Infection Prevention in Practice 6 (2024) 100407

Available online at www.sciencedirect.com

Infection Prevention in Practice

journal homepage: www.elsevier.com/locate/ipip

Status of infection prevention and control in Cameroon healthcare facilities: lessons learned from the WHO COVID-19 scorecard tool under the hierarchy of control model

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ARTICLE INFO

Article history:
Received 20 January 2024
Accepted 24 June 2024
Available online 28 October 2024

Keywords:
Infection prevention and control

SUMMARY

Background: Infection prevention and control (IPC) helps prevent disease transmission in healthcare facilities. There is a dearth of information on the implementation of IPC during the COVID-19 outbreak in Cameroon using the recommended WHO COVID-19 IPC scorecard tool. The present study assessed healthcare facilities' compliance to IPC by continuous assessments, with an evaluation of the tool using the hierarchy of control theory.
Methods: This cross-sectional study was conducted in the 10 administrative regions of Cameroon by evaluating healthcare facilities prioritized by the Ministry of Public Health as high-risk facilities between March 2020 and November 2023. Comparisons were made regarding the facilities' ownership, level and status.

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https://doi.org/10.1016/j.infpip.2024.100407

Healthcare facilities
WHO IPC scorecard tool
Hierarchy of control
Model
Cameroon

Results: 2,188 assessments from 1,358 healthcare facilities were collected. The median IPC scores at each evaluation were between the intermediate and advanced level, with a bias linked with decreasing selection of facilities. However, only 172 (13%) healthcare facilities achieved advanced IPC score (≥75%). Higher IPC scores were found in hospitals ($p<0.001$) and in private facilities ($p=0.02$). Predictors of good IPC compliance were hospital (OR=3.7, CI: 1.4—9.8) and private facility (OR=2.3, CI: 1.6—3.3). The tool met the five domains of the hierarchy of control model.

Conclusion: Repeated IPC assessments using recommended tools contribute to a better compliance of IPC by healthcare facilities in resources constrained settings.

Introduction

Infection prevention and control (IPC) is a clinical and public heath specialty relying on practical evidence-based-approaches with the aim of protecting patients, health workers and visitors from avoidable infections [1]. Healthcare facilities sometimes act as either the starting point or amplifiers of major outbreaks due to the inappropriate/lack of implementation of IPC measures and the lack of basic water, sanitation, hygiene (WASH) and waste services [2]. Healthcare-associated infections (HCAI) may result from poor quality and unsafe patient care and the World Health Organization (WHO) estimated that among hospital-treated sepsis, 1 in 4 cases are the result of unsafe care worldwide [1,3,4]. The WHO identifies disparities between country level income: in low-middle income countries (LMIC) the observed HCAI pooled prevalence was 15.5%, compared to 7.6% in high-income countries (HIC) with significantly higher rates during outbreaks [5—8]. Similar trends of HCAI were observed in specific medical units such as intensive care [9—11], though patients attending outpatient services are still exposed to infections [12].

The world had faced major emerging and re-emerging epidemic diseases that significantly affect healthcare workers (HCW), such as Ebola Virus Disease (EVD), Marburg Virus Disease (MVD) and Coronavirus Disease of 2019 (COVID-19). Factors that contribute to occupational infections among HCWs include insufficient/incorrect use of personal protective equipment (PPE), lack of or insufficient training in IPC, and the non-compliance of standard and complementary IPC measures [5,13,14]. To better assess and mitigate the risk of infection, the World Health Organization in 2016, provided guidelines on the successful implementation of the core components of IPC programmes (both at national and health facility levels). In 2018, they further provided a practical manual for healthcare facilities to support intrahospital implementation of effective IPC [15,16] with tools tested and recognized to trigger better IPC outcomes [17]. Specific tools for assessing IPC compliance in emergency situations or crisis were developed by the WHO, including scorecards used during the EVD outbreak and reviewed and adapted for the measurement of IPC during the recent COVID-19 pandemic [18]. According to the hierarchy of control model, the identification of key actions to mitigate hazards in the workplace for the protection of workers is based on five graded domains. These are implemented in priority orders; the elimination, the substitution, the engineering controls, administrative controls and the use of personal protective equipment (PPE) [19,20].

In Cameroon, the response to the COVID-19 pandemic was led by the Public Health Emergency Operation Center (PHEOC), which was reorganized to prevent and control infections through the joint management of the IPC unit within the PHEOC and the continuous support of the Directorate of Health Promotion within the Ministry of Health (MoH) [21—23]. The tool most widely used for evaluating IPC in Cameroon, during the pandemic, was the WHO COVID-19 IPC scorecard tool; recommended for emergency situations [24]. The Cameroon MoH adopted the WHO COVID-19 IPC scorecard tool for the rapid assessment and improvement of IPC within healthcare facilities (HCF). To the best of our knowledge there have been no prior studies reporting accurate national IPC data from healthcare facilities in Cameroon during COVID-19 pandemic.

This study aimed to analyze the level of IPC implemented in Cameroonian healthcare facilities using the WHO COVID-19 IPC scorecard tool. Specifically, we sought to analyze implementation within different levels of HCF, and according to the ownership, the type and the level of the HCF from March 2020 to November 2023. We further analyzed the IPC tool using the hierarchy of control model to understand how best the tool addressed the IPC related issues.

Materials and methods

Study design and setting

We conducted a serial cross-sectional study of the implementation of IPC in healthcare facilities from March 2020 to November 2023. Healthcare facilities were stratified based on ownership (public or private), the having vs not having a COVID-19 unit, and the "level" of the healthcare setting. Healthcare setting levels were defined as "health centers", "medical centers", and "hospitals". In our study, a "health center" is a primary healthcare facility at the first contact within communities that provides preventive care, and some curative care, typically managed by a nurse. A "medical center" is a healthcare facility at the next level of the health pyramid, and is managed by a general physician; a medical center and provides the package available at the health center with an additional higher technical support, such as radiology diagnostic devices and laboratory service. A "hospital" is a bigger healthcare facility to which patients from the previous facilities are referred. A hospital has modern technical support center, and aims to provide a complete health package with more advanced care.

Study population and sampling

All healthcare facilities evaluated with the WHO COVID-19 IPC scorecard tool during the study period in the 10 administrative regions of Cameroon were included in the study population and were units of analysis [25]. Facilities were recruited based on the selection by the MoH, which guided implementation of IPC practices based on the magnitude of each of the five COVID-19 waves experienced by the country, with priority given to areas of high risk [26,27].

Data collection

The WHO COVID-19 IPC scorecard tool was developed and validated by the WHO Regional Office for Africa, and was adopted by the Cameroon MoH. The tool is in the form of a questionnaire made up of 42 indicators, clustered in 14 priority components [24]. It is designed to rapidly assess the level of IPC implementation within HCFs. The Priority components included the (a) existence of an IPC programme, (b) availability of a triage station, (c) identification of an isolation facility, (d) availability of hand-wash stations at all points of care, (e) availability and use of personal protective equipment (PPE), (f) effectiveness of waste segregation, (g) effectiveness of waste disposal, (h) healthcare worker training on IPC, (i) intra-hospital surveillance of COVID-19, (j) sterilization, (l) cleaning and disinfection of patient environment, (m) risk assessment of healthcare workers exposed to SARS-CoV-2, (n) water supply and storage in the HCF and (o) sanitation and hygiene in the HCF. Each component is estimated based on a Likert scale ranging from 0 (absence of the indicator) to 3 (well implemented indicator) rating the processes, practices and materials or supplies. An aggregated component score is calculated by summing each point of the indicator. The total score of all the 14 components is then computed and rated as a percentage. All IPC scores are graded in three main categories as follow: basic IPC performance if the score is below 50%, intermediate IPC performance if the score is between 50% and 74%, and advance IPC performance if the score is equal to or above 75%.

IPC health facility committees and focal points

Each healthcare facility had a functional IPC committee and a focal point. Each of the committees was made up of a representative of the HCF's administration, an IPC focal person, the head nurse, the head of the laboratory, the head of pharmacy, the head of financial unit, the head of hygiene unit and other nurses and physicians involved in providing care. These members were trained using a short IPC course with a focus on the use of the WHO COVID-19 scorecard tool for the initial assessment. The committee ensured the evaluation of each component of the IPC scorecard tool within the HCF at least twice a month. The IPC focal point documented all decisions and recommendations arrived at by committee and provided a follow up for its implementation including planning, reporting and archiving of committee's reports.

Within each healthcare facility, there was a designated IPC focal person (IPCFP) with/without an IPC committee who were in charge of conducting all IPC activities. The IPCFP was charged with holding staff accountable to the compliance of IPC practices through the use of good communication, sensitization, negotiation and leadership. The IPCFP was trained to use the WHO tool by the health district IPC team or the regional IPCFP. The WHO IPC scorecard tool "was designed to rapidly assess the level of IPC implementation within HCFs", thus it was not aimed at evaluating reduction of HAI directly.

Data analysis

Under the leadership of the MoH, training was followed by baseline assessment and reassessment. IPC data were collected at the HCF jointly with the HCF IPCFP and the IPC team, then a copy of the score (on hard copy) was shared to the health district focal person who approved it before it was sent to the regional focal person with whom we closely work to filter inaccurate data. The compilation of data was then shared with the NIPCFP for final approval. Data gathered at the central level was sorted, coded and exported into the Statistical Package for the Social Sciences SPSS version 21.0, SPSS Inc. Armonk, NY: IBM Corp. We used frequencies and percentages to summarize data related to HCF's characteristics (type, ownership and level) and IPC score.

To visualize changes in healthcare facility scores over time, we utilized a Sankey diagram to show changes in IPC category between assessment periods, and a spaghetti diagram to show changes in each individual healthcare facility's IPC score over time. In the Sankey diagram, the three types of IPC category (basic, intermediate and advanced) are displayed independently on the Y-axis with the number of healthcare facilities with the corresponding median IPC score being laid out per assessment point on the X-axis; each evaluation period has a specific color to allow the easy identification of facilities in the specific category while the crossing lines between different categories reflect prospective changes in median IPC score categories between two evaluation periods. The Spaghetti diagram displays clustered individual healthcare facility's IPC score on the Y-axis and at each assessment point with a line matching two consecutive scores; a fitted value per assessment is created to generate a fitted line made up by matching all fitted values across time.

We conducted comparison analysis between HCF using the Mann Whitney U test and the Kruskall Wallis test to assess differences in the median IPC scores among variables. The Chi-square test was used to assess the association between variables. We then dichotomized IPC scores (1: score greater than 50% and 2: score lower and 50%), and used multiple logistic regression to determine independent predictors of intermediate/advanced IPC. Results of regression analysis are presented as odds ratios (OR) with their 95% confidence intervals (CI). Results with $p \leq 0.05$ were considered statistically significant.

Ethical approval

From 2020 to 2023, the Ministry of Health (MoH) provided administrative approval for the evaluation of healthcare facilities using the WHO COVID-19 IPC scorecard tool in the 10 administrative regions. IPC data were collected in routine COVID-19 surveillance and monitoring activities. This study did not rely on patient data and no ethics approval or patient consent was therefore required.

Results

Description of healthcare facilities

We analyzed 2,184 IPC assessments from 1,355 healthcare facilities during the three-year period. Of facilities, 136 (10%) were hospitals, 217 (16%) were medical centers, and 1,002 (74%) were health centers. In total, 867 (64%) were public owned HCF and 488 (36%) were privately owned HCF. One hundred and twenty-one (9%) had a COVID-19 treatment unit. Among the 136 hospitals, three (2.2%) were General hospitals, three (2.2%) were central hospitals, 14 (10.4%) were regional hospitals and 119 (85.2%) were health district hospitals.

IPC evaluations included 1,355 (62.04%) at the first assessment (baseline), 482 (22.06%) at the second assessment, 236 (10.8 %) the third assessment, 65 (3%) the fourth assessment, 32 (1.46%) the fifth assessment, 7 (0.32%) the sixth assessment, 5 (0.22%) the seventh assessment and 1 (0.05%) seventh IPC reassessment. More details on the IPC assessments are available in Table I.

Healthcare facilities compliance with IPC using the WHO COVID-19 scorecard tool: baseline and reassessments

Among all the healthcare facilities evaluated, only 482 (22.06%) have been evaluated at least 2 times. We constructed Spaghetti diagrams to visualize individual improvement and IPC compliance in healthcare facilities. As shown in Figure 1 below, the 2,184 IPC evaluations are displayed on the eight assessment periods with most evaluations conducted from the 1st to the 4th assessment point. The majority of median IPC scores in each assessment are concentrated within the intermediate IPC score category. A fitted value in all cohorts of healthcare facilities are generated to represent the median IPC score at each assessment point. The fitted line (in orange color) shows the overall trend of median IPC scores, correlated with the repeated assessment of healthcare facilities.

The median IPC score was 52.4% (IQR: 40.5%, 69%) at baseline. From reassessments 1 to 7, the median score was respectively 50% (IQR: 38.1%, 64.2%), 57.1% (IQR: 40.5%, 71.4%), 62% (IQR: 45.2%,

Table I
Characteristics of healthcare facilities at baseline and reassessments from 2020 to 2023

		Health facility level				Ownership status			COVID-19 status		
		Health centers	Medical centers	Hospitals	Total	Public	Private	Total	Have COVID-19 unit	Non COVID-19	Total
Assessment 1 (baseline)	N (%)	1002 (74)	217 (16)	136 (10)	1355	867 (64)	488 (36)	1355	121 (9)	1234 (91)	1355
Assessment 2	N (%)	326 (67.5)	81 (17)	75 (15.5)	482	260 (54)	222 (46)	482	67 (14)	415 (86)	482
Assessment 3	N (%)	153 (64.8)	46 (19.5)	37 (15.7)	236	130 (55)	106 (45)	236	29 (12.3)	207 (87.7)	236
Assessment 4	N (%)	33 (50)	10 (15.2)	23 (34.8)	66	56 (84.8)	10 (15.2)	66	18 (27.3)	48 (72.7)	66
Assessment 5	N (%)	20 (62.5)	1 (3.1)	11 (34.4)	32	29 (90.6)	3 (9.4)	32	9 (28)	23 (72)	32
Assessment 6	N (%)	0	1 (14)	6 (86)	7	7 (100)	0	7	6 (85.7)	1 (14.3)	7
Assessment 7	N (%)	0	1 (20)	4 (80)	5	5 (100)	0	5	4 (80)	1 (20)	5
Assessment 8	N (%)	0	1 (100)	0	1	1 (100)	0	1	0	1 (100)	1

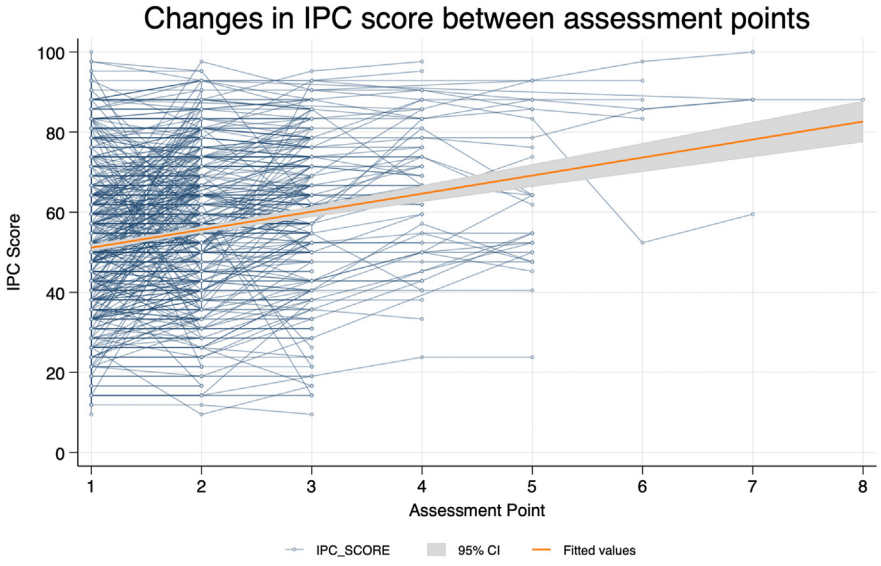

Figure 1. Spaghetti diagram showing changes in healthcare facilities' IPC scores between assessment points.

Table II
Compliance to IPC based on status of healthcare facilities between baseline and reassessments (2020—2023)

		All facilities	Health facility level			Ownership status		COVID-19 status	
			Health centers	Medical centers	Hospitals	Public	Private	Have COVID-19 unit	Non COVID-19
Assessment 1 (baseline)	Median IPC score (IQR)	50% (38%, 64.2%)	47.6% (35.7%, 62%)	52.4% (41.6%, 64.2%)	64.3% (52.4%, 78.5%)	47.6% (38.1%, 64.3%)	52.4% (38.1%, 66.7%)	64.3% (52.4%, 78.6%)	47.6% (38.1%, 64.2%)
	p-value		<0.001			0.02		<0.001	
Assessment 2	Median IPC score (IQR)	57% (40.4%, 71.4%)	50% (35.7%, 61.9%)	59.5% (46.4%, 73.8%)	71.4% (59.5%, 81%)	57.1% (40.5%, 71.2%)	54.7% (38.1%, 69%)	71.4% (59.5%, 81%)	52.3% (38%, 66.7%)
	p-value		<0.001			0.4		<0.001	
Assessment 3	Median IPC score (IQR)	62% (45.2%, 73.8%)	57.1% (42,8%, 69%)	59.5% (49.%, 71.4%)	78.5% (69%, 85%)	63.1% (46.4%, 73.8%)	59.5% (45.2%, 73.8%)	78.5% (69%, 85.7%)	59.5% (42.8%, 71.4%)
	p-value		<0.001			0.4		<0.001	
Assessment 4	Median IPC score (IQR)	66.7% (51.2%, 81%)	56% (49.4%, 69%)	67.8% (64.3%, 81%)	83.3% (70.2%, 88.1%)	67.8% (52.4%, 82.7%)	66.7% (40.5%, 73.8%)	83.3% (66%, 88.7%)	64.2% (50%, 71.4%)
	p-value		<0.001			0.2		0.001	
Assessment 5	Median IPC score (IQR)	64.2% (51%, 81%)			85.7% (74.4%, 88.1%)	64.3% (52.4%, 84%)	47.6% (35.7%, 56%)	83.3% (70.2%, 88.1%)	54.7% (47.6%, 64.2%)
	p-value		<0.001			0.1		0.001	
Assessment 6	Median IPC score (IQR)	85.7% (83.3%, 92.8%)			87% (75.6%, 94%)	85.7% (83.3%, 93%)		87% (60.7%, 95.2%)	85.7% (84.5%, 89.2%)
	p-value		<0.001					0.9	
Assessment 7	Median IPC score (IQR)	88% (73.8%, 94%)			88.1% (66.7%, 97%)	88.1% (73.8%, 94%)		88.1% (73.8%, 94%)	88.1% (88%, 88%)
	p-value		<0.001					1	

73.8%), 66.7% (IQR: 51.1%, 81%), 64.3% (IQR: 52.3%, 78.5%), 85.7% (IQR: 83.3%, 92.8%) and 88.1% (IQR: 73.8%, 94%). Between the baseline and reassessments, there were significant differences in the median IPC score between healthcare facilities ($P<0.001$, Kruskal Wallis) with hospitals having a higher median IPC score than medical centers and the latter having higher median IPC score than health centers. These differences were maintained throughout the multiple reassessments. Significant differences in the median IPC score were found according to whether the HCF had a COVID-19 unit ($P<0.001$, Mann Whitney U), with those having a COVID-19 unit having a higher median IPC score graded at the advance level (more than 75% after the second reassessment). Despite significant differences in median IPC score between public and private HCFs, with privately-owned facilities more likely to have a higher score ($p=0.02$, Mann Whitney U), there were no significant differences at all the reassessments conducted ($p=0.4$, Mann Whitney U). More details are provided in Table II.

We also created a Sankey diagram to visualize changes in IPC score category between assessment periods, for healthcare facilities that had multiple assessments. As shown in Figure 2, at baseline, almost half (45%) of healthcare facilities had a basic IPC level (unacceptable), 42% had an intermediate IPC level and only 13% had implemented an advanced IPC level. During assessment two, which was conducted after the training of both the IPC team and the IPC focal person within the same settings, the number of healthcare facilities in the intermediate and advanced IPC categories were respectively 44.6% and 18%. At assessment three, the number of healthcare facilities dropped (only 236 assessed) with 50% of them reaching the intermediate IPC level and 23% the advanced IPC score. At the 4th assessment, 66 healthcare facilities were assessed with 50% and 33.3% of them reaching the intermediate and advanced IPC level. These proportions were maintained at the 5th assessment with another reduction of healthcare facilities to 32. At the 6th, 7th and 8th assessments,no healthcare facilities (7 vs. 5 vs. 1) were evaluated as basic.

The diagrams showed an improvement of the median IPC score per healthcare facility and per level, despite the progressive reduction in number of analyzed facilities (Figure 2).

The number of IPC assessments varied significantly per region, ranging from 41 (1.9%) in the Far North region to 574 (26.2%) in the North-West region and 479 (21.9%) in the Littoral region, with a higher proportion of facilities achieving advanced IPC score in the Far North region (51%), the South-West region (43%), the North region (39%) and the Adamaoua region (32%). Regions with higher proportions of facilities achieving intermediate IPC score were the North-West region (50%), the North region (49%), the East region (48%), the Adamoua region (46%), and the South region (42%). Regions with higher proportions of healthcare facilities with basic IPC score were the West region (63%), the Center region (52%), the South region (51%) and the East region (45%) (Figure 3).

Predictors of improved IPC score within healthcare facilities

We tested how well the ownership, HCF category, COVID-19 status and continuous IPC assessment of HCF (with the WHO COVID-19 scorecard) predicted the attainment of intermediate/advanced (vs basic) IPC score. Multivariate regression analysis showed significant association between IPC performance score with the three studied variables: healthcare facility level, ownership and COVID-19 status. At baseline, hospitals were nearly four times more likely to have an intermediate/advanced IPC score than health centers, and nearly two times that of medical centers, this likelihood remained strongly significant up to the fourth reassessment. Private HCF were twice as likely to have an intermediate/advanced IPC score than publicly owned HCF. This association was lost during the first reassessment but re-emerged during the second and third reassessments. HCF having a COVID-19 unit (or mixed HCF) were 1.6 times more likely to have an intermediate/advanced IPC score than non-COVID-19 HCF, although these differences were not statistically significant (Table III).

Evaluation of the impact of the WHO COVID-19 scorecard tool respectively to the hierarchy of control theory

We analyzed the WHO COVID-19 scorecard tool by matching each of the 14 components with each of the five domains of the

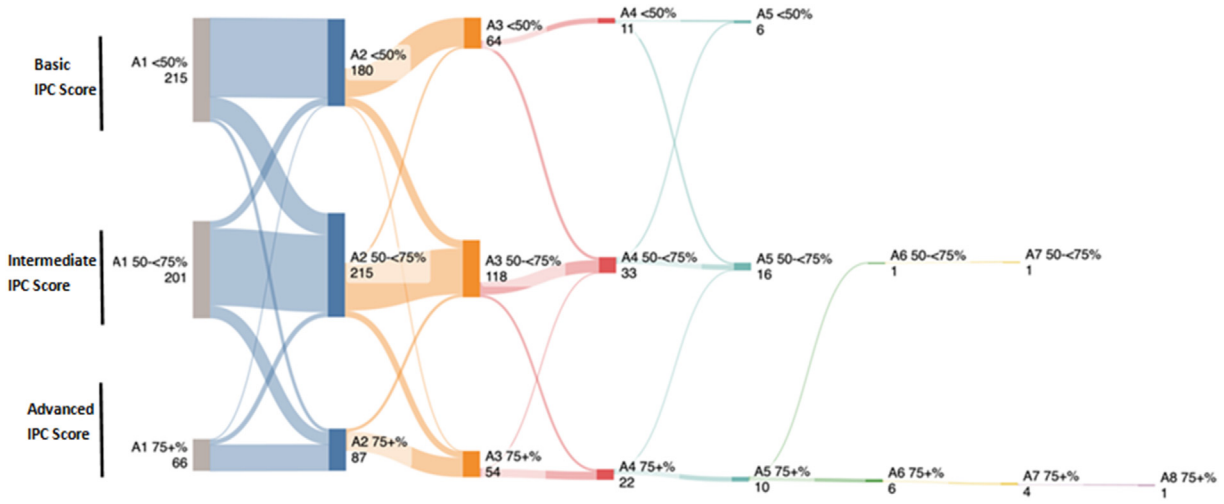

Figure 2. Sankey diagram of changes in IPC scores between assessment periods, for healthcare facilities that had multiple assessments. A(n) refers to the assessment period.

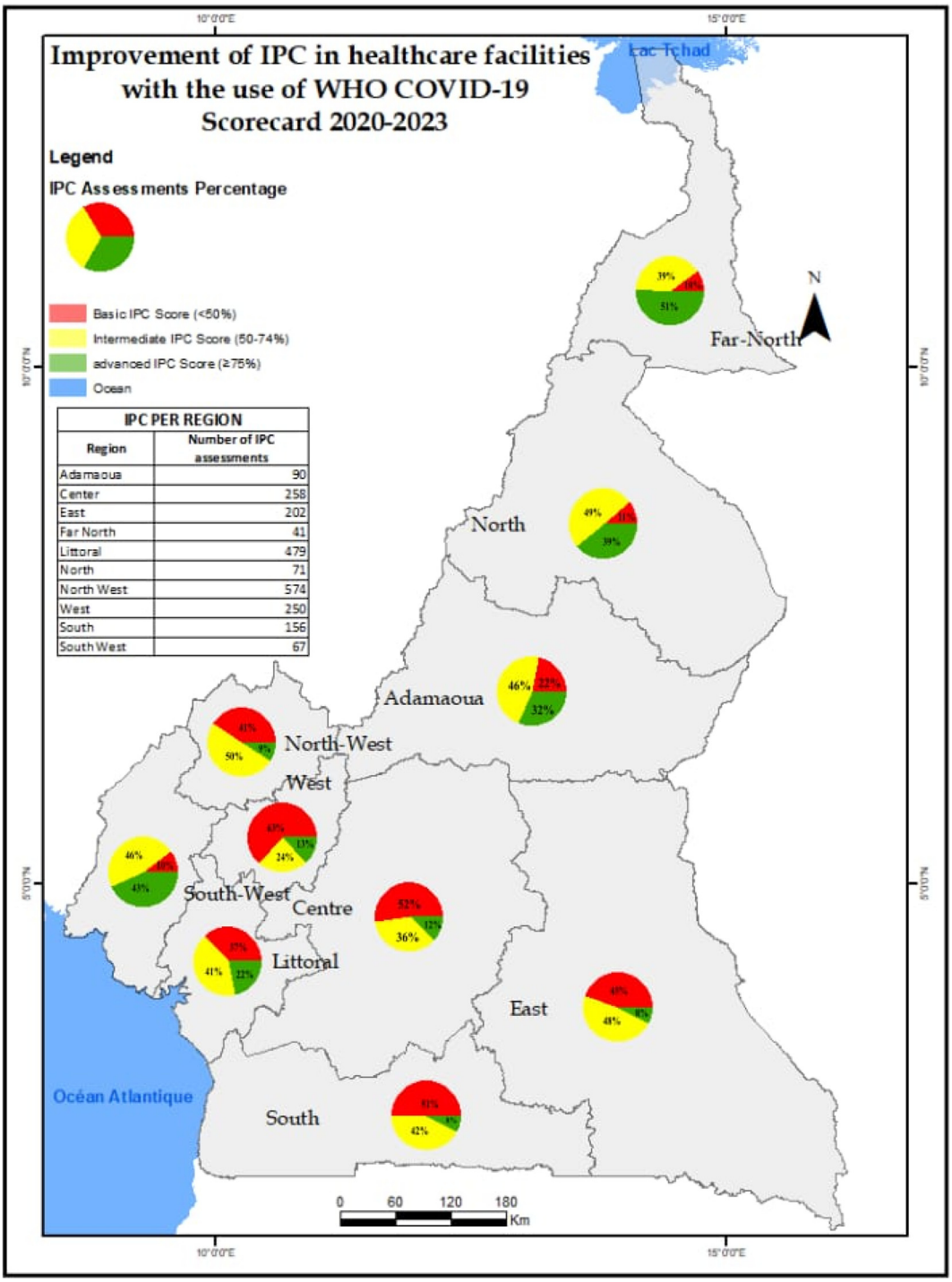

Figure 3. Distribution of the IPC assessments per category and per region.

hierarchy of control model to determine how best to utilize the WHO COVID-19 scorecard tool to address IPC challenges. The matrix created demonstrated that only two components (Triage and Isolation area) successfully addressed the elimination and substitution domains whereas eight components successfully addressed the engineering controls domain. All of the 14 components are tailored to address both the administrative controls and PPE, which is the last domain of the hierarchy of control, useful when the other four domains have failed to mitigate the risk of infection.

Discussion

This study in Cameroon reported substantial efforts made by a Sub-Saharan African country to reduce transmission of SARS-CoV-2 within healthcare facilities through a bundle of

Table III
Predictive factors of intermediate advanced IPC score in healthcare facilities between the baseline and third reassessment (2020–2023)

		Health facility level			Ownership status		COVID-19 status	
		Hospitals	Medical centers	Health centers	Public	Private	Have COVID-19 unit	Non COVID-19
assessment 1 (baseline)	Odds Ratios	3.7	1.2	Ref.	Ref.	2.3	1.6	Ref.
	OR 95%CI	1.4–9.8	0.7–1.9		1.6–3.3		0.5–4.4	
	p-values	0.007	0.4		<0.001		0.3	
Assessment 2	Odds Ratios	4	1.6	Ref.	Ref.	1.4	1.4	Ref.
	OR 95%CI	1.1–13.6	0.8–3		0.8–2.4		0.3–5	
	p-values	0.025	0.1		0.1		0.6	
Assessment 3	Odds Ratios	5.5	0.8	Ref.	Ref.	2.2	2.4	Ref.
	OR 95%CI	1.2–24.3	0.3–2.2		1–4.9		0.4–12.4	
	p-values	0.024	0.7		0.034		0.293	
Assessment 4	Odds Ratios	31.3	5.8	Ref.	Ref.	3.4	1.3	
	OR 95%CI	1.8–538	0.8–41		0.4–28		0.1–17	
	p-values	0.018	0.7		0.2		0.8	

interventions, including a risk assessment tool. We found increasing IPC compliance from a baseline of 52.4% (IQR: 40.5%, 69%) to 88.1% (IQR: 73.8%, 94%) after successive assessments. Even minimum requirements of IPC within different levels of HCFs are proven to contribute to the reduction healthcare associated infections and improve patient safety. This is reinforced when the design and implementation of IPC programmes involves baseline assessments, regular monitoring and evaluation of activities [11,12,16,17]. The WHO COVID-19 scorecard tool is effective in improving IPC compliance [24]. Our findings are in accordance with a previous study conducted in Tanzania. Differences in IPC compliance could be explained by the physical environment, site sampling and the assessment tool used, as the two assessment tools were slightly different.

Our findings are also consistent with a study conducted by Kabego *et al*. which found a median IPC score of 60.2% (IQR: 42.9%, 78.6%), in which healthcare facilities dedicated to COVID-19 patients also had the highest median IPC score 68.2% (IQR: 57.7%, 83.3%). Compared to our study, Kabego *et al*. neither look at differences in the ownership status nor analyzed key differences between baseline assessments and reassessments, though they report significant improvement in IPC score 71.4% (IQR: 50%, 78%, $p<0.001$), thus corroborating our own findings [24].

Significant association between the ownership status, type of healthcare facilities and the advanced IPC score was also found in Uganda, with private HCF being more likely to have better IPC scores than government HCF, although this wasn't statistically significant [28]. Hospitals and health center IV facilities were 30 times more likely to perform better than other HCF with respect to better preparation for suspected or confirmed COVID-19 or EVD cases. Observed differences with our study could be due to the use of a modified version of a different tool. Our findings are not consistent with another study in Kenya, whereby the implementation of IPC measures was weakly associated with healthcare facility levels and ownership status [12]. These differences could be due to the observational design of the study, where investigators did not train staff prior to the assessments and no further interventions were conducted to address the observed insufficiencies in IPC in the healthcare facilities studied.

Our findings highlight best IPC compliance within hospitals, facilities with a COVID-19 unit and private health facilities and these were maintained during some reassessments, owing to the well implemented social measures, the adoption of specialised SARS-CoV-2 treatment centers and national IPC training. In Cameroon, hospitals (in general) have better technical support centers and IPC measures, whereas private facilities have more rigorous behaviors regarding the effectiveness in the use of resources for the improvement of overall services including IPC [26,27,29].

The analysis of the WHO IPC COVID-19 scorecard tool with respect of the hierarchy of control model (HCM) emphasizes not only the identification of the risk of infection within the healthcare facilities, but goes further by providing a concept of triage. On one hand, it helps to identify individuals who either have the symptoms of the disease or are at risk of developing it. On the other hand, it proposes to direct those people towards an isolation area or towards other appropriate healthcare facilities to avoid further infection transmission within the healthcare settings. Thus, the scorecard protects healthy individuals, aligning with the elimination and substitution domains of the HCM aiming at removing, if possible, the source of the risk by changing the work process. The tool further assessed the availability of an IPCFP, the availability of supplies for hand washing and the effectiveness of IPC training in different IPC areas). These features are in line with the engineering controls and the administrative domains of the HCM. Lastly, as we are dealing with an infectious disease, it cannot always be possible to avoid exposure and mitigation strategies, such as use of appropriate PPE, the availability of effective sterilization, cleaning and disinfection of services and increasing ventilation are vital. Our findings provide evidence to fill the gap in the lack of conceptual frameworks and analysis of models guiding IPC principles [19,30–32].

The use of the WHO COVID-19 scorecard tool within the Cameroonian healthcare system was a great opportunity undertaken by the Ministry of Health (MoH) to improve IPC compliance, which could also address other epidemics such as the EVD or the MVD. Our findings could guide policy implications, since there is a recognized low utilization and effectiveness of validated IPC tools in low- and middle-income countries, particularly in Sub-Saharan Africa [3,17,33,34].

Despite being the first study providing deep insights into IPC during the COVID-19 pandemic with the use of the WHO scorecard in Cameroon, some limitations should be reported. First, we did not use a random sampling method to assess IPC compliance of healthcare facilities as priorities were defined by the MoH, which could introduce a selection bias. We did not control for the propensity for facilities to be reassessed during the course of the study time period. Thus, median IPC scores at each assessment point likely reflect some degree of selection bias. Yet, assessments were conducted in all 10 regions of the country (100%) with an inclusion of 1,358 health care facilities, ensuring the national representation of our findings. Regardless of the validated IPC scorecard tool by the WHO Regional Office for Africa, the comparability of our results was difficult as very few studies have reported the use of this tool. More studies using the approved WHO IPC scorecard tool in crisis situations should be conducted to ensure the generalizability of such results in other contexts, therefore providing more evidence to the existing literature.

Emergencies are opportunities to improve and monitor IPC compliance in LMIC. Sustaining such results after the pandemic remains a challenge.

Acknowledgements

We are grateful to the Ministry of Health for the efforts made along with its partners (WHO, USAID-MTaPS, ICRC, MSF) for the improvement of infection prevention and control in the Country.

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Funding

None.

Conflict of interest

None declared.

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