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ORIGINAL RESEARCH

Clinical Staff Responsiveness to Cardiopulmonary Resuscitation and Basic Life Support Practices in the Winneba Municipal Hospital, Ghana

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Abstract

Background: CPR is essential for survival after a Sudden Cardiac Arrest. However, many health workers in Ghana are still not adequately trained or equipped. This gap frequently contributes to delayed or absence of CPR interventions, which in turn contributes to mortality.
Objective: To assess clinical staff responsiveness to CPR and Basic Life Support Practices in the Winneba Municipal Hospital, Ghana.
Methods: The study employed a cross-sectional design and utilised a sequential explanatory mixed-methods strategy. It involved surveying all eligible in-patient clinical staff quantitatively, while intentionally selecting five unit heads for deeper qualitative data collection.
Results: The study revealed that 87.2% of clinical staff had recently participated in CPR and 82.1% had taken an active role, but only 3.9% held valid BLS certification. CPR outcomes were poor, with an 88.5% fatality rate. Only 10% of professionals demonstrated proficiency in defibrillation. Multivariate analysis confirmed that formal BLS training (OR = 1.448, p = 0.016) and hands-on practice (OR = 1.104, p = 0.038) significantly enhanced the likelihood of an effective CPR response. In contrast, unit assignment (OR = 0.342, p = 0.003) reduced the likelihood of success.
Conclusions: While clinical staff may show strong commitment to CPR and possess strong hands-only CPR skills, only a few hold formal BLS certification, and significant gaps remain in equipment use, particularly with defibrillators. Formal training and frequent practice may significantly improve outcomes, but disparities in unit placement, limited equipment, and lack of advanced training contribute to high CPR mortality.

Keywords: Basic Life Support, Cardiac arrest, Cardiopulmonary resuscitation, Defibrillators, Emergency Cardiac Care.

Introduction

Cardiopulmonary Resuscitation (CPR) is the bedrock of quality Emergency Cardiac Care. [1] Cardiopulmonary resuscitation (CPR) guidelines trace their origins to 1960, when the American Heart Association (AHA) launched a program aimed at training physicians in closed-chest cardiac resuscitation; an initiative that laid the foundational framework for modern CPR education. [2] By 1963, cardiologist Leonard Scherlis had effectively established the AHA's CPR committee. [3]

Ghana's Ministry of Health has an extensive policy on Accident and Emergency (A&E) services, which, among other guidelines, states that health professionals have to mandatorily receive formal training in various aspects of life support services every three years; and that health institutions are to be equipped with some basic critical care equipment. [4] This policy directive was in line with the American Heart Association policy for recertification every two years for Advanced Cardiac Life Support (ACLS) and Basic Life Support (BLS) courses. [5] Informal observations of community reactions to sudden out-of-hospital collapses revealed that well-meaning, untrained bystanders who, according to AHA guidelines [6], qualify as first responders, frequently engaged in misguided interventions. These included vigorous fanning, dousing victims with water, or applying substances such as hot spices, all of which lacked clinical justification. Notably, CPR was rarely initiated before arranging emergency transportation.

In most Ghanaian hospitals, casual observation of some questionable practices in the early 2000 were that, in the event of the discovery of an unconscious patient on the ward, health workers then would rather call the attention of a doctor on duty and wait for their intervention, rather than begin even hands-only CPR themselves, which undoubtedly delayed the time to initiate CPR, leading to irreversible brain injury and subsequent death. In the unlikely event that health workers were willing to begin CPR, most facilities had their defibrillators and resuscitation equipment securely locked in their theatres, or they may not even have had such equipment readily available. [7] It had become common knowledge in communities that when a critical patient was started on oxygen therapy in most Ghanaian hospitals, death was inevitable. Some family members resisted referrals to higher centres of care in fear of outcomes for critical patients. For some, the mention of Korle-Bu Teaching Hospital in Accra, which is the highest centre of care in Ghana, meant imminent death for their relative.

Responsive initiation of CPR remains the best chance of survival for victims of Sudden Cardiac Arrest (SCA), which is the leading cause of death worldwide. [8, 1] Despite the low survival rates for cardiac arrests globally, i.e. between 2% and 11%, efforts of responsiveness to initiate CPR are still worthwhile, as no or delayed CPR initiation for victims of SCA means inevitable death. [8] Responsive CPR initiation is a result of several factors; for this work, inputs such as Basic Life Support (BLS) training, BLS practice and critical equipment skills were investigated. Unfortunately, despite the policy requirement of CPR training every 3 years, health staff may have had little formal CPR training, and even doctors who may have had some training may not have kept it up to date as per the guidelines. [4, 9] With the unavailability of critical equipment and insufficient training of staff in CPR, a Botswana study found that nurses, who were first-line health workers, experienced some inertia in initiating CPR before experts arrived. [9, 10] Osei-Ampofo et al. have suggested that health workers who lack regular training in life support and who have no skills in the use of basic emergency equipment are a threat to society, as avoidable mortalities would be the norm in their places of

work. [7] Such clinical staff, possibly unaware of it, were utterly unprepared for emergencies, lacked the requisite skills to care for the critically ill and injured, and were liabilities to employers. [11]

The sudden passing of Ghana's former Vice President while exercising [12] really brings to light how crucial timely CPR is, alongside proper basic life support (BLS) training and the effective use of emergency tools. When someone experiences a cardiac arrest, their chances of survival drop quickly with every passing minute; for every minute that goes by without help, the odds of surviving decrease by 6 to 10%. [13, 6] Sadly, research shows that there is an absolute lack of preparedness in Africa, with healthcare workers averaging less than 50% in BLS knowledge. [14, 15] On a positive note, structured training programs can significantly boost both knowledge and skills. [16] This situation highlights the pressing need to enhance CPR readiness, expand BLS training, and ensure everyone in clinical settings is proficient with essential medical equipment.

Methods

This study used a cross-sectional design as part of a sequential explanatory mixed-methods approach. The quantitative phase aimed to provide a snapshot of key process measures, including Basic Life Support (BLS) training, BLS practice, equipment skills, and the time to initiate CPR. Following that, the qualitative phase delved deeper into the quantitative results.

Ethical Considerations

Ethical clearance was obtained from the Ghana Health Service Ethics Review Committee, and the research team also secured written permissions from the management team of Winneba Municipal Hospital. Informed consent was obtained from all participants, and confidentiality was strictly maintained.

Study population and sampling technique

For the quantitative aspect, a census survey method was used. All in-patient clinical staff at Winneba Municipal Hospital could participate if they: (a) had been active at the hospital for at least six months, (b) were directly involved in patient care, and (c) agreed to participate. Clinical staff on extended leave or not directly involved in patient management during the study period were not included.

In the qualitative phase, purposive sampling was used to gather a range of perspectives from individuals in leadership and emergency response roles. Five unit-heads were chosen: the Nurse Manager (NM1), the Head of the Emergency Response Team (ER1), the duty doctor in Accident and Emergency (DR2), the Head of the Anaesthesia Department (AN1), and the Head Nurse of the Emergency Unit (AE1).

Team Constitution

In this study, a "Team" was defined as a multidisciplinary group of clinical staff who were directly involved in emergency response, especially during cardiopulmonary resuscitation. These teams were formed at the ward or unit level and typically included nurses, doctors, and support personnel trained in BLS and in the use of emergency equipment. Each team was evaluated based on their collective practice, response times to CPR initiation, and their equipment-handling skills.

Data collection tools and measures

The quantitative phase used a structured questionnaire, whereas the qualitative phase involved semi-structured audio-recorded interviews.

BLS Training: This was measured by self-reported participation in formal BLS workshops, courses, or refresher sessions within the past 2 years. Participants noted how frequently they had

training and if it included both theory and practical sessions.

BLS Practice: This was assessed by determining the frequency of hands-on resuscitation practice (e.g., mock drills or actual CPR) over the last six months. Responses were graded on a Likert scale from never (1) to more than five times (5).

Equipment Skills: Participants answered questions about their familiarity and confidence with essential resuscitation tools, including automated external defibrillators (AEDs), bag-valve masks, and oxygen delivery systems.

Team Practice: This was calculated as a composite measure combining individual scores on BLS practice, response to CPR, and equipment skills across each unit, reflecting how effectively teams responded during emergencies.

The qualitative interviews provided further exploration of these areas, featuring guiding questions on team dynamics, leadership roles during resuscitation, challenges in timely CPR initiation, equipment adequacy, and views on ongoing BLS training. Unit heads (NM1, ER1, DR2, AN1, AE1) participated in the interviews, while in-patient clinical staff completed the questionnaires.

Table I: Study variables, indicators, and data sources

Variable	*Indicator(s)*	*Measurement/Scale*	*Data Source*
BLS Training	Participation in BLS workshops, refresher courses, or formal certification	Yes/No; frequency of training.	Questionnaire (staff)
BLS Practice	Frequency of resuscitation practice (drills or real cases) in the past 6 months	Likert scale: Never (1) → >5 times (5)	Questionnaire (staff)
Equipment Skills	Familiarity and confidence with AED, bag-valve mask, and oxygen systems	5-point scale: Not confident → Very confident	Questionnaire (staff)
Responsiveness to CPR initiation	clinical staff to promptly recognise cardiac arrest and start a high-quality CPR)	Interview guide and Questionnaire: time taken to initiate CPR after patient collapse (≤1 min; 2–3 min; >3 min) 5-point scale (quality of CPR equipment)	Interview (NM1, ER1, DR2, AN1, AE1)
Team Practice	Composite measure: BLS practice + response to CPR + equipment skills	Summed composite score	Derived (quantitative)
Leadership Perspectives	Views on team coordination, challenges, equipment adequacy, and CPR timeliness	Interview guide	Interview (NM1, ER1, DR2, AN1, AE1)
Process Context	Perceptions of institutional support, barriers to effective response	Interview guide	Interview (Unit Heads)

Data management and analysis

The completeness and internal consistency of the questionnaires were checked. The data were sorted into respondents' classes, coded, and cleaned to ensure the accuracy of the information. The data were first entered and organised in Microsoft Excel before being imported into STATA 15 for statistical analysis. The composite scores for Team Practice of BLS, Responsiveness to CPR, Equipment skills, and the level of

Standard Equipment were derived for each respondent. Multivariate logistic regression analyses were performed, controlling for the effects of confounding variables on the observed associations among BLS practice, BLS training, and responsiveness to CPR. The qualitative data were analysed using the four levels of coding method suggested by Bryman. [17] Transcripts were read and reread, and the audiotapes were listened to repeatedly to become acquainted with the data as a whole. Then, after sifting of data according to the objective of the study, it was coded to develop categories, and subcategories were reached.

Results

Seventy-five (96.2 %) clinical staff had no recent BLS certification; only 3 (3.9%) had valid certification of BLS by the national policy requirement. This agreed with the response of one interviewee as follows:

"*Only three of our staff are certified trainers who got their training last year or so*" [NM1].

In respect of recording deaths on the wards in the last quarter, 64 (82.1%) of respondents agreed, while 14 (17.9%) did not. Interview for ER1 revealed that several deaths were reported from the Winneba Municipal Hospital, mainly from end-of-life issues, and that Sudden Cardiac Arrests were not rampant:

"*CPR happens more on the maternity wards and the pediatric wards, but for the general adult wards, there is no or very little CPR initiation because deaths are from other comorbidities and complications; and really, those are the end-of-life issues, so they don't need CPR. But in the theatre, in maternity, or in more acute situations in the ER or wherever, staff are generally ready to resuscitate victims. Nurses do not wait for doctors in those settings to start CPR because they are trained.*" [ER1].

Table II: Description of BLS training among respondents

CPR Characteristic	*Frequency*	*Percentage*
Formal BLS Training		
Not Certified	75	96.2%
Certified	3	3.9%
On-the-job BLS training		
Not trained	17	22%
Trained	61	78%
Recent mortality records in units		
Recent Deaths	64	82.1%
No Deaths	14	17.9%

No wonder respondents of the qualitative analysis all said that most clinical staff could do CPR:

"*As for the staff of WMH, all of us have been trained and should be able to do BLS. If anyone is unable or unwilling to resuscitate, then that is their choice, and it is unfortunate. We were set up into three emergency teams, and I am in team B. Once a month, or so, we do simulation exercises for emergency response. I think staff generally have a good attitude towards the BLS training.* [AN1]

For outcomes of the most recently observed CPR activity, 64 (82.1%) reported the patient died, and 14 (17.9%) reported recovery. This aligned with the response of ER1, who said:

"*The success rate for resuscitation attempts is about 10 per cent.*"

Table III shows the Basic Life Support (BLS) practices of respondents. The overall CPR outcome was poor, with 69 deaths (88%) compared to only nine recoveries (12%). This high mortality rate must be interpreted within the context of the process factors under investigation - BLS training, BLS practice, equipment skills, and responsiveness to CPR.

Although the majority of staff (97%) had recently participated in CPR and 82% reported taking an active role, defined as direct involvement in chest

compressions, airway management, or defibrillation, the effectiveness of these practices was undermined by low formal training and certification rates. Only 5% of respondents were BLS-certified, while 95% lacked certification. In contrast, passive roles, involving supportive or observational duties such as preparing equipment or assisting the team, were reported by 18% of participants.

Table III: BLS practice in Winneba Metropolitan Hospital (WMH)

CPR Characteristic	*Frequency (n=78)*	*Percentage*
CPR Outcome		
Death	69	88%
Recovery	9	12%
Role in CPR		
Active role (hands-on: compressions, airway, defibrillation)	64	82%
Passive role (assisting/observing)	14	18%
Recent CPR Activity		
Participated	76	97%
Not participated	2	3%
Formal BLS Training/Certification		
Certified	3	5%
Not certified	75	95%

The distinction between active and passive roles is relevant to outcomes because successful resuscitation depends on the competence of those performing active, hands-on tasks. The findings suggest that while staff were actively involved in resuscitations, the quality of execution was likely inadequate due to insufficient training and limited mastery of critical equipment. Consequently, in this study, responsiveness to CPR initiation focused not only on whether CPR was initiated, but also on the quality of staff actions and the availability of high-quality equipment.

Results of the critical care equipment skills, as illustrated in Table IV, showed that, overall, 46 (41%) of the respondents were skilled with a manual resuscitator bag (critical care equipment). In comparison, the remaining 32 (59%) had either inadequate or no skills with a manual resuscitator bag. Most doctors and anaesthetists were skilled or at least had some knowledge of defibrillation. Degree-qualified nurses had some basic or intermediate training (12 had inadequate training), but most diploma nurses and nursing assistants (25 and 14, respectively) were unskilled.

The Hands-Only CPR Skill is the critical life-saving technique involving chest compressions without mouth-to-mouth breathing. Seventy-six clinical staff (97%) were skilled, while 2 (3%) were not skilled — these two were nursing assistants. All doctors, PAs, degree- and diploma-qualified nurses, midwives, and anaesthetists were trained in hands-only CPR, demonstrating excellent proficiency of this basic life-saving skill. Actually, these professionals formed the core of the hospital's Emergency Response Teams, as the unit heads stated in the interviews.

Table IV: Proficiency of the different cadres of clinical staff with equipment skills

	Doctors	*Phy. Asst*	*Deg Nurses*	*Dip. Nurses*	*Nurs. Asst.*	*Midwife*	*Anaesth*	*Total (%)*
Ambu bag skills								
No Skill	0	0	2	22	12	10	0	32 (41.0)
Skilled	2	3	14	6	2	1	4	46 (59.0)
Total	2	3	16	28	14	11	4	78 (100.0)
Defibrillation skills								
No skill	0	2	1	25	14	10	0	52 (67.0)
Inadequate	0	1	12	3	0	0	2	18 (23.0)
Skilled	2	0	3	0	0	1	2	8 (10.0)
Total	2	3	16	28	14	11	4	78 (100.0)
Hands-only cardiopulmonary resuscitation skill								
No skill	0	0	0	0	2	0	0	2 (97.0)
Skilled	2	3	16	28	12	11	4	76 (3.0)
Total	2	3	16	28	14	11	4	78 (100.0)

Phy. Asst – Physician Assistant; Deg Nurses – Degree Nurses; Dip Nurses – Diplomate Nurses; Anaesth – Anaesthetist

"We don't have an ECG machine and several cardiac care equipment like AEDs. But for a primary care hospital, I think we have adequate equipment tailored to our needs. The whole thing is to structure the equipment needs of the facilities according to their level of care. As far as BLS is concerned, I think we have all the equipment needed. It is the ACLS that we are not yet there. Without an ECG machine, we cannot even start ACLS. The professional expertise is also lacking anyway, we cannot intubate, we cannot do a lot of the high-level stuff because we do not have the specialists. Even our defibrillator, which is in the ambulance, is a white elephant. You know, we have only nurse anaesthetists and emergency nurses, so we are limited in what we can do." [ER1]

The interviews found the BLS practice to be good, especially given that most staff had received on-the-job BLS training, as shown in Table II. The scores in Table V for defibrillation in BLS practice, however, were low, with 67% of staff having no skill with the defibrillator. The qualitative interviews confirmed that the only available defibrillator in the ambulance was a "white elephant" because it had never been used.

*"We hardly get cases of cardiac arrest, but as I said, when they do occur, there is a prompt response to resuscitate the patients. And the staff are generally good. Even in the theatre, when a flaccid baby is removed, the older midwives and theatre staff can actively resuscitate the newborn with excellent results. Some of the newer ones need help with CPR skills, but the older ones help a lot, too. [*DR2]

Responsiveness to CPR initiation in this study focused not only on whether CPR was initiated within the specified time, but also on the quality of staff actions and the availability of quality equipment (Table V). The researchers realised that most of the staff claimed to be prompt in their interviews. Still, their responsiveness to CPR initiation in terms of the measure of time was not satisfactory, as most did not or tended to delay CPR initiation because of other process factors.

Table V further shows that only 24.4% of staff responded to CPR initiation, while the vast majority (75.6%) did not. However, contrary to the above findings, some interviewees argued that CPR was initiated promptly, with first

responders willing and confident to start CPR before the arrival of the ERTs.

Table V: Responsiveness to CPR initiation

Responsiveness to CPR initiation	*Time-to-initiation*	*Frequency (n=78)*	*Percentage*
Responsive	Within 1 minute	5	6.4
	1–3 minutes	8	10.3
	>3 minutes	6	7.7
Not Responsive	No CPR initiated / Delayed beyond recommended time	59	75.6
Total		**78**	**100**

"Oh, our staff are very responsive to CPR initiation where needed. We have emergency teams ready at all times to assist in emergencies, and the head nurse in the ER is a trained Emergency Nurse, so their responsiveness is commendable. Though we lack some critical machines, such as ECGs and AEDs, we are not doing badly. [NM1]

Table VI presents the findings from a multivariate logistic regression analysis examining how various input, process, and outcome variables affect the likelihood of achieving the targeted outcome. Respondents who had BLS training were notably more likely to achieve the desired outcome, with a 44.8% increase in the odds (OR = 1.448, 95% CI [1.072, 1.957], p = 0.016). Additionally, those who practised BLS regularly experienced a 10.4% rise in their odds of success (OR = 1.104, 95% CI [1.005, 1.212], p = 0.038). Being assigned to a specific unit, however, significantly decreased the odds of achieving the outcome by 65.8% (OR = 0.342, 95% CI [0.170, 0.691], p = 0.003). While having an action plan appeared to have a strong positive correlation with the outcome (OR = 3.168), it did not reach the level of significance (p = 0.065). Other factors, such as equipment skills (p = 0.158) and profession (p = 0.343), did not show statistically significant relationships with the outcome.

Table VI: Multivariate regression of input, process and outcome variables

Covariate	Odds ratio	Standard error	{95% Conf Interval}	p-value
Equip. skill	1.146	0.111	0.9482767 - 1.386411	0.158
BLS training	1.448	0.222	1.07221 - 1.957488	0.016
BLS practice	1.104	0.053	1.005365 - 1.212457	0.038
Profession	1.830	0.504	0.5248219 - 6.385893	0.343
Assigned to a unit	0.342	0.117	0.1698263 - 0.6907894	0.003
Having an action plan	3.168	10.07	0.0016044 1.215775	0.065

Discussion

The study revealed that only 4% of clinical staff were formally trained and certified in Basic Life Support (BLS). This figure is alarmingly below the expected global standards of care, where all frontline healthcare professionals are expected to undergo BLS and Advanced Cardiac Life Support (ACLS) training, with periodic recertification to ensure skill retention. [6] A study

in Botswana similarly reported critically low certification rates, highlighting the gap between local realities in sub-Saharan Africa and international expectations. [18] These findings indicate a systemic shortfall in structured capacity-building initiatives for emergency preparedness across many low-resource settings.

Despite this, the study showed that BLS practice in the facility was generally acceptable, with respondents demonstrating confidence in core CPR procedures. This encouraging outcome was attributed to the ongoing BLS training programs organised by the hospital's Emergency Response Teams (ERTs). Similar results were found in Uganda and Ethiopia, where in-service training significantly improved staff competence in CPR. [14, 15] However, a critical limitation emerged in the lack of defibrillation skills, which is a central component of current BLS and ACLS guidelines. Studies across Africa have consistently noted that while chest compressions and airway management may be practised adequately, the absence of Automated External Defibrillator (AED) use extensively undermines survival outcomes. [16] It was an obvious indicator of the clinical staff's willingness to learn new skills and a firm assurance that, if the requisite levels of acceptable BLS practice with defibrillation were known, the staff would have had no inertia in learning and practising the new skills.

The enthusiasm of clinical staff towards training demonstrates strong potential for compliance with national and institutional policies mandating formal Basic Life Support (BLS) training. Research shows that staff acceptance of mandatory training policies significantly improves knowledge retention and clinical performance in emergency care. [19] If effectively disseminated and enforced, such a policy could enhance staff confidence and consistency in performing high-quality cardiopulmonary resuscitation (CPR). The study findings on responsiveness to CPR initiation compare favourably with international standards set by the World Health Organisation (WHO) and the American Heart Association (AHA), which recommend recognition of cardiac arrest and initiation of high-quality CPR within 10 seconds of collapse to maximise the likelihood of Return of Spontaneous Circulation (ROSC). [6, 20] responsiveness in this study correlated strongly with the practice of BLS, suggesting that practical skills training, rather than knowledge alone, is the most critical determinant of timely CPR initiation.

This represents a marked improvement compared to earlier decades, where nurses were often reluctant to initiate CPR until a physician arrived. Similar paradigm shifts have been documented globally, with studies reporting that structured BLS training programs empower nurses and other first responders to act decisively in emergencies. [21] Such responsiveness has been shown to significantly reduce time-to-CPR initiation, which is directly associated with improved survival outcomes in patients with sudden cardiac arrest. [22]

The study also highlights a gap in defibrillation skills. While initiation of CPR has improved, the absence of routine use of Automated External Defibrillators (AEDs) limits survival chances, especially in ventricular fibrillation or pulseless ventricular tachycardia cases. International Guidelines emphasise that AEDs should be readily available in public facilities and health institutions, with accessibility comparable to fire extinguishers and other emergency equipment. [6] Incorporating AED use into BLS training for clinical staff represents the next necessary step to align with current CPR responsiveness standards fully. A 76% responsive staff team was commendable for CPR initiation in WMH.

The finding of responsiveness to some CPR initiation is commendable, though the CPR quality at the study centre may be suboptimal by the current standards of care. It is important to note that the respondents never utilised the

defibrillation step in CPR, which has become mandatory since the 2010 Basic Life Support guidelines became operative. [1, 23]

Conclusion

This study demonstrates that while clinical staff at Winneba Municipal Hospital demonstrated commendable responsiveness to CPR initiation and an active willingness to intervene, significant gaps remained in formal Basic Life Support (BLS) certification and in the use of advanced equipment. Although most staff were confident in hands-only CPR, limitations in defibrillator use and other critical equipment restricted the effectiveness of resuscitation efforts. The findings further revealed that formal BLS training and regular practice were strongly associated with improved responsiveness and survival outcomes. On the other hand, disparities across units, shaped by resource availability and exposure to emergencies, negatively influenced performance. Despite a visible culture of teamwork and readiness, the persistently high mortality following CPR points to systemic barriers, including inadequate access to advanced BLS training and poor distribution of essential resuscitation equipment. To strengthen survival outcomes, the study recommends scaling up access to formal BLS certification, ensuring equitable equipment availability across units, and tailoring continuous training to address unit-specific needs. These measures would align local practices with international standards, particularly the WHO and AHA guidelines, where timely CPR initiation and early defibrillation are critical for improving return of Spontaneous Circulation (ROSC) and patient survival.

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Authors' Contributions: O-AB conceived and designed the study. EOE and MV curated, analysed and interpreted the data. O-AB drafted the manuscript, and EOE revised it for sound intellectual content. All the authors approved the final version of the manuscript.

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