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State of the Science Review

Barriers to hand hygiene practices among health care workers in sub-Saharan African countries: A narrative review

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Key Words:
Facilitators

Background: Hand hygiene (HH) is the primary measure in the prevention of health care–associated infections; however, from published studies, compliance of health care workers (HCWs) to HH guidelines is low. There is currently no review on HH compliance rates in developing countries, specifically sub-Saharan Africa (SSA), or the barriers to compliance. We therefore, through a narrative review, sought to identify the compliance with and the barriers to HH in SSA.

Methods: From 3 databases, we performed a search of peer-reviewed studies from SSA, conducted among HCWs, published in the English language between 2005 and 2017. Only studies that reported HH compliance and/or barriers were included.

Results: A total of 278 articles were identified, and the final sample of 27 articles was analyzed in full length. Overall, the HH compliance rate was estimated to be 21.1%, and doctors had better compliance irrespective of the type of patient contact. The main barriers identified were heavy workload, infrastructural deficit (eg, lack of water, soap, hand sanitizers, and blocked/leaking sinks), and poorly positioned facilities.

Conclusions: HH compliance is poor among SSA HCWs. There is a need for more reports of HH compliance in SSA, and emphasis needs to be placed on surgical wards in which surgical site infections—the most common form of health care—associated infections in SSA—are most likely to occur. Barriers identified in this review are consistent with the findings of studies conducted elsewhere; however, it appears that heavy workload, infrastructural deficit, and poorly positioned facilities are more likely in developing countries.

Health care–associated infections (HCAIs) remain a global health care challenge and a safety burden to patients, their visitors, and health care workers (HCWs)[1] because they contribute to prolonged hospital stays, additional hospital expenditures, greater disease burden, and higher patient morbidity and mortality.[2] Globally, it is estimated that 1.4 million patients are affected by HCAIs.[3] In England, about 300,000 patients acquire HCAIs per annum.[4] Despite a dearth of reporting, it is clear that the impact of HCAI in developing countries, particularly in Africa, is more pronounced. Approximately 66% of developing countries have no published reports on the burden of HCAI, thereby rendering the exact enormity unknown.[5] The few reports available present poor statistical illustrations of HCAI prevalence, but it is reported that HCAI contributes 4%-56% to all causes of neonatal mortality, with 75% of these mortalities occurring in sub-Saharan Africa (SSA) and Southeast Asia.[6] The probability of acquiring a HCAI is around 2-20 times more in developing countries, and the proportion of infected patients is >25%.[5,7,8]

Numerous studies reiterated the correlation between active adherence to infection prevention and control (IPC) measures and a decline in transmission of infectious diseases.[9] Hand hygiene (HH) has been described as the primary measure in the prevention of HCAI.[10,11] It is cheap and efficient[12] and can result in between 15% and 30% of HCAIs being avoided.[13] However, compliance of HCWs to HH guidelines is low.[10] HH compliance in developed countries is only 40%.[14] There is no review of HH compliance in developing countries (specifically SSA) or the barriers to compliance.

AIM

Our aim was to conduct a narrative review of published studies to identify (1) compliance with and (2) barriers to HH in SSA.

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METHODS

Literature Search Strategy

We conducted a scoping review to confirm that there is no similar existing literature and to identify the relevant search terms. A search of the PROSPERO database identified no similar ongoing review. The protocol for this review can be found on PROSPERO (registration number CRD42018087062).[15] The literature search was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines,[16] and subject-specific databases were explored, namely, CINAHL Complete, MEDLINE, and PsycINFO. Different key words including names of countries within SSA were combined during the literature search, and when applicable, Boolean operators were used and truncation employed. The final search strategy was as follows:

hand hygien* or handwash* or hand wash*

AND

barrier* or challeng* or practic* or facilitat* or complian* or adheren*

AND

healthcare worker* or health care worker* or nurs* or medic* or healthcare profession*

AND

africa* or sub-sahara* or sub sahara* or Gambia* or Swaziland* or Sao Tome and Principe* or central Africa* or Mosambique* or cote d'ivoire* or Comoros* or Madagascar* or Lesotho* or Senegal* or Seychell* or Togo* or Somalia* or Sudan* or guinea* or Tanzania* or Sierra Leone* or Niger* or Kenya* or Botswana* or Burundi* or Benin or Angola* or Cameroon* or Congo* Maurit* or Liberia* or Ghana* or Uganda* or Malawi* or Burkina Faso or Chad* or Zimbabwe* or Zambia* or Namibia*.

Inclusion and exclusion criteria

The inclusion and exclusion criteria are presented in Table 1.

Study selection, data extraction, and quality assessment

The article selection process is shown in Figure 1 using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram. Two reviewers independently screened all studies based on titles (YA and JD), abstracts (YA and MG) and full-text reports (YA and JD). Disagreements were resolved through discussion with a third reviewer (MG for title and full-text; JD for abstracts). All 27 articles considered eligible were examined in full text and assessed for methodological quality using quality appraisal tools.[17,18] Only exceptions to quality were reported. Studies were not excluded based on quality appraisal.

Analysis

Data were extracted according to the review questions, and a narrative synthesis was conducted[19] to identify the HH barriers. Table 2 and Figure 2 show the description of included studies and the barriers thematic map, respectively. Two broad thematic categories and 10 subcategories were derived. Compliance was tabulated (Table 3) according to overall rate before and after patient contact and according to the practitioner group (where this information was reported).

RESULTS

Characteristics of included studies

Twenty-seven studies are included in this review. Nine studies[21-29] used questionnaires only, whereas 4 conducted observational studies on HH practices.[30-33] The remaining 14 studies employed mixed methods: 6[20,34-38] are interventional studies, which used quasi-experimental study design, 3[39-41] combined observation with questionnaires, 3[42-44] employed both observation and interviews, and the remaining 2 studies conducted focus group discussions, which combined questionnaires and observations, respectively.[45,46]

In terms of study location, a rich mix of countries from SSA are represented in the review. Thirteen studies were conducted in Nigeria,[21,23-30,32,38,41,45] 4 in Ghana,[22,31,33,44] 2 in Uganda,[35,43] 2 in Ethiopia,[37,39] 2 in Rwanda,[20,42] and 1 each from Mali,[34] Eritrea,[46] Malawi,[40] and South Africa.[36]

Study participants varied: 13 studies[22-24,32-39,43,44] included nurses, doctors, ward assistants, and other HCWs, whereas 5 studies[20,21,30,31,42] recruited only doctors and nurses as participants. Three studies[29,40,41] employed doctors only, whereas 1 study included only nurses.[26] One study included dentists and dental students,[27] 1 included medical students,[28] 1 involved physiotherapists, [45] and the final study included patients alongside HCWs.[46]

FINDINGS

Study findings are presented first according to the aims of the study, with the compliance rates followed by the thematic categories. The barriers were grouped into 2 categories: individual (personal) factors and organizational (institutional) factors, each of which has subcategories.

Table 1
Inclusion and exclusion criteria

Inclusion	Exclusion
Published between 2005 and 2017 because their evidences are both current and comprehensive	
Explored HH barriers and/or compliance of HCWs to provide answers to the review question	
Conducted in SSA countries and among hospital-based HCWs because this is the focused setting for the review	Conducted in other African countries and among community HCWs
Only empirical studies are appropriate for the research question	
Peer-reviewed studies because they are more reliable, having undergone the rigor of quality assessment	Non–peer-reviewed studies
Only studies published in the English language with English being the authors' first language	Published in non-English languages owing to lack of translation resources

HCWs, health care workers; *HH*, hand hygene; *SSA*, sub-Saharan Africa.

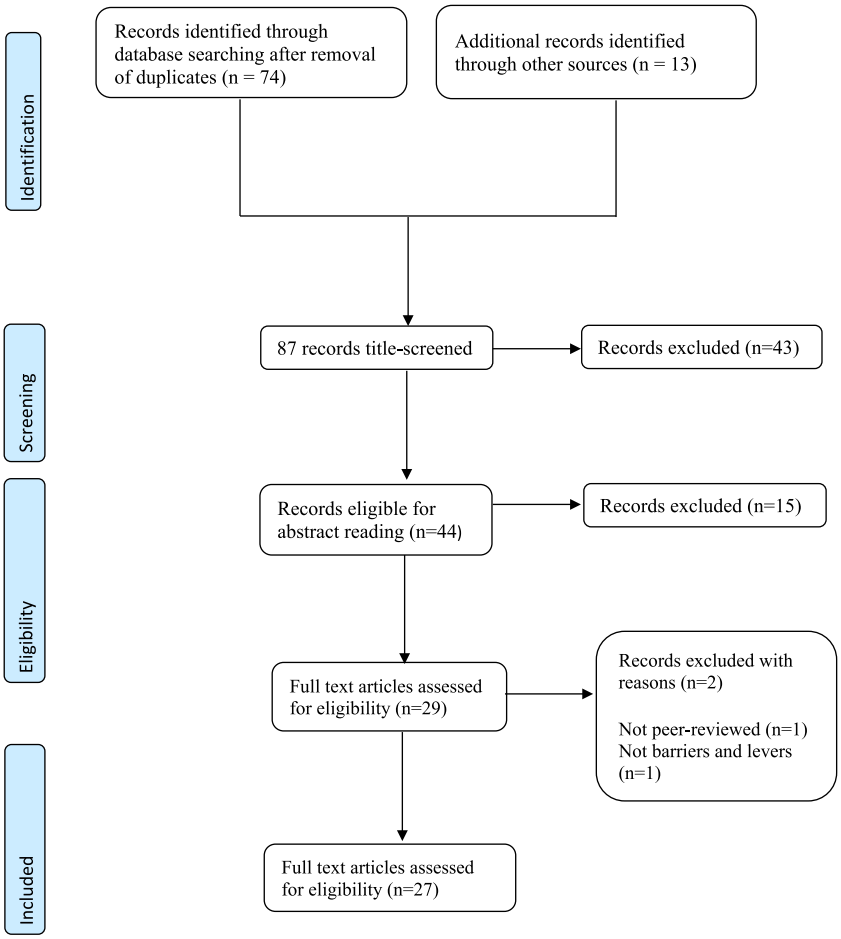

Fig 1. Article selection process using Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Compliance rate

The studies that report on compliance are identified in Table 3. Nine studies on HH compliance rate were synthesized in this review to determine an overall compliance rate among HCWs in SSA. From synthesis of this available limited data, the total number of HH opportunities was 3,221, whereas the total number of participants was 994. The mean HH compliance rate was 21.1%. Doctors had better compliance rates irrespective of the type of patient contact. HH before patient contact was 16.3% among all professional groups, 19% among doctors, and 17.5% among nurses. Compliance rate after patient contact was 39.1% across all professional groups, 50.8% among doctors, and 31.1% among nurses.

CATEGORY 1: INDIVIDUAL (PERSONAL) FACTORS

Type of patient contact

In terms of patient contact, 2 studies[22,41] identified participants performing HH before and after patient contact and 2 studies[43,46] between patients. HH practices before patient contact ranged from 0.8%[37] to 91%.[23] After patient contact, this ranged between 3%[37] and 97.7%.[25] On exposure to body fluids or when hands are visibly soiled, 5 studies[23,27,28,32,42] reported on this ranging from 50%[42] to 98.1%.[27]

Knowledge and training

Thirteen studies[20,22,23,25-27,35,37-39,43,44,46] identified poor HH knowledge/training as a barrier to HH practices. All studies except 3[20,37,39] identified lack of previous or continuous education/training on when to perform HH; these 3 reported improvement in compliance after training.

Glove use

Seven studies[22,23,27,30,32,39,41] reported that participants believed HH is unnecessary when gloves are used. In 1 study, participants preferred glove use to HH practice.[46]

Forgetfulness

Eight studies[21,22,24,27,38,40,41,45] identified forgetfulness as a barrier to HH practices. Interview participants in 1 study[43] viewed this as carelessness. Focus group discussion participants in another study[38] also affirmed this, whereas some participants in the study[28] noted this as a form of laziness.

Perceived risks

Three studies identified fear of contracting diseases as their motivator for enhanced HH practice.[21,25,28] In some studies,[25,27,28] >70% of study participants noted HH as a means to protect HCWs from infections, whereas some participants stated that HH is unnecessary in the absence of perceived risks of infection.[29] More than twice the HCWs will perform HH in high-risk centers than in medium-risk centers, [33] and this is supported by HCWs' prevalent belief of being able

Table 2
Description of included studies

Author (year)	Population and sample	Research aim and methods	Summary of research findings	Quality appraisal (exceptions)
Abdella et al[39] (2014)	HCWs at a university hospital in Ethiopia (n = 405)	To assess HH compliance and determinants in a cross-sectional study involving thorough observations of HH and a questionnaire	Compliance was 16.5%; determinants were training, provision, and locations of facilities, time, skin irritation, glove use, IPC committee, and provision of individual towel/tissue paper	Observer's bias
Alex-Hart and Opara[21] (2011)	HCWs at a university teaching hospital in Nigeria (n = 258)	To explore perceptions, attitudes, and handwashing practices through a cross-sectional study involving questionnaires	Rate of handwashing of the HCWs in this hospital were reported as low; figure not given; factors influencing HH practices: fear of contracting disease, handwashing facilities, and training/education	Self-reported bias, no account of ethical consideration, no account of questionnaire pilot study
Alex-Hart and Opara[30] (2014)	HCWs at a university teaching hospital in Nigeria (n = 150)	To assess the handwashing practices through an observational study	Overall compliance not reported; factors influencing HH practices: glove use, patient contact type, need for personal protection, and time of the day	Observer's bias, no account of ethical consideration, no account if data collection instrument used was standardized
Allegranzi et al[34] (2010)	HCWs at a university teaching hospital in Mali (n = 224)	To evaluate the feasibility and effectiveness of the HH implementation strategy through a before-and-after study involving questionnaires, observations, and an inventory of resources in each of 24 clinical wards	Factors influencing HH practices: professional category, HH indication, presence of hand sanitizer, facilities	Observer's bias
Amissah et al[22] (2016)	HCWs at a teaching hospital in Ghana (n = 130)	To assess HH knowledge and practices through a cross-sectional, descriptive study (questionnaire)	Factors influencing HH practices: heavy workload, forgetfulness, lack of water, lack of cleaning towels, lack of hand dryer, lack of detergent, lack of time, HH training	Self-reported bias, no account of questionnaire pilot study
Ango et al[23] (2017)	HCWs in government-owned facilities in a local government area in Nigeria (n = 144)	To assess knowledge, attitude, and practice of HH through a cross-sectional study involving a questionnaire	Factors influencing HH practices: irregular water supply, inconveniently located sink, lack of hand sanitizer, lack of soap, knowledge/training, patient contact type	Self-reported bias
Asare et al[31] (2009)	HCWs in a teaching hospital in Ghana (n = 38)	To evaluate the nature and frequency of patient contacts and HCWs' compliance with HH guidelines through observations	Overall compliance not reported; factors influencing HH practices: contact type, glove use, occupational category, and training/education	Observer's bias, no account of ethical consideration, small sample size
Bello et al[24] (2013)	HCWs in a teaching hospital in Nigeria (n = 356)	To assess practice, knowledge, beliefs/attitudes, and determinants of handwashing practices through a cross-sectional study involving a questionnaire	Factors influencing HH practices: lack of facilities/poor quality, lack of time, heavy workload, and forgetfulness	Self-reported bias, no account of questionnaire pilot study
Ekwere and Okafor[25] (2013)	HCWs in a teaching hospital in Nigeria (n = 430)	To evaluate knowledge, attitude, and HH practices and to identify both the barriers and motivators of handwashing practices through a cross-sectional study involving a questionnaire	Factors influencing HH practices: fear of contracting disease, heavy workload, facilities, patient contact type, training/knowledge, and occupational category	Self-reported bias
Holmen et al[20] (2016)	HCWs in a hospital in Rwanda (n = 66)	To explore HH compliance improvement following implementation of a WHO tool kit through a quasi-experimental study; observations and surveys conducted at baseline and 3 weeks after implementation	Factors influencing HH practices: occupational category, knowledge, contact type, lack of resources	Observer's bias
Holmen et al[42] (2017)	HCWs in a hospital in Rwanda (interviews n = 17)	To assess HH compliance through observations at a rural hospital in Rwanda after HH improvement initiatives, interviews	Study is a continuation of the preceding study (Holmen et al [2016[20]]); overall compliance fell from 68.9% to 36.8% within a year; factors influencing HH practices: professional group, role model attitude, more HH for personal protection	Observer's bias

(*continued*)

Table 2 (*Continued*)

Author (year)	Population and sample	Research aim and methods	Summary of research findings	Quality appraisal (exceptions)
Ibeneme et al (2017)	Physiotherapists in 3 tertiary hospitals in Nigeria (FGD n = 15; questionnaire n = 44)	To investigate compliance through a cross-sectional study involving a questionnaire, FGDs, and inventory of resources	Factors influencing HH practices: inadequate infrastructure and materials, HH protocol, forgetfulness, distant location of HH facilities	Self-reported bias, small sample size; study aim (compliance) not investigated
Kalata et al[40] (2013)	Doctors and medical students in a hospital in Malawi (observations n = 58; questionnaires n = 116)	To investigate HH compliance through observations and questionnaires	Compliance rate was 23.5%, with only 30% of all HH being effective; factors influencing HH practices: lack of resources, heavy workload, forgetfulness, negligence, location of facilities, professional category, and perceived risk of infection	Observer's bias (observations), self-reported bias (questionnaire), small sample size (observations)
Mearkle et al[43] (2016)	HCWs in 2 hospitals in Uganda (observations n = 37; interviews n = 9)	To explore current HH practice through observation and identify any barriers through inventory and interviews	Factors influencing HH practices: contact type, HH training/knowledge, means of self-protection, busy workload, forgetfulness (carelessness), location of facilities	Observer's bias, small sample size
Muhumuza et al[35] (2015)	HCWs in a national hospital in Uganda (baseline n = 18; follow-up n = 20)	To improve HH practice through an interventional study involving baseline (2 weeks) and follow-up (2 weeks) observations and questionnaires; implementation involved training, display of posters, feedback on baseline audit, and provision of resources	Factors influencing HH practices: workload and overcrowding, staff attitude and lack of knowledge, limited resources	Observer's bias (observations), self-reported bias (questionnaire)
Ojong et al[26] (2014)	Nurses in a general hospital in Nigeria (n = 102)	To assess the practice of handwashing through a cross-sectional survey	Factors influencing HH practices: knowledge, IPC unit/guideline and facilities	Self-reported bias, no account of questionnaire pilot study
Omogbai et al[27] (2011)	Dentists and dental students in a teaching hospital in Nigeria (n = 105)	To assess handwashing attitudes and practices through a cross-sectional survey	Factors influencing HH practices: glove use, time, facilities, forgetfulness, skin irritation, contact type	Self-reported bias, no account of questionnaire pilot study
Omuemu et al[41] (2013)	Doctors in a teaching hospital in Nigeria (questionnaire n = 326; observations n = 108)	To ascertain the knowledge and practice of HH among medical doctors through a cross-sectional survey and observations	Overall compliance is 16.7%; factors influencing HH practices: lack of facilities, forgetfulness, lack of time, glove use, skin irritation, professional category, time of the day, contact type	Self-reported bias (survey), observer's bias (observations)
Opara and Alex-Hart[28] (2009)	Medical students in a teaching hospital in Nigeria (n = 261)	To assess the perceptions, attitudes, and handwashing practices through a cross-sectional survey	Factors influencing HH practices: lack of facilities, lack of motivation, lack of time, procedure type, time of the day	Self-reported bias, no account of questionnaire pilot study, questionnaires were retrieved immediately; respondents might have been coerced into filling out the questionnaires
Owusu-Ofori et al[44] (2010)	HCWs in a teaching hospital in Ghana (interviews n = 27; observations [HH opportunities] n = 1,226)	To establish baseline HH practices and resources through observations, interviews, and inventory of HH resources	Overall compliance was 12%; factors influencing HH practices: contact type, professional group, limited resources, lack of knowledge	Observer's bias, no account of ethical consideration, misinterpretation of Twi language likely
Patel et al[36] (2016)	HCWs in a hospital in South Africa (trained n = 557; observed n = 497; intervention group n = 146)	To establish an improvement in HH compliance using a multifaceted pre- and postintervention study involving a prestudy needs assessment questionnaire, training, and display of posters; postintervention evaluation involved observations and monthly feedback	Factors influencing HH practices: ward type, professional category, lack of motivation, time constraints, staff rotations, and turnover of doctors and nurses	Observer's bias
Samuel et al[46] (2005)	HCWs in a hospital in Eritrea (observations n = 30; FGD n = 34 HCWs, 30 patients)	To assess quality of HH care through FGDs, observations, and inventory of resources in medical, surgical, and obstetric units	Overall compliance rate not reported; factors influencing HH practices: contact type, glove use, training	Observer's bias, small sample size

(*continued*)

Table 2 (*Continued*)

Author (year)	Population and sample	Research aim and methods	Summary of research findings	Quality appraisal (exceptions)
Schmitz et al[37] (2014)	HCWs in a university teaching hospital in Ethiopia (observations n = not reported; postintervention survey n = 161)	To define baseline HH compliance and assess the impact of implementing the WHO multimodal HH strategy through a before and after study; intervention: distribution of hand sanitizers and implementation of the WHO multimodal HH strategy; pre- and postintervention: HH observations and postintervention questionnaires	Factors influencing HH practices: facilities, knowledge, professional group, time of the day, ward type (better in ER than surgical wards), type of patient care, hand sanitizer type (HCWs preferred commercially prepared rather than hospital-prepared sanitizers)	Observer's bias, no account of questionnaire pilot study, no account of ethical consideration
Shobowale et al[32] (2016)	HCWs in a teaching hospital in Nigeria (n = 148)	To assess the compliance level with respect to appropriate HH practices through an observational study	Compliance before and after patient contact was 5.7% and 27%, respectively; factors influencing HH practices: assumption of HH as a means of personal protection, contact type, glove use	Observer's bias, no account of ethical consideration
Tobi and Enyi-Nwafor[29] (2013)	HCWs in a teaching hospital in Nigeria (n = 100)	To evaluate the handwashing knowledge, practices, and compliance through a questionnaire	Factors influencing HH practices: lack of time, skin irritation, lack of and inconveniently placed facilities, handwashing thought of as not necessary, poor knowledge of policies	Self-reported bias, no account of questionnaire pilot study, informed consent not taken
Uneke et al[38] (2014)	HCWs in a teaching hospital in Nigeria (intervention phase n = 202; evaluation phase n = 209)	To identify factors associated with HH noncompliance through a cross-sectional, interventional study; intervention phase: training, reminders at workplace, etc; training preceded by questionnaire administration and FGDs; evaluation phase: observations	Factors HH influencing practices: facilities, forgetfulness, occupational category, contact type, skin irritation, lack of awareness, absence of guidelines	Observer's bias
Yawson and Hesse[33] (2013)	HCWs in a teaching hospital in Ghana (observations n = not reported)	To provide baseline survey data on HH practices and determine resources available in all major clinical service provision centers through an observational study	Overall compliance rate not reported; factors influencing HH practices: professional group, patient contact (exposure) type, facilities, perceived risk of infection	Observer's bias

ER, emergency room; *FGD*, focus group discussion; *HCW*, health care worker; *HH*, hand hygiene; *IPC*, infection control and prevention; *WHO*, World Health Organization.

to physically recognize infectious patients whereby their HH practices are enhanced in such instances.[43]

Skin irritation

Five studies[27,29,37,38,41] identified skin irritation from hand sanitizers and soaps as a reason for poor HH practice. Participants noted that their HH practice improved if provided with commercially prepared sanitizers compared with the hospital-prepared ones for which they expressed less preference.[37]

CATEGORY 2: INSTITUTIONAL (ORGANIZATIONAL) FACTORS

Infrastructural deficit

Some studies identified lack, insufficient, or poor quality of soap as a barrier.[21-24,28,34,37] Others noted lack of water as a barrier,[21-24,28,34] and some reported lack of, insufficient, leaking, and/or blocked sinks as barriers.[20,24,34,38,42] Some studies reported the absence of hand sanitizers as a barrier,[24,34,37,40] although in 1 study hand sanitizers were always available but not necessarily used.[31] In terms of HH facility locations, 7 studies identified inconvenient locations of wash sinks and hand sanitizers as a barrier for HH,[21,23,24,28,40,41,45] and 3 studies noted lack of support, commitment, and motivation by hospital managers as a barrier to HH practices.[21,28,36]

Heavy workload and time constraints

Eight studies reported heavy workload and inadequate staffing,[22,24,25,28,35,38,41,46] and 7 studies noted time constraints as barriers to HH practice.[21,24,27-29,36,39,45]

Occupational category and seniority

Five studies showed higher compliance rates among nurses than doctors,[33,36-38,44] and 5 reported better compliance among doctors than nurses.[20,22,31,34,42] One study found no significant difference between compliance rates of doctors and nurses.[25] Two studies found that the higher the professional level, the better their HH practices,[40,41] and 1 reported higher compliance among nursing students than nurses.[34]

Access to IPC policy

Four studies[25,29,38,39] indicated participants' ignorance of World Health Organization HH guidelines, the presence of any IPC committee in hospitals, and the presence of any documentary evidence on

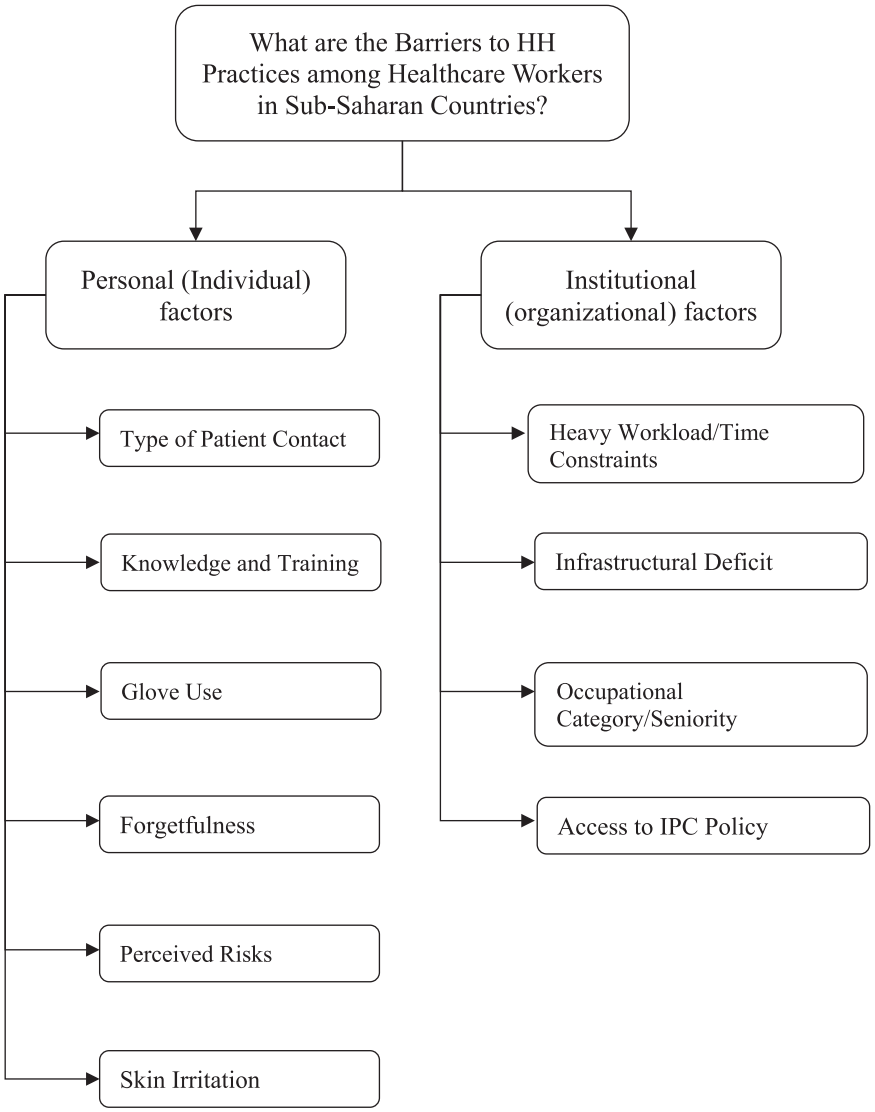

Fig 2. Barriers thematic map. *IPC*, infection control and prevention.

HH and disinfection practices. One study[45] reported that most of the participants were aware of the HH protocol in their unit.

DISCUSSION

This review has drawn together empirical evidence on HH compliance rates and the barriers to HH practices among HCWs in SSA countries. From the included research, the mean HH compliance rate among HCWs in SSA countries is 21.1%.

To understand the barriers specifically related to SSA, we considered these within the context of the wider literature. All individual-level barriers identified in our review of SSA have been identified in developing countries as well. Most of our included articles noted that HH compliance is influenced by the type of patient contact/procedure, and HH compliance was generally better after patient contact. A systematic review of studies from developed countries[14] reported improved HH compliance after patient contact or when there is perceived risk of infection. Our review identified that the more senior a HCW, the more likely he or she had better HH practices. This is consistent with the findings of studies from both other developing countries, such as Israel,[47] and developed countries.[48-51] Findings from our review also suggest that HCWs prioritize HH as a means of personal protection rather than to ensure patient safety. This finding is congruent with research conducted in developed countries—for example,[52] where only 1 of 8 interviewed nurses identified patient safety as a HH facilitator, whereas the others focused on their personal safety. Additionally, forgetfulness is a barrier identified in our review of SSA and developed countries.[49]

Similarly, most of the institutional barriers identified in our review have been identified in other developing countries. For instance, our included articles noted heavy workload as a barrier to HH practice, a barrier typical of virtually all health care systems.[48] Heavy workload is often linked to stressful work situations and the shortage of HCWs in SSA,[53,54] evidenced by the low densities of doctors and nurses against the World Health Organization–recommended minimum.[55] Poor HH practices can also be linked to infrastructural deficit[11,56,57] in which shortage of water supply, inadequate sinks and their locations, and lack of soap and hand sanitizers were identified as barriers. However, our review suggests dissimilar findings in relation to occupational category, especially doctors and nurses and their HH compliance. In

Table 3
HH compliance studies

Study No.	Author (year)	Hospital area	No. of HH opportunities (participant nos.)	Overall compliance rate (%)	Compliance before patient contact	Compliance after patient contact
1	Abdella et al[39] (2014)	Not reported	Opportunities not reported (n = 405)	16.5	Not reported	Not reported
2	Alex-Hart and Opara[30] (2014)	Children's emergency and neonatal ICU	Opportunities not reported (n = 150)	Not reported	17.4 (doctors)	64 (doctors)
3	Asare et al[31] (2009)	Neonatal ICU	Opportunities not reported (n = 97)	Not reported	15.4 (doctors); 14.1 (nurses)	38.5 (doctors); 9.9 (nurses)
4	Holmen et al[42] (2017)	Maternity. pediatrics, internal medicine	1,273 (participant nos. not reported)	36.8	24.3 (doctors); 20.8 (nurses)	50 (doctors); 52.3 (nurses)
5	Kalata et al[40] (2013)	Medicine, surgery, pediatrics, obstetrics, and gynecology	722 (n = 58)	23.5	Not reported	Not reported
6	Omuemu et al[41] (2013)	Anesthesiology, community health, family medicine, hematology, internal medicine, psychiatry, obstetrics and gynecology, pediatrics, radiology, surgery	Opportunities not reported (n = 108)	16.7	Not reported	Not reported
7	Owusu-Ofori et al[44] (2010)	Children's health, medicine, surgery, medical emergency unit, pediatric emergency unit	1,226 (participant nos. not reported)	12	6	20
8	Shobowale et al[32] (2016)	Emergency, ICU, medicine, pediatrics, surgery, general outpatient department, dental	Opportunities not reported (n = 176)	Not reported	5.7 (calculated by self)	27 (calculated by self)
9	Yawson and Hesse[33] (2013)	Internal medicine, surgery, child health, obstetrics and gynecology, central laboratory	Neither opportunities nor participant nos. reported	Range: 9.2-57 (doctors); 9.6-54 (nurses)	Not reported	Not reported
	Synthesis of data when possible		Total opportunities = 3,221; total participants = 994	Mean across all papers = 21.1	Mean across all papers and professional groups = 16.3; doctors = 19; nurses = 17.5	Mean across all papers and professional groups = 39.1; doctors = 50.8; nurses = 31.1

HH, hand hygiene; *ICU*, intensive care unit; SN, serial/study number.

developed countries, nurses nearly always have better compliance than doctors,[14] whereas in SSA countries, evidence suggests that this varies.

CONCLUSIONS

As far as we know, our study is the first literature review that synthesizes previous studies relating to HH compliance and barriers among HCWs in SSA. From our review, average HH compliance is low in SSA countries, which might suggest a reason for the alarming rates of HCAI in these regions. Virtually all included studies identified infrastructural deficit and heavy workload as barriers. The main limitation of our review is the dearth of works from SSA that report both HH compliance and barriers. Furthermore, included articles did not always report their process of observation. It is possible that processes varied and results were subject to the Hawthorne effect. There is a need to prioritize HH to enhance patient safety in resource-limited settings such as SSA.

RECOMMENDATION FOR FUTURE RESEARCH

There is a need for further reports of HH compliance in SSA, and studies need to report the process of observation to allow replication of methods. Although many hospital areas are covered in the literature, there are no reports suggesting compliance rates for surgical wards specifically (where patients are most likely to contract surgical site infections—the most common form of HCAI in SSA), and these need to be prioritized.

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