healthcare workers. The Census method of sampling was applied.	A structured questionnaire was used.	53.4% of HCW has 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.
ı et	2019	Assessment of knowledge, attitude and vaccination status of hepatitis B among nursing training students in Ho, Ghana	Volta	Cross-sectional	358 students were randomly selected.	A self-administered questionnaire.	Age group and level of study were associated with knowledge score. Though 66.8% of nurses had been vaccinated, only 49.4% have taken 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 nurses claimed the hepatitis B vaccine was expensive.
HIV post-exposure prophylaxis protocol							
et)	2021	Predictors of adherence to HIV post-exposure prophylaxis protocol among frontline healthcare workers at the Ho Teaching Hospital, Ghana	Volta	Cross-sectional	199 frontline HCW including Health Aids were randomly selected to partake in this study. However, a proportionate sampling method was used to recruit determine participants to be recruited from each category.	A closed-ended question was used to assess adherence to PEP, knowledge on PEP, socio-demographic characteristics and perception of risk of occupational exposure.	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 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.
Infection prevention and control guidelines							
o et)	2021	Infection prevention	Greater Accra	Cross-sectional	408 HCW including	WHO COVID-19 risk	The study found IPC compliance during

		and control compliance among healthcare workers in COVID-19 treatment centres in Ghana: A descriptive cross-sectional study.	and Ashanti		nursing assistants, catering staff, cleaners and other administrative workers were conveniently selected to participate in the study.	assessment tool was used to collect data.	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, lower compliance was seen among nonclinical 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.
gor (104)	2018	Practices relating to hepatitis B virus infection prevention and its determinants among health care workers in the Ho Municipality, Ghana	Volta	Cross-sectional	273 HCW including health assistants and housekeeping staff were randomly selected.	A self-administered questionnaire and direct observational checklist were used for data collection.	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 on 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).
& (103)	2013	Infection prevention and control practices among health workers at Ridge Regional Hospital in	Greater Accra	Cross-sectional	Exactly 204 Health care workers, participants were recruited for the study	Self-administered questionnaires and observational guides were used to collect data from participants.	Compliance with IPC guidelines were 54.9% while 51.0% had moderate knowledge of IPC. The availability and access to materials for IPC practices was 58.0%.

	Accra, Ghana

Table 6: Studies (n = 5) on knowledge of control/preventive measures (arranged in chronological order according to the year of publication)

Authors	Year	Topic	Study setting	Study design	Participants/ Sample size	Methodology/ Instrument	Outcomes Key findings
Post-exposure prophylaxis							
Babanawo et al. (108)	2018	Assessment of knowledge and usage of HIV post-exposure prophylaxis among healthcare workers in a regional hospital in Ghana	Eastern	Cross-sectional	185 healthcare workers were recruited through a random sampling method.	A self-structured questionnaire based on previous studies was developed for the study.	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.
Konlan et al. (96)	2017	The level of nurses' knowledge on occupational post-exposure to hepatitis B infection in the Tamale metropolis, Ghana	Northern	Cross-sectional	108 nurses were selected for the study through simple random sampling.	A semi-structured questionnaire was employed for the study.	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 on 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.
Standard precautions							
Akagbo et al. (111)	2017	Knowledge of standard precautions and barriers to compliance among healthcare workers in the Lower Manya Krobo District, Ghana	Eastern	Cross-sectional	100 HCWs including ward orderlies took part in the study. And they were sampled through the quota and random sampling methods.	A structured questionnaire was developed based on two previous studies.	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 compliances include lack of time, panic to patients, demands for patient care and lack of PPE.
Tuberculosis infection prevention and control measures							
Osei-Yeboah (116)	2019	Knowledge and practice of tuberculosis infection prevention and control measures among nurses and doctors in selected government hospitals in Accra, Ghana.	Greater Accra	Cross-sectional	403 doctors and nurses were selected through a proportionate stratified sampling method.	Structured questionnaire	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, ever attending TBIPC training were key predictors of effective TBIPC practices.
Codjoe (117)	2012	Assessment of Tuberculosis infection prevention and	Greater Accra	Cross-sectional	229 health workers were randomly selected.	54-item self-administered questionnaire was used for	The mean knowledge score was 13.44 out of a maximum of 20. Knowledge of tuberculosis infection

	control practices among healthcare workers in Tema General Hospital	data collection.	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.

Figures

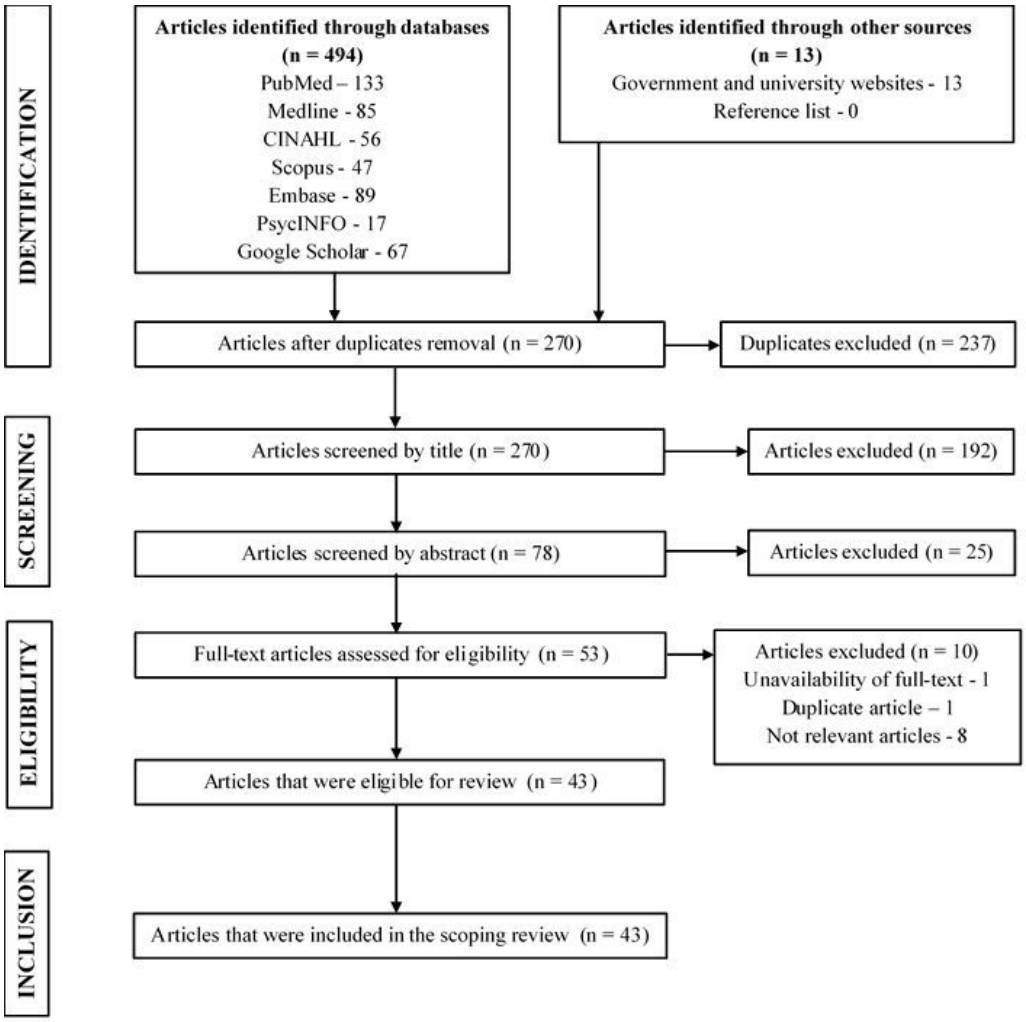


Figure 1

Flow chart illustrating the scoping review study selection process

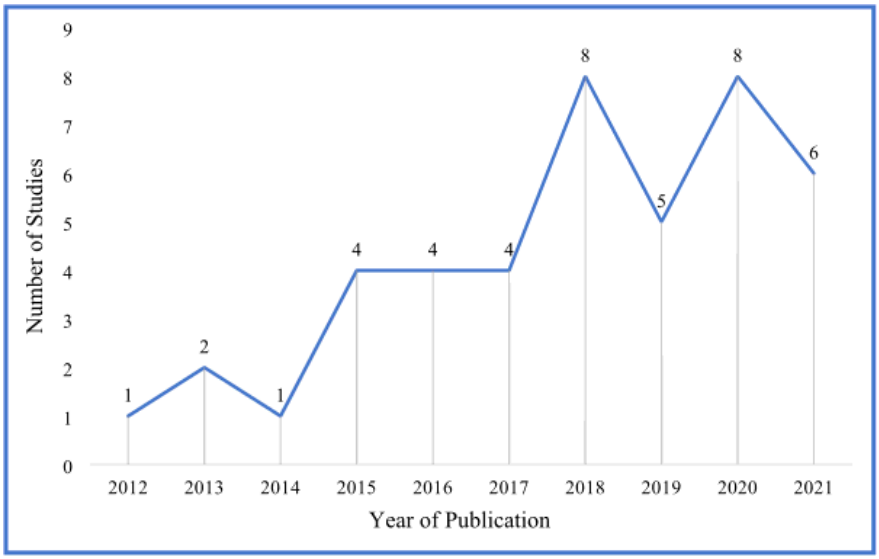


Figure 2

Number of studies published from 2013 to 2021

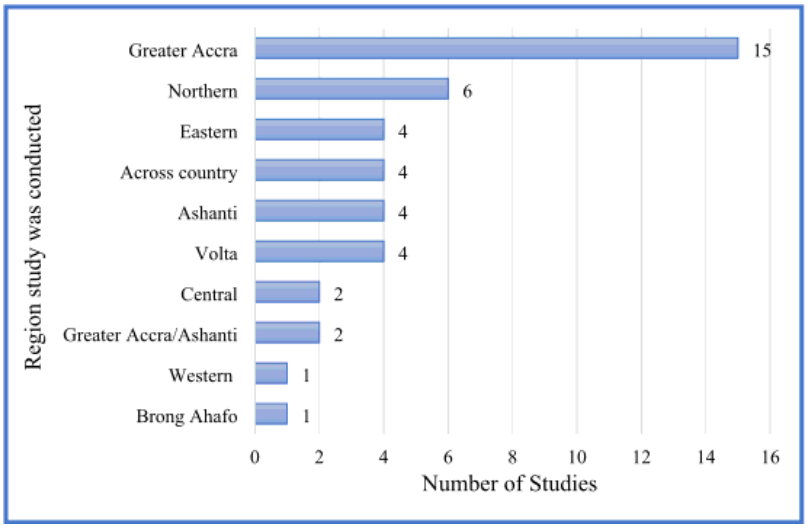


Figure 3

Number of studies and the regions they were conducted

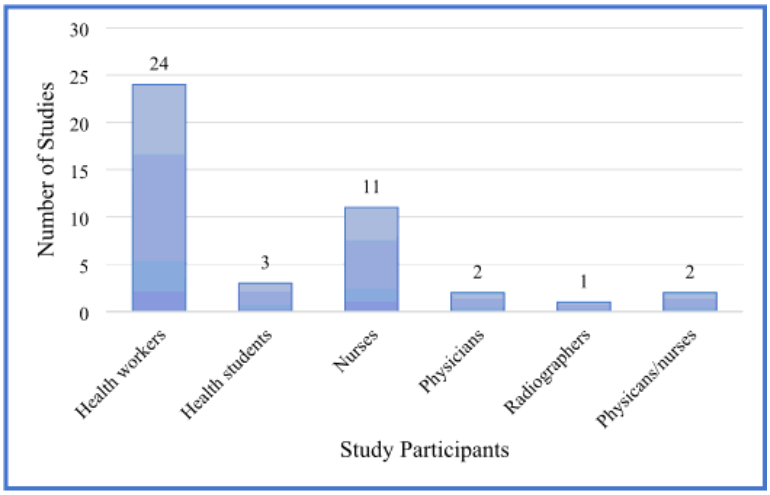


Figure 4

Number of studies and study participants involved

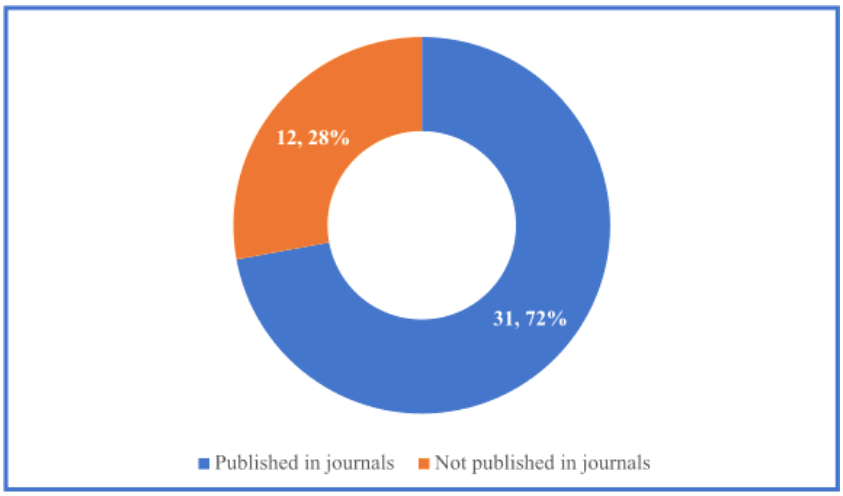


Figure 5

Number of studies published in journals

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- AppendixISearchstrategy.pdf
- AppendixIIDataExtractionTool.pdf