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Title: Barriers to hand hygiene practices among healthcare workers in Sub-Saharan African countries: a narrative review

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Abstract

Background: Hand hygiene (HH) is the primary measure in the prevention of healthcare associated infections though from published studies, compliance of healthcare workers to HH guidelines is low. There is currently no review on HH compliance rate 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 three databases, we performed a search of peer-reviewed studies from SSA, conducted among healthcare workers, published in English language and 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 analyzed in full length. Overall 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 (e.g. lack of water, soap, hand sanitizers and blocked/leaking sinks) and poorly positioned facilities.

Conclusion: HH compliance is poor among SSA healthcare workers. There is a need for more reports of HH compliance in SSA and emphasis needs to be placed on surgical wards where surgical sites infections, the commonest form of HCAI in SSA are likeliest. 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.

Keywords: Hand hygiene, Barriers, Facilitators, Sub-Sahara Africa, Healthcare Workers

- The impact of HCAI in developing countries, particularly in Africa is pronounced
- Contaminated hands play a significant role in the spread of HCAI
- Hand hygiene is the chief preventive measure, but compliance rate is generally low
- Hand hygiene compliance rate among SSA healthcare workers is low
- Barriers to compliance include lack of facilities, poor positions and heavy workload

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Introduction

Healthcare associated infections (HCAI) remain a global healthcare challenge and a safety burden to patients, their visitors and healthcare workers (HCWs)¹ as they contribute to prolonged hospital stay, additional hospital expenditures, greater disease burden and higher patient morbidity and mortality². Globally, it is estimated that 1.4 million patients are affected by HCAI³. In England, about 300,000 patients acquire HCAI per annum⁴. Despite a dearth of reporting, it is clear the impact of HCAI in developing countries, particularly in Africa, is more pronounced. Approximately 66% of the 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 reported that HCAI contributes 4%-56% to all causes of neonatal mortality with 75% of these mortalities occurring in sub-Saharan Africa (SSA) and South-East Asia⁶. The probability of acquiring HCAI is around 2-20 times more in developing countries and the proportion of infected patients is greater than 25% ⁷. ^{5,8}.

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 it can result in between 15%-30% of HCAI being avoided ¹³. Yet, 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

To conduct a narrative review of published studies to identify (i) compliance with and the (ii) barriers to HH in SSA.

Methods

Literature Search Strategy

We conducted a scoping review to confirm there is no similar existing literature and to identify the relevant search terms. A search of PROSPERO identified no similar ongoing review. The protocol for this review can be found on PROSPERO (registration number CRD42018087062)¹⁵. Literature search was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines¹⁶ 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 where applicable, Boolean operators were used and truncation employed . The final search strategy is presented below.

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.

Table 1:	Inclusion	and Excl	lusion	criteria
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Inclusion	Exclusion
Published between 2005 and 2017 for current	
and comprehensive coverage	
Explored HH barriers and/or compliance of	
HCWs to provide answers to the review	
question	
Conducted in SSA countries and among	Conducted in other African countries and
hospital-based HCWs since this is the focused	among community HCWs
setting for the review	
Only empirical studies are appropriate for the	
research question	
Peer-reviewed studies as they have undergone	Non-peer-reviewed studies
the rigour of quality assessment	
Only studies published in English language due	
to the lack of resources for translation	

Study Selection, Data Extraction and Quality Assessment

The article selection process is shown on figure 1 using the PRISMA flow diagram. Two reviewers independently screened all studies based on titles, abstracts, and full-text reports. Disagreements were resolved through discussion with a third reviewer. 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.

Fig 1: The Article Selection Process using PRISMA



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 sub-categories were derived. Compliance was tabulated (see table 3) according to overall rate, before and after patient contact and according to practitioner group (where this information was reported).

Fig 2: Barriers Thematic Map



Table 2:	Description	of included	studies
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Author	Population and	Research Aim and Methods	Summary of Research Findings	Quality Appraisal
(Year)	Sample			(Exceptions)
Abdella et al.	HCWs at a University	To assess HH compliance and	Compliance was 16.5%.	Observer's bias
(2014)	Hospital in Ethiopia	determinants in a cross-sectional	Determinants were training, provision	
	(n=405)	study involving through	and locations of facilities, time, skin	
		observations of HH and a	irritation, glove use, IPC committee	
		questionnaire	and provision of individual	
			towel/tissue paper	
Alex-Hart	HCWs at a University	To explore perceptions, attitudes	Rate of handwashing of the HCWs in	Self-reported bias, no
and Opara	teaching hospital in	and handwashing practices	this hospital reported to be low;	account of ethical
(2011)	Nigeria (n=258)	through a cross-sectional study	figure not given. Factors influencing	consideration, no account of
		involving questionnaires	HH practices: fear of contracting	questionnaire pilot study
			disease, handwashing facilities and	
			training/education	
Alex-Hart	HCWs at a University	To assess the handwashing	Overall compliance not reported.	Observer's bias, no account
and Opara	teaching hospital in	practices through observational	Factors influencing HH practices:	of ethical consideration, no
(2014)	Nigeria (n=150)	study	glove use, patient contact type, need	account if data collection
			for personal protection and time of the	instrument used was
			day.	standardized
Allegranzi et	HCWs at a University	To evaluate the feasibility and	Factors influencing HH practices:	Observer's bias
al. (2010)	teaching hospital in	effectiveness of the HH	professional category, HH indication,	
	Mali (n=224)	implementation strategy through	presence of hand sanitizer, facilities	
		a before and after study		
		involving questionnaires,		
		observations and an inventory of		
		resources in each of 24 clinical		
		wards		

Author (Year)	Population and Sample	Research Aim and Methods	Summary of Research Findings	Quality Appraisal (Exceptions)
Amissah et	HCWs at a teaching	To assess HH knowledge and	Factors influencing HH practices:	Self-reported bias, no
al. (2016)	hospital in Ghana	practices through a cross-	heavy workload, forgetfulness, lack	account of questionnaire
	(n=130)	sectional, descriptive study	of water, lack of cleaning towels, lack	pilot study
		(questionnaire)	of hand dryer, lack of detergent, lack	
			of time, HH training	
Ango et al.	HCWs in government-	To assess knowledge, attitude	Factors influencing HH practices:	Self-reported bias
(2017)	owned facilities in a	and practice of HH through	irregular water supply, inconveniently	
	local government area	cross-sectional study involving	located sink, lack of hand sanitizer,	
	in Nigeria (n=144)	questionnaire	lack of soap, knowledge/training,	
			patient contact type	
Asare et al.	HCWs in a teaching	To evaluate the nature and	Overall compliance not reported.	Observer's bias, no account
(2009)	hospital in Ghana	frequency of patient contacts and	Factors influencing HH practices:	of ethical consideration,
	(n=38)	HCWs' compliance to HH	contact type, glove use, occupational	small sample size
		guidelines through observations	category and training/education	
Bello et al.	HCWs in a teaching	To assess practice, knowledge,	Factors influencing HH practices:	Self-reported bias, no
(2013)	hospital in Nigeria	beliefs/attitudes and	lack of facilities/poor quality, lack of	account of questionnaire
	(n=356)	determinants of handwashing	time, heavy workload and	pilot study
		practices through cross-sectional	forgetfulness	
		study involving questionnaire		
Ekwere and	HCWs in a teaching	To evaluate knowledge, attitude	Factors influencing HH practices:	Self-reported bias
Okafor	hospital in Nigeria	and HH practices and to identify	fear of contracting disease, heavy	
(2013)	(n=430)	both the barriers and motivators	workload, facilities, patient contact	
		of handwashing practices	type, training/knowledge and	
		through cross-sectional study	occupational category.	
		involving questionnaire		
Holmen et al.	HCWs in a hospital in	To explore HH compliance	Factors influencing HH practices:	Observer's bias
(2016)	Rwanda(n=66)	improvement following	occupational category, knowledge,	
		implementation of World Health	contact type, lack of resources	

Author	Population and	Research Aim and Methods	Summary of Research Findings	Quality Appraisal
(Year)	Sample			
		Organisation (WHO) tool kit		
		through a quasi-experimental		
		study. Observations and surveys		
		conducted at baseline and 3		
		weeks post implementation		
Holmen et al.	HCWs in a hospital in	To assess HH compliance	Study is a continuation of previous	Observer's bias
(2017)	Rwanda	through observations at a rural	study – see above ²⁰	
	(interviews n=17)	hospital in Rwanda after HH	Overall compliance fell from 68.9%	
		improvement initiatives	to 36.8% within a year. Factors	
		interviews.	influencing HH practices:	
			professional group, role model	
			attitude, HH more for personal	
			protection	
Ibeneme et al.	Physiotherapists in 3	To investigate compliance	Factors influencing HH practices:	Self-reported bias, small
(2017)	tertiary hospitals in	through cross-sectional study	inadequate infrastructure and	sample size
	Nigeria (FGD n=15;	involving questionnaire, FGDs	materials, HH protocol, forgetfulness,	Study aim (compliance) not
	questionnaire n=44)	and inventory of resources	distant location of HH facilities	investigated
Kalata et al.	Doctors and medical	To investigate HH compliance	Compliance rate was 23.5% with only	Observer's bias
(2013)	students in a hospital in	through observations and	30% of all HH being effective.	(observations), self-reported
	Malawi (Observations	questionnaire	Factors influencing HH practices:	bias (questionnaire), small
	n=58; questionnaires		lack of resources, heavy workload,	sample size (observations)
	n=116)		forgetfulness, negligence, location of	
			facilities, professional category and	
			perceived risk of infection	
Mearkle et al.	HCWs in two hospitals	To explore current HH practice	Factors influencing HH practices:	Observer's bias, small
(2016)	in Uganda	through observation and identify	contact type, HH training/knowledge,	sample size
	(Observations n=37;	any barriers through inventory	means of self-protection, busy	
	interviews n=9)	and interviews.	workload, forgetfulness	

Author	Population and	Research Aim and Methods	Summary of Research Findings	Quality Appraisal
(Year)	Sample			(Exceptions)
			(carelessness), location of facilities	
Muhumuza et	HCWs in a national	To improve HH practice through	Factors influencing HH practices:	Observer's bias
al. (2015)	hospital in Uganda	an interventional study involving	workload and overcrowding, staff	(observations), self-reported
	(baseline n=18; follow-	baseline (2 weeks) and follow up	attitude and lack of knowledge,	bias (questionnaire)
	up n=20)	(2 weeks) observations and	limited resources	
		questionnaires. Implementation		
		involved training, display of		
		posters, feedback on baseline		
		audit, provision of resources		
Ojong et al.	Nurses in a general	To assess the practice of	Factors influencing HH practices:	Self-reported bias, no
(2014)	hospital in Nigeria	handwashing through cross-	knowledge, IPC unit/guideline and	account of questionnaire
	(n=102)	sectional survey	facilities	pilot study
Omogbai et	Dentists and dental	To assess handwashing attitudes	Factors influencing HH practices:	Self-reported bias, no
al. (2011)	students in a teaching	and practices through cross-	glove use, time, facilities,	account of questionnaire
	hospital in Nigeria	sectional survey	forgetfulness, skin irritation, contact	pilot study
	(n=105)		type	
Omuemu et	Doctors in a teaching	To ascertain the knowledge and	Overall compliance is 16.7%. Factors	Self-reported bias (survey),
al. (2013)	hospital in Nigeria	practice of HH among medical	influencing HH practices: lack of	observer's bias
	(questionnaire n=326;	doctors through cross-sectional	facilities, forgetfulness, lack of time,	(observations)
	observations n=108)	survey and observations	glove use, skin irritation, professional	
			category, time of the day, contact	
			type	
Opara and	Medical students in a	To assess the perceptions,	Factors influencing HH practices:	Self-reported bias, no
Alex-Hart	teaching hospital in	attitudes and handwashing	lack of facilities, lack of motivation,	account of questionnaire
(2009)	Nigeria (n=261)	practices through a cross-	lack of time, procedure type, time of	pilot study, questionnaires
		sectional survey	the day	were retrieved immediately;
				respondents might have

Author	Population and	Research Aim and Methods	Summary of Research Findings	Quality Appraisal
(Year)	Sample			(Exceptions)
				been coerced into filling the
				questionnaires
Owusu-Ofori	Ofori HCWs in a teaching To establish baseline HH Overall compliance was 12%. Factor	Fo establish baseline HHOverall compliance was 12%. Factors		Observer's bias, no account
et al. (2010)	hospital in Ghana	practices and resources through	influencing HH practices: contact	of ethical consideration,
	(interviews n=27;	observations, interviews and	type, professional group, limited	misinterpretation of Twi
	observations (HH	inventory of HH resources	resources, lack of knowledge	language likely
	opportunities n=1226)			
Patel et al.	HCWs in a hospital in	To establish an improvement in	Factors influencing HH practices: ward	Observer's bias
(2016)	South Africa	HH compliance using a	type, professional category, lack of	
	(trained n=557;	multifaceted pre-post	motivation, time constraints, staff	
	observed n=497;	intervention study involving pre-	rotations and turnover of doctors and	
	intervention group	study needs assessment	nurses.	
	n=146)	questionnaire, training and		
		display of posters. Post-		
		intervention evaluation involved		
		observations and monthly		
		feedback		
Samuel et al.	HCWs in a hospital in	To assess quality of HH care	Overall compliance rate not reported.	Observer's bias, small
(2005)	Eritrea	through FGDs, observations and	Factors influencing HH practices:	sample size
	(observations n=30;	inventory of resources in	contact type, glove use, training	
	FGD n=34 HCWs, 30	medical, surgical and obstetric		
	patients)	units)		
Schmitz et al.	HCWs in a university	To define baseline HH	Factors influencing HH practices	Observer's bias, no account
(2014)	teaching hospital in	compliance and assess the	facilities, knowledge, professional	of questionnaire pilot study,
	Ethiopia (observations	impact of implementing the	group, time of the day, ward type	no account of ethical
	n = not reported; post-	WHO multimodal HH strategy	(better in ER than surgical wards),	consideration
	intervention survey	through a before and after study.	type of patient care, hand sanitizer	
	n=161)	Intervention: distribution of hand	type (HCWs preferred commercially	

Author	AuthorPopulation andResearch Aim and MethodsSummary of Research Findings		Quality Appraisal	
(Year)	Sample			(Exceptions)
		sanitizers and implementation of the WHO multimodal HH	prepared to hospital prepared sanitizers)	
		Pre and post-intervention : HH observations and post intervention questionnaires.		
Shobowale et al. (2016)	HCWs in a teaching hospital in Nigeria (n=148)	To assess the compliance level with respect to appropriate HH practices through 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 (2013)	HCWs in a teaching hospital in Nigeria (n=100)	To evaluate the handwashing knowledge, practices and compliance through questionnaire	Factors influencing HH practices: lack of time, skin irritation, lack of and inconveniently placed facilities, handwashing thought as not necessary, poor knowledge of policies	Self-reported bias, no account of questionnaire pilot study, informed consent not taken
Uneke et al. (2014)	HCWs in a teaching hospital in Nigeria (intervention phase n=202; evaluation phase n=209)	To identify factors associated with HH non-compliance 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 (2013)	HCWs in a teaching hospital in Ghana	To provide baseline survey data on HH practices and determine	Overall compliance rate not reported. Factors influencing HH practices:	Observer's bias

Author	Population and	Research Aim and Methods	Summary of Research Findings	Quality Appraisal
(Year)	Sample			(Exceptions)
		resources available in all the	professional group, patient contact	
	(observations n= not	major clinical service provision	(exposure) type, facilities, perceived	
	reported)	centres through an observational	risk of infection	
		study		

Results

Characteristics of Included Studies

Twenty-seven studies are included in this review. Nine studies ²¹⁻²⁹ used questionnaires only while four conducted observational studies on HH practices ³⁰⁻³³. The remaining fourteen studies employed mixed methods; of these studies, six ^{20,34-38} are interventional studies which used quasi-experimental study design, three ³⁹⁻⁴¹ combined observation with questionnaires, three ⁴²⁻⁴⁴ employed both observation and interviews while the remaining two studies conducted focus group discussions which they combined with 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}, four in Ghana ^{22,31,33,44}, two in Uganda ^{35,43}, two in Ethiopia ^{37,39}, two in Rwanda ^{20,42} and one 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 while five studies ^{20,21,30,31,42} recruited only doctors and nurses as participants. Three studies ^{29,40,41} employed just doctors while one study included only nurses ²⁶. One study had dentists and dental students ²⁷, one had medical students ²⁸, one study involved physiotherapists ⁴⁵ and the final study included patients alongside HCWs ⁴⁶.

Findings

Study findings are presented according to the study aims; first the compliance rates followed by the thematic categories. The barriers were grouped into two: individual (personal) factors and organisational (institutional) factors each of which has sub-categories.

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 limited data available, the total number of HH opportunities was 3221 while the total number of participants was 994. The mean HH compliance rate was 21.1%. Doctors had better compliance rate 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.

Table 3: Hand Hygiene Compliance Studies

SN	Author	Hospital Area	Number of HH opportunities (Participant Numbers)	Overall compliance rate (%)	Compliance before patient contact	Compliance after patient contact
1	Abdella et al. (2014)	Not reported	Opportunities not reported (n=405)	16.5	Not reported	Not reported
2	Alex-Hart and Opara (2014)	Children's emergency and Neonatal ICU	Opportunities not reported (n=150)	Not reported	17.4 (Drs)	64 (Drs)
3	Asare et al. (2009)	Neonatal ICU	Opportunities not reported (n=97)	Not reported	15.4 (Drs) 14.1 (nurses)	38.5 (Drs) 9.9 (nurses)
4	Holmen et al (2017)	Maternity. Paediatrics, Internal Medicine	1273 (Participant numbers not reported)	36.8	24.3 (Drs) 20.8 (nurses)	50 (Drs) 52.3 (nurses)
5	Kalata et al. (2013)	Medicine, Surgery, Paediatrics, Obstetrics and Gynaecology	722 (n=58)	23.5	Not reported	Not reported
6	Omuemu et al. (2013)	Anaesthesiology, Community Health, Family Medicine, Haematology, Internal Medicine, Psychiatry, Obstetrics and Gynaecology, Paediatrics, Radiology, Surgery	Opportunities not reported (n=108)	16.7	Not reported	Not reported
7	Owusu-Ofori et al. (2010)	Children's Health, Medicine, Surgery, Medical Emergency Unit, Paediatric Emergency Unit	1226 (Participant numbers not reported)	12	6	20
8	Shobowale et al. (2016)	Emergency, ICU, Medicine, Paediatrics, Surgery, General Out- Patient Department, Dental	Opportunities not reported (n=176)	Not reported	5.7 (calculated by self)	27 (calculated by self)
9	Yawson and Hesse (2013)	Internal Medicine, Surgery, Child Health, Obstetrics and Gynaecology, Central Laboratory	Neither opportunities nor participant numbers reported	Ranged from 9.2 to 57 (Drs) and 9.6 to 54 (nurses)	Not reported	Not reported

Synthesis of	Total number of	Mean across all	Mean across all	Mean across all
Data where	opportunities =3221	papers=21.1	papers and	papers and
possible	Total number of participants		professional	professional
	=994		groups=16.3	groups=39.1
			Drs=19,	Drs=50.8,
			nurses=17.5	nurses=31.1

Category 1 - Individual (Personal) Factors

Type of Patient Contact

In terms of patient contact, two studies ^{22,41} identified participants performing HH before and after patient contact and two 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 to 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 three ^{20,37,39} identified lack of previous or continuous education/training on when to perform HH; these three 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 one 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 one study ⁴³ viewed this as carelessness whereas focus group discussion participants in another ³⁸ also affirmed this while some participants in a study ²⁸ noted this as 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}, more than 70% of study participants noted HH as a

means to protect HCWs from infections while some participants stated HH is unnecessary in the absence of perceived risks of infection ²⁹. More than twice the HCWs will perform HH in high risk centres compared to medium risk centres ³³ and this is supported by HCWs' prevalent belief of being able to physically recognise infectious patients whereby their HH practices are enhanced in such instance 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 their HH practice improved if provided with commercially prepared sanitizers compared to the hospital prepared ones which they expressed less preference for ³⁷.

Category 2 - Institutional (Organisational) Factors

Infrastructural Deficit

Some studies identified lack or insufficient or poor quality of soap as a barrier ^{21-24,28,34,37}. Others noted lack of water ^{21-24,28,34} and some reported lack/insufficient, leaking and/or blocked sinks as barriers ^{20,24,34,38,42}. Some studies stated absence of hand sanitizers as a barrier ^{24,34,37,40} though in one study hand sanitizers were always available but not necessarily used ³¹. In terms of locations of HH facilities, seven studies identified inconvenient locations of wash sinks and hand sanitizers as barrier for poor HH ^{21,23,24,28,40,41,45}. Three 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 seven 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 the higher the professional level, the better their HH practices ^{40,41} and one reported higher compliance among nursing students than nurses ³⁴.

Access to IPC Policy

Four studies ^{25,29,38,39} indicated participants' ignorance of WHO HH guidelines, any IPC committee in hospitals and the presence of any documentary evidence on HH and disinfection practices. One study⁴⁵ reported most of the participants were aware of 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 included papers, 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 too. Most of our included papers noted 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 the more senior a HCW, the more likely they have better HH practices. This is consistent with the findings of studies from both other developing countries such as Israel ⁴⁷ as well as developed countries ⁴⁸⁻⁵¹. Findings from our review also suggest that

HCWs prioritise 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 one of eight interviewed nurses identified patient safety as a HH facilitator whereas the others focused on their personal safety. Forgetfulness too is a barrier identified in our review of SSA and developed countries⁴⁹.

Similarly, most of the institutional barriers identified in our review have been identified in other developing countries too. For instance, our included papers noted heavy workload as a barrier to HH practice, a barrier typical of virtually all healthcare 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 WHO recommended minimum ⁵⁵. Poor HH practices can also be linked to infrastructural deficit ^{11,56,57} where shortage of water supply, inadequate sinks and their locations, 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 developed countries, nurses nearly always have better compliance than doctors ¹⁴ whereas in SSA countries, evidence suggests this varies.

Conclusion

This is the first literature review which 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 papers from SSA that report both HH compliance and barriers. Furthermore, included papers did not always report their process of observation. It is possible that processes varied and results were subject to the

Hawthorne effect. There is need to prioritise HH to enhance patient safety in resource limited settings like SSA.

Recommendation for Future Research

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

Conflict of Interest

There are no conflicts of interest in this study.

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1. Rutter P, Syed SB, Storr J, Hightower JD, Bagheri-Nejad S, Kelley E, et al. Development of an evaluation framework for African--European hospital patient safety partnerships. *BMJ QUAL SAF* 2014;**23**:332,337 6p.

2. Zimlichman E, Henderson D, Tamir O, Franz C, Song P, Yamin CK, et al. Health care-associated infections: a meta-analysis of costs and financial impact on the US health care system. *JAMA Intern Med* 2013;**173**:2039-46.

3. Cooper T, Percival SL. Chapter One - Introduction to Infection and Infection Prevention. In: Percival SL, , Williams DW, , Randle J, , et al, editors. *Biofilms in Infection Prevention and Control*Boston: Academic Press; 2014, p. 3-17.

4. Ampofo B. Healthcare workers' hand hygiene and infection control compliance: should patients and relatives be involved? *J INFECT PREV* 2013;**14**:214,218 5p.

5. Allegranzi B, Nejad SB, Combescure C, Graafmans W, Attar H, Donaldson L, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and metaanalysis. *Lancet* 2011;**377 North American Edition**:228-41.

6. World Health Organization. Report on the Burden of Endemic Health Care-Associated Infection Worldwide A systematic review of the literature. 2011;**ISBN 978 92 4 150150 7**.

7. World Health Organization. Infection prevention and control in health care: time for collaborative action. 2010; Available at:

http://apps.who.int/iris/bitstream/10665/80135/1/9789241501507_eng.pdf?ua=1. Accessed 11/14, 2017.

8. Raka L, Mulliqi-Osmani G. Infection Control in Developing World. In: Sudhakar C, editor. *Infection Control - Updates*Croatia: InTech; 2012, p. 65.

9. Vindigni SM, Riley PL, Jhung M. Systematic review: handwashing behaviour in low- to middleincome countries: outcome measures and behaviour maintenance. *Trop Med Int Health* 2011;**16**:466-77.

10. Graf K, Chaberny IF, Vonberg R. Beliefs about hand hygiene: A survey in medical students in their first clinical year. *American Journal of Infection Control.* 2011;**39**:885-8.

11. World Health Organization. WHO guidelines on hand hygiene in health care: First global patient safety challenge clean care is safer care. 2009;.

12. Mathur P. Hand hygiene: back to the basics of infection control. *Indian J Med Res* 2011;**134**:611-20.

13. Weston D, Weston D. *Fundamentals of infection prevention and control : theory and practice.* Chichester, West Sussex: John Wiley & Sons; 2014.

14. Erasmus V, Daha TJ, Brug H, Richardus JH, Behrendt MD, Vos MC, et al. Systematic review of studies on compliance with hand hygiene guidelines in hospital care. *Infect Control Hosp Epidemiol* 2010;**31**:283,294 12p.

15. Ataiyero Y, Dyson J, Graham M. Barriers to hand hygiene practices among healthcare workers in Sub-Saharan African countries: a narrative review. 2018; Available at: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018087062.

16. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Int J Surg* 2010;**8**:336-41.

17. Critical Appraisal Skills Programme. CASP Cohort Study Checklist. 2018; Available at: <u>https://casp-uk.net/casp-tools-checklists/</u>. Accessed 11/08, 2018.

18. Center for Evidence Based Management. Critical Appraisal Checklist for Cross-Sectional Study. 2014; Available at: <u>https://www.cebma.org</u>. Accessed 11/08, 2018.

19. Ferrari R. Writing narrative style literature reviews. *Medical Writing* 2015;24:230-5.

20. Holmen IC, Seneza C, Nyiranzayisaba B, Nyiringabo V, Bienfait M, Safdar N. Improving Hand Hygiene Practices in a Rural Hospital in Sub-Saharan Africa. *Infect Control Hosp Epidemiol* 2016;**37**:834-9.

21. Alex-Hart B, Opara PI. Handwashing practices amongst health workers in a teaching hospital. *American Journal of Infectious Diseases.* 2011;**7**:8-15.

22. Amissah I, Salia S, Craymah JP. A Study to Assess Hand Hygiene Knowledge and Practices among Health Care Workers in a Teaching Hospital in Ghana. *International Journal of Science and Research* 2016;**5**:301-7.

23. Ango UM, Awosan KJ, Adamu H, Salawu S, Sani MM, Ibrahim AH. Knowledge, Attitude and Practice of Hand Hygiene among Healthcare Providers in Semi-urban Communities of Sokoto State, Nigeria. *International Journal of TROPICAL DISEASE & Health* 2017;**26**:1-9.

24. Bello S, Effa EE, Okonkon EE, Oduwole OA. Handwashing practice among healthcare providers in a tertiary hospital in southern Nigeria.

. International Journal of Infection Control. 2013;**9**.

25. Ekwere TA, Okafor IP. Hand hygiene knowledge and practices among healthcare providers in a tertiary hospital, South West Nigeria. *International Journal of Infection Control.* 2013;**9**.

26. Ojong IN, Etim MI, Nlumanze FF, Akpan MI. The practice of hand washing for the prevention of nosocomial infections among nurses in general hospital lkot Ekpene, Akwa Ibom State, Nigeria. . *Archives of Applied Science Research* 2014;**6**:97-101.

27. Omogbai JJ, Azodo CC, Ehizele AO, Umoh A. Hand hygiene amongst dental professionals in a tertiary dental clinic. *African journal of clinical and experimental microbiology.* 2011;**12**:9-14.

28. Opara PI, Alex-Hart BA. Handwashing practices among medical students in Port Harcourt, Nigeria. . *The Nigerian health journal.* 2009;**9**:16-20.

29. Tobi K, Enyi-Nwafor K. Hand washing practices and compliance among health care workers in the intensive care unit of a teaching hospital in Nigeria. *Nigerian Medical Practitioner.* 63(4): pp. 82-89. 2013;63:82-9.

30. Alex-Hart B, Opara PI. Observed Hand Washing Practices among Health Workers in Two Critical Paediatrics Wards of a Specialist Hospital. *AM J INFECT DIS* 2014;**10**:95-9.

31. Asare A, Enweronu-Laryea C, Newman MJ. Hand hygiene practices in a neonatal intensive care unit in Ghana. *J Infect Dev Ctries* 2009;**3**:352-6.

32. Shobowale EO, Adegunle B, Onyedibe K. An assessment of hand hygiene practices of healthcare workers of a semi-urban teaching hospital using the five moments of hand hygiene. *Niger Med J* 2016;**57**:150-4.

33. Yawson AE, Hesse AAJ. Hand hygiene practices and resources in a teaching hospital in Ghana. *J Infect Dev Ctries* 2013;**7**:338-47.

34. Allegranzi B, Sax H, Bengaly L, Richet H, Minta DK, Chraiti M, et al. Successful implementation of the World Health Organization hand hygiene improvement strategy in a referral hospital in Mali, Africa. *Infect Control Hosp Epidemiol* 2010;**31**:133-41.

35. Muhumuza C, Gomersall JS, Fredrick ME, Atuyambe L, Okiira C, Mukose A, et al. Health care worker hand hygiene in the pediatric special care unit at Mulago National Referral Hospital in Uganda: a best practice implementation project. *Int J Evid Based Healthc* 2015;**13**:19-27.

36. Patel B, Engelbrecht H, McDonald H, Morris V, Sythme W. A multifaceted hospital-wide intervention increases hand hygiene compliance. *South African Medical Journal.* 106(4): pp. 335-341. 2016;**106**:335-41.

37. Schmitz K, Kempker RR, Tenna A, Stenehjem E, Abebe E, Tadesse L, et al. Effectiveness of a multimodal hand hygiene campaign and obstacles to success in Addis Ababa, Ethiopia. *Antimicrob Resist Infect Control* 2014;**3**:8-.

38. Uneke CJ, Ndukwe CD, Oyibo PG, Nwakpu KO, Nnabu RC, Prasopa-Plaizier N. Promotion of hand hygiene strengthening initiative in a Nigerian teaching hospital: implication for improved patient safety in low-income health facilities. *The Brazilian journal of infectious diseases.* 18(1): pp. 21-27. 2014;**18**:21-7.

39. Abdella NM, Tefera MA, Eredie AE, Landers TF, Malefia YD, Alene KA. Hand hygiene compliance and associated factors among health care providers in Gondar University Hospital, Gondar, North West Ethiopia. *BMC Public Health* 2014;**14**:96-.

40. Kalata NL, Kamange L, Muula AS. Adherence to hand hygiene protocol by clinicians and medical students at Queen Elizabeth Central Hospital, Blantyre-Malawi. *Malawi Med J* 2013;**25**:50-2.

41. Omuemu VO, Ogboghodo EO, Opene RA, Oriarewo P, Onibere O. Hand hygiene practices among doctors in a tertiary health facility in southern Nigeria. *Journal of Medicine in the Tropics*. 2013;**15**:96-101.

42. Holmen IC, Niyokwizerwa D, Nyiranzayisaba B, Singer T, Safdar N. Challenges to sustainability of hand hygiene at a rural hospital in Rwanda. *Am J Infect Control* 2017;**45**:855-9.

43. Mearkle R, Houghton R, Bwonya D, Lindfield R. Barriers to hand hygiene in ophthalmic outpatients in Uganda: a mixed methods approach. *J Ophthalmic Inflamm Infect* 2016;**6**:11-.

44. Owusu-Ofori A, Jennings R, Burgess J, Prasad PA, Acheampong F, Coffin SE. Assessing hand hygiene resources and practices at a large African teaching hospital. *Infect Control Hosp Epidemiol* 2010;**31**:802,808 7p.

45. Ibeneme S, Maduako V, Ibeneme GC, Ezuma A, Ettu TU, Onyemelukwe NF, et al. Hand Hygiene Practices and Microbial Investigation of Hand Contact Swab among Physiotherapists in an Ebola Endemic Region: Implications for Public Health. *BIOMED RES INT* 2017;:1-13.

46. Samuel, Almedom AM, Hagos G, Albin S, Mutungi A. Promotion of handwashing as a measure of quality of care and prevention of hospital-acquired infections in Eritrea: the Keren study. *Afr Health Sci* 2005;**5**:4-13.

47. Cantrell D, Shamriz O, Cohen MJ, Stern Z, Block C, Brezis M. Hand hygiene compliance by physicians: marked heterogeneity due to local culture? *American journal of infection control* 2009;**37**:301-5.

48. Barrett R, Randle J. Hand hygiene practices: nursing students' perceptions. *J Clin Nurs* 2008;**17**:1851,1857 7p.

49. Erasmus V, Brouwer W, van Beeck EF, Oenema A, Daha TJ, Richardus JH, et al. A qualitative exploration of reasons for poor hand hygiene among hospital workers: lack of positive role models and of convincing evidence that hand hygiene prevents cross-infection. *Infect Control Hosp Epidemiol* 2009;**30**:415-9.

50. Lankford MG, Zembower TR, Trick WE, Hacek DM, Noskin GA, Peterson LR. Influence of role models and hospital design on hand hygiene of healthcare workers. *Emerg Infect Dis* 2003;**9**:217-23.

51. Snow M, White GLJ, Alder SC, Stanford JB. Mentor's hand hygiene practices influence student's hand hygiene rates. *American Journal of Infection Control.* 2006;**34**:18-24.

52. Boscart VM, Fernie GR, Lee JH, Jaglal SB. Using psychological theory to inform methods to optimize the implementation of a hand hygiene intervention. *IMPLEMENT SCI* 2012;**7**:77-.

53. Lasebikan VO, Oyetunde MO. Burnout among Nurses in a Nigerian General Hospital: Prevalence and Associated Factors. *ISRN Nurs* 2012;**2012**:402157-.

54. Olayinka AO, Osamudiamen SO, Ojo AA. Occupational stress management among nurses in selected hospitals in Benin city, Edo State, Nigeria. . *European journal of experimental biology* 2013;**3**:473-81.

55. Kinfu Y, Dal Poz M,R., Mercer H, Evans DB. The health worker shortage in Africa: are enough physicians and nurses being trained? *Bull World Health Organ* 2009;**87**:225-30.

56. Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Lancet* 2000;**356 North American Edition**:1307,1312 6p.

57. Pittet D. Improving compliance with hand hygiene in hospitals. *Infect Control Hosp Epidemiol* 2000;**21**:381,386 6p.

Author (Year)	Population and Sample	Research Aim and Methods	Summary of Research Findings	Quality Appraisal (Exceptions)
Abdella et al.	Healthcare workers at a	To assess HH compliance and	Compliance was 16.5%.	Observer's bias
(2014)	University Hospital in	determinants in a cross-sectional	Determinants were training, provision	
	Ethiopia (n=405)	study involving through	and locations of facilities, time, skin	
		observations of HH and a	irritation, glove use, IPC committee	
		questionnaire	and provision of individual	
			towel/tissue paper	
Alex-Hart	Healthcare workers at a	To explore perceptions, attitudes	Rate of handwashing of the	Self-reported bias, no
and Opara	University teaching	and handwashing practices	healthcare workers in this hospital	account of ethical
(2011)	hospital in Nigeria	through a cross-sectional study	reported to be low; figure not given.	consideration, no account of
	(n=258)	involving questionnaires	Factors influencing HH practices:	questionnaire pilot study
			fear of contracting disease,	
			handwashing facilities and	
			training/education	
Alex-Hart	Healthcare workers at a	To assess the handwashing	Overall compliance not reported.	Observer's bias, no account
and Opara	University teaching	practices through observational	Factors influencing HH practices:	of ethical consideration, no
(2014)	hospital in Nigeria	study	glove use, patient contact type, need	account if data collection
	(n=150)		for personal protection and time of the	instrument used was
			day.	standardized
Allegranzi et	Healthcare workers at a	To evaluate the feasibility and	Factors influencing HH practices:	Observer's bias
al. (2010)	University teaching	effectiveness of the HH	professional category, HH indication,	
	hospital in Mali	implementation strategy through	presence of hand sanitizer, facilities	
	(n=224)	a before and after study		
		involving questionnaires,		
		observations and an inventory of		
		resources in each of 24 clinical		
		wards		

Author (Year)	Population and Sample	Research Aim and Methods	Summary of Research Findings	Quality Appraisal (Exceptions)
Amissah et	Healthcare workers at a	To assess HH knowledge and	Factors influencing HH practices:	Self-reported bias, no
al. (2016) teaching hospital in practices through a cross-		practices through a cross-	heavy workload, forgetfulness, lack	account of questionnaire
	Ghana (n=130)	sectional, descriptive study	of water, lack of cleaning towels, lack	pilot study
		(questionnaire)	of hand dryer, lack of detergent, lack	
			of time, HH training	
Ango et al.	Healthcare workers in	To assess knowledge, attitude	Factors influencing HH practices:	Self-reported bias
(2017)	government-owned	and practice of HH through	irregular water supply, inconveniently	
	facilities in a local	cross-sectional study involving	located sink, lack of hand sanitizer,	
	government area in	questionnaire	lack of soap, knowledge/training,	
	Nigeria (n=144)		patient contact type	
Asare et al.	Healthcare workers in	To evaluate the nature and	Overall compliance not reported.	Observer's bias, no account
(2009)	a teaching hospital in	frequency of patient contacts and	Factors influencing HH practices:	of ethical consideration,
	Ghana (n=38)	healthcare workers' compliance	contact type, glove use, occupational	small sample size
		to HH guidelines through	category and training/education	
		observations		
Bello et al.	Healthcare workers in	To assess practice, knowledge,	Factors influencing HH practices:	Self-reported bias, no
(2013)	a teaching hospital in	beliefs/attitudes and	lack of facilities/poor quality, lack of	account of questionnaire
	Nigeria (n=356)	determinants of handwashing	time, heavy workload and	pilot study
		practices through cross-sectional	forgetfulness	
		study involving questionnaire		
Ekwere and	Healthcare workers in	To evaluate knowledge, attitude	Factors influencing HH practices:	Self-reported bias
Okafor	a teaching hospital in	and HH practices and to identify	fear of contracting disease, heavy	
(2013)	Nigeria (n=430)	both the barriers and motivators	workload, facilities, patient contact	
		of handwashing practices	type, training/knowledge and	
		through cross-sectional study	occupational category.	
		involving questionnaire		
Holmen et al.	Healthcare workers in	To explore HH compliance	Factors influencing HH practices:	Observer's bias
(2016)	a hospital in	improvement following	occupational category, knowledge,	

Author	thor Population and Research Aim and Methods Summary of Research		Summary of Research Findings	Quality Appraisal
(Year)	Sample			(Exceptions)
	Rwanda(n=66)	implementation of WHO tool kit	contact type, lack of resources	
		through a quasi-experimental		
		study. Observations and surveys		
		conducted at baseline and 3		
		weeks post implementation		
Holmen et al.	Healthcare workers in	To assess HH compliance	study is a continuation of previous	Observer's bias
(2017)	a hospital in Rwanda	through observations at a rural	study – see above (Holmen et al.,	
	(interviews n=17)	hospital in Rwanda after HH	2016)	
		improvement initiatives	Overall compliance fell from 68.9%	
		interviews.	to 36.8% within a year. Factors	
			influencing HH practices:	
			professional group, role model	
			attitude, HH more for personal	
			protection	
Ibeneme et al.	Physiotherapists in 3	To investigate compliance	Factors influencing HH practices:	Self-reported bias, small
(2017)	tertiary hospitals in	through cross-sectional study	inadequate infrastructure and	sample size
	Nigeria (FGD n=15;	involving questionnaire, FGDs	materials, HH protocol, forgetfulness,	Study aim (compliance) not
	questionnaire $n = 44$)	and inventory of resources	distant location of HH facilities	investigated
Kalata et al.	Doctors and medical	To investigate HH compliance	Compliance rate was 23.5% with only	Observer's bias
(2013)	students in a hospital in	through observations and	30% of all HH being effective.	(observations), self-reported
	Malawi (Observations	questionnaire	Factors influencing HH practices:	bias (questionnaire), small
	n=58; questionnaires		lack of resources, heavy workload,	sample size (observations)
	n=116)		forgetfulness, negligence, location of	
			facilities, professional category and	
			perceived risk of infection	
Mearkle et al.	Healthcare workers in	To explore current HH practice	Factors influencing HH practices:	Observer's bias, small
(2016)	two hospitals in	through observation and identify	contact type, HH training/knowledge,	sample size
	Uganda (Observations	any barriers through inventory	means of self-protection, busy	

Author Population and Research Aim and		Research Aim and Methods	Summary of Research Findings	Quality Appraisal
(Year)	Sample			(Exceptions)
	n=37; interviews n=9)	and interviews.	workload, forgetfulness	
			(carelessness), location of facilities	
Muhumuza et	Healthcare workers in	To improve HH practice through	Factors influencing HH practices:	Observer's bias
al. (2015)	a national hospital in	an interventional study involving	workload and overcrowding, staff	(observations), self-reported
	Uganda	baseline (2 weeks) and follow up	attitude and lack of knowledge,	bias (questionnaire)
	(baseline n=18; follow-	(2 weeks) observations and	limited resources	
	up n=20)	questionnaires. Implementation		
		involved training, display of		
		posters, feedback on baseline		
		audit, provision of resources		
Ojong et al.	Nurses in a general	To assess the practice of	Factors influencing HH practices:	Self-reported bias, no
(2014)	hospital in Nigeria	handwashing through cross-	knowledge, IPC unit/guideline and	account of questionnaire
	(n=102)	sectional survey	facilities	pilot study
Omogbai et	Dentists and dental	To assess handwashing attitudes	Factors influencing HH practices:	Self-reported bias, no
al. (2011)	students in a teaching	and practices through cross-	glove use, time, facilities,	account of questionnaire
	hospital in Nigeria	sectional survey	forgetfulness, skin irritation, contact	pilot study
	(n=105)		type	
Omuemu et	Doctors in a teaching	To ascertain the knowledge and	Overall compliance is 16.7%. Factors	Self-reported bias (survey),
al. (2013)	hospital in Nigeria	practice of HH among medical	influencing HH practices: lack of	observer's bias
	(questionnaire n=326;	doctors through cross-sectional	facilities, forgetfulness, lack of time,	(observations)
	observations n=108)	survey and observations	glove use, skin irritation, professional	
			category, time of the day, contact	
			type	
Opara and	Medical students in a	To assess the perceptions,	Factors influencing HH practices:	Self-reported bias, no
Alex-Hart	teaching hospital in	attitudes and handwashing	lack of facilities, lack of motivation,	account of questionnaire
(2009)	Nigeria (n = 261)	practices through a cross-	lack of time, procedure type, time of	pilot study, questionnaires
		sectional survey	the day	were retrieved immediately;
				respondents might have

Author Population and Re		Research Aim and Methods	Research Aim and Methods Summary of Research Findings	
(Year)	Sample			(Exceptions)
				been coerced into filling the
				questionnaires
Owusu-Ofori	Healthcare workers in	To establish baseline HH	Overall compliance was 12%. Factors	Observer's bias, no account
et al. (2010)	a teaching hospital in	practices and resources through	influencing HH practices: contact	of ethical consideration,
	Ghana (interviews	observations, interviews and	type, professional group, limited	misinterpretation of Twi
	n=27; observations	inventory of HH resources	resources, lack of knowledge	language likely
	(HH opportunities			
	n=1226)			
Patel et al.	Healthcare workers in	To establish an improvement in	Factors influencing HH practices: ward	Observer's bias
(2016)	a hospital in South	HH compliance using a	type, professional category, lack of	
	Africa	multifaceted pre-post	motivation, time constraints, staff	
	(trained n=557;	intervention study involving pre-	rotations and turnover of doctors and	
	observed n=497;	study needs assessment	nurses.	
	intervention group	questionnaire, training and		
	n=146)	display of posters. Post-		
		intervention evaluation involved		
		observations and monthly		
		feedback		
Samuel et al.	Healthcare workers in	To assess quality of HH care	Overall compliance rate not reported.	Observer's bias, small
(2005)	a hospital in Eritrea	through FGDs, observations and	Factors influencing HH practices:	sample size
	(observations n=30;	inventory of resources in	contact type, glove use, training	
	FGD n=34 HCWs, 30	medical, surgical and obstetric		
	patients)	units)		
Schmitz et al.	Healthcare workers in	To define baseline HH	Factors influencing HH practices	Observer's bias, no account
(2014)	a university teaching	compliance and assess the	facilities, knowledge, professional	of questionnaire pilot study,
	hospital in Ethiopia	impact of implementing the	group, time of the day, ward type	no account of ethical
	(observations n = not	WHO multimodal HH strategy	(better in ER than surgical wards),	consideration
	reported; post-	through a before and after study.	type of patient care, hand sanitizer	

Author Population and Research		Research Aim and Methods	Summary of Research Findings	Quality Appraisal	
(Year)	Sample			(Exceptions)	
	intervention survey	Intervention: distribution of hand	type (HCWs preferred commercially		
	n=161)	sanitizers and implementation of	prepared to hospital prepared		
		the WHO multimodal HH	sanitizers)		
		strategy			
		Pre and post-intervention : HH			
		observations and post			
		intervention questionnaires.			
Shobowale et	Healthcare workers in	To assess the compliance level	Compliance before and after patient	Observer's bias, no account	
al. (2016)	a teaching hospital in	with respect to appropriate HH	contact was 5.7% and 27%	of ethical consideration	
	Nigeria	practices through observational	respectively. Factors influencing HH		
	(n =148)	study	practices: assumption of HH as a		
			means of personal protection, contact		
			type, glove use		
Tobi and Enyi-	Healthcare workers in	To evaluate the handwashing	Factors influencing HH practices: lack	Self-reported bias, no	
Nwafor (2013)	a teaching hospital in	knowledge, practices and	of time, skin irritation, lack of and	account of questionnaire	
	Nigeria	compliance through	inconveniently placed facilities,	pilot study, informed consent	
	(n=100)	questionnaire	handwashing thought as not necessary,	not taken	
			poor knowledge of policies		
Uneke et al.	Healthcare workers in	To identify factors associated	Factors HH influencing practices:	Observer's bias	
(2014)	a teaching hospital in	with HH non-compliance	facilities, forgetfulness, occupational		
	Nigeria	through a cross-sectional,	category, contact type, skin irritation,		
		interventional study. Intervention	lack of awareness, absence of		
	(intervention phase	phase: training, reminders at	guidelines		
	n=202; evaluation	workplace etc. Training			
	phase n=209)	preceded by questionnaire			
		administration and FGDs.			
		Evaluation phase: observations			
Yawson and	Healthcare workers in	To provide baseline survey data	Overall compliance rate not reported.	Observer's bias	

Author	Population and	Research Aim and Methods	Summary of Research Findings	Quality Appraisal
(Year)	Sample			(Exceptions)
Hesse (2013)	a teaching hospital in	on HH practices and determine	Factors influencing HH practices:	
	Ghana	resources available in all the	professional group, patient contact	
		major clinical service provision	(exposure) type, facilities, perceived	
	(observations n = not	centres through an observational	risk of infection	
	reported)	study		

Table 3: Hand Hygiene Compliance Studies

SN	Author	Hospital Area	Number of HH opportunities (Participant Numbers)	Overall compliance rate (%)	Compliance before patient contact	Compliance after patient contact
1	Abdella et al. (2014)	Not reported	Opportunities not reported (n=405)	16.5	Not reported	Not reported
2	Alex-Hart and Opara (2014)	Children's emergency and Neonatal ICU	Opportunities not reported (n=150)	Not reported	17.4 (Drs)	64 (Drs)
3	Asare et al. (2009)	Neonatal ICU	Opportunities not reported (n=97)	Not reported	15.4 (Drs) 14.1 (nurses)	38.5 (Drs) 9.9 (nurses)
4	Holmen et al (2017)	Maternity. Paediatrics, Internal Medicine	1273 (Participant numbers not reported)	36.8	24.3 (Drs) 20.8 (nurses)	50 (Drs) 52.3 (nurses)
5	Kalata et al. (2013)	Medicine, Surgery, Paediatrics, Obstetrics and Gynaecology	722 (n=58)	23.5	Not reported	Not reported
6	Omuemu et al. (2013)	Anaesthesiology, Community Health, Family Medicine, Haematology, Internal Medicine, Psychiatry, Obstetrics and Gynaecology, Paediatrics, Radiology, Surgery	Opportunities not reported (n=108)	16.7	Not reported	Not reported
7	Owusu-Ofori et al. (2010)	Children's Health, Medicine, Surgery, Medical Emergency Unit, Paediatric Emergency Unit	1226 (Participant numbers not reported)	12	6	20
8	Shobowale et al. (2016)	Emergency, ICU, Medicine, Paediatrics, Surgery, General Out- Patient Department, Dental	Opportunities not reported (n=176)	Not reported	5.7 (calculated by self)	27 (calculated by self)
9	Yawson and Hesse (2013)	Internal Medicine, Surgery, Child Health, Obstetrics and Gynaecology, Central Laboratory	Neither opportunities nor participant numbers reported	Ranged from 9.2 to 57 (Drs) and 9.6 to 54 (nurses)	Not reported	Not reported

Synthesis of	Total number of	Mean across all	Mean across all	Mean across all
Data where	opportunities =3221	papers=21.1	papers and	papers and
possible	Total number of participants		professional	professional
	=994		groups=16.3	groups=39.1
			Drs=19,	Drs=50.8,
			nurses=17.5	nurses=31.1

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

Table 1: Inclusion and Exclusion criteria

Figure(s) Click here to download Figure(s): prisma.pptx



Figure(s) Click here to download Figure(s): Barriers thematic map.pptx

