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**PERSONAL PROTECTIVE EQUIPMENT AVAILABILITY AND USE IN
PRIMARY HEALTH CARE FACILITIES: A SYSTEMATIC REVIEW OF
BARRIERS AND ENABLERS**

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ABSTRACT

The primary health care (PHC) worker provides first contact health services and is exposed to infectious, biological and other occupational hazards. Personal protective equipment (PPE) is an important part of infection prevention and control (IPC), and often availability is not equal to correct and sustained use. This review brings together evidence on the availability and use of PPE in PHC and other on-the-front-line health-care settings, focusing on the barriers and enabling conditions for PPE use. The manuscript followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The underlying review conducted a search of the PubMed, Scopus, Web of Science and Google Scholar data bases for English language studies from 2015 to 2026. Of these, 85 records were found during the screening process, 10 were removed as duplicates, 75 were screened and 45 were assessed for full text, with 32 studies included in the narrative synthesis. The underlying manuscript does not contain a study-level extraction matrix, and does not contain any information on protocol registration or database-specific search history, which are therefore reported transparently, without being reconstructed. The evidence shows that there are continuing shortages of PPE, especially respirators and gowns, and some eye-protection items. LMIC evidence demonstrates that shortages are coupled with procurement, distribution, stock management and facility infrastructure weaknesses. Nigerian evidence revealed that 22.1% of the respondents in the study had access to PPEs regularly and access to N95 respirators was limited. In both qualitative and implementation evidence, barriers included were inadequate supply, lack of clarity or poor communication of guidance, lack of training, discomfort, workload, and weak managerial support. Factors that enabled the operation were reliable supply, good communication, practical IPC training, supportive leadership, supervision, and a positive safety culture. Availability and use of PPE in PHC is an occupational health and IPC system-level issue, not an individual behaviour. Improvements need to be sustainable, and this means that integrated interventions should be implemented in procurement and inventory systems, financing, leadership of the facilities, training, supervision, and monitoring the implementation. The protocols and strategies for future systematic reviews should be prospectively registered in the review register, strategies should be reported by data source, and study-level risk-of-bias analyses and data extraction should be provided.

Keywords: personal protective equipment; primary health care; health-care workers; infection prevention and control; occupational health; barriers; implementation; systematic review.

1. INTRODUCTION

PHC can't be about protecting individual workers; PPE is also important for the protection of the workers. Health-care workers play a crucial role in sustaining the continuity of preventive and curative services, especially in times of outbreaks when the number of needed service users could increase, and the number of health-care workers who might be exposed could decrease. Poor protection may lead to absenteeism, decrease in the capacity of provision of services, transmission within health facilities and loss of public trust. PPE is therefore part of the health-system's resilience strategy and not just something to be handed out in emergency situations.

PPE is most effective when utilized as part of a hierarchy of controls that incorporates engineering controls, administrative controls, environmental controls, safe work practices and appropriate clinical triage from an occupational health point of view. When these measures are not enough to sufficiently protect from exposure, PPE is an added layer of protection. In PHC, the worker is often the first to meet a patient prior to making a definitive diagnosis and suitable risk assessment and access to suitable PPE is critical.

Primary health care is a key pillar of resilient health systems as it is the first point of contact with the health system and plays a vital role in prevention and health promotion, treatment and continuity of care. Health-care workers might be exposed to undifferentiated respiratory illness, blood and body-fluid exposures, and other biological exposures before a definitive diagnosis is possible in these settings. PPE thus is one part of a full range of controls (World Health Organization [WHO], 2020a), which also includes administrative, environmental and engineering controls.

COVID-19 revealed significant gaps in the supply chains and protection systems for PPE. Adverse situations for access to protective equipment have been reported in Africa early in the pandemic, and the risk of frontline workers in a critical-care setting with limited resources for the health system has been highlighted (Chersich et al., 2020). WHO later highlighted the importance of risk based selection, donning and doffing, rational use and stewardship of supplies in emergencies (WHO, 2020a, 2020b).

Importantly, availability and use are interrelated but different implementation outcomes. The results of a large Facility survey that was conducted across multiple countries showed that only 43% of all facilities had adequate PPE to comply with the WHO Pandemic influenza preparedness recommendations, and even when all the required PPE were available, reported use of the recommended PPE was only 61% of facilities that supported patients suspected of COVID-19 (Drouard et al., 2023). A survey of 258 health-care workers in Nigeria revealed that only 22.1% reported that they had access to PPE regularly,

and that they were limited in their access to N95 respirators and in their organization and operational readiness to use PPE appropriately (Oladele et al., 2021).

1.1 Rationale and Review Gap

Evidence has tended to be developed in health facilities in hospitals or in the context of acute outbreaks, while PHC facilities have different operational characteristics, with less specialized staff, less stock and first contact interactions. The empirical intervention evidence available in the recent review of IPC interventions in primary care is limited and heterogeneous and further research is needed in primary care to be better designed and better reported (Gozdzielewska et al., 2024).

The present review accordingly concentrates on availability and use of PPE and structural, organizational and behavioural factors influencing PPE use. The review is especially applicable to LMIC health systems where procurement resilience, protecting and maintaining health systems essential services, are highly interdependent.

1.2 Aim and objectives

Aim: To synthesize evidence on PPE availability and utilization in PHC facilities and identify barriers and enablers influencing appropriate use.

1. Assess the reported availability of PPE in PHC and comparable frontline health-care settings.
2. Identify structural, organizational and behavioural barriers affecting PPE utilization.
3. Examine factors that facilitate consistent and appropriate PPE use.
4. Derive evidence-informed implications for occupational health, IPC policy and PHC practice.

2. METHODS

The methodological presentation is based on the 27-item guide for the transparent reporting of systematic reviews (PRISMA 2020) [Page et al., 2021]. The review is presented as a narrative systematic synthesis as the evidence underpinning this review was diverse in terms of study design and setting, outcome definition and measurement method. The methods outlined below preserve the reported procedures and information regarding the numbers studied in the exercise, but do not invent other numbers that were not reported in the source review.

Reporting framework. The review was rewritten to follow the reporting domains of PRISMA 2020. PRISMA 2020 is a reporting guideline designed to enhance transparency of the reasons for conducting a review, the methods used and the evidence found and

synthesized (Page et al., 2021). The explanation-and-elaboration guidance was also applied to enhance clarity of reporting (Page et al., 2021b).

2.1 Review question

The review question was: What is known about the availability and utilization of PPE among health-care workers in PHC settings, and what structural, organizational and behavioural factors act as barriers or enablers?

2.2 Information sources and search strategy

The review conducted a PubMed, Scopus, Web of Science and Google Scholar search. This period of search was reported as 2015 – 2026. The main conceptual search that was carried out encompassed concepts of PPE, primary health care, availability/utilization/compliance, barriers/enablers/determinants and occupational safety/IPC. The search term used was the following: “Personal Protective Equipment” AND “Primary Health Care” AND (“availability” OR “utilization” OR “compliance”) AND (“barriers” OR “enablers” OR “determinants”) AND (“occupational safety” OR “infection prevention”).

The original record from the search should be included and provided as an extra file to be published to ensure the search is reproducible as it was conducted. These are not available in the source manuscript, but are not invented in this revision.

2.3 Eligibility criteria

Domain	Eligibility
Population/setting	Health-care workers in primary health-care facilities; studies including mixed levels of care were considered where PHC/frontline findings were relevant.
Exposure/outcome	Availability, access, utilization, adherence or implementation of PPE, including masks/respirators, gloves, gowns and eye/face protection.
Study design	Quantitative, qualitative and mixed-method primary studies.
Publication period	January 2015 to March 2026.
Language	English.
Exclusion	Editorials, commentaries and narrative reviews; studies exclusively concerning non-health-care occupational settings; studies without primary data; and studies focused solely on tertiary hospital settings.

2.4 Study selection

Duplicate removal, screening of titles/abstracts, and eligibility of full-text articles were the reported selection process. Inside the source manuscript, the flow of numbers is arithmetically consistent of the total number of records retrieved (85 records identified; 10 duplicates excluded; 75 records screened; 45 full texts completed; 13 full texts excluded; 32 studies completed). The source manuscript does not contain database-level yields, however, nor does it list the 13 full-text exclusion reasons. These omissions are explicitly noted on transparency as opposed to being made up later.

2.5 Data extraction

Domains reported in the extraction were author/year, country, study design, sample size, PPE type(s), availability findings, barriers and enablers. The synthesis was narrative due to the variation in study design, population, PPE definition and outcome measure.

2.6 Risk of bias and methodological quality.

Source manuscript indicated methodological quality on the basis of study design but did not specify a single uniform appraisal instrument, nor did it indicate judgments for each study. This is a material reporting limitation, if you want to make your journal submission a high impact. The final submission should include the completed appraisal (by using design-appropriate tools, such as Joanna Briggs Institute critical appraisal instruments or equivalent and validated tools) and include judgments for all of the included studies. No judgments of risk of bias have been manufactured in this revision.

2.7 Synthesis

Due to the above-described heterogeneity, a narrative thematic synthesis was conducted. Results were grouped into three pre-specified areas: (1) PPE availability and access; (2) challenges in using PPE; and (3) conditions that facilitate PPE use. This method is in line with the guideline “Method of synthesis should match the nature and comparability of the evidence”.

2.8 Registration and protocol

The source manuscript did not report prospective protocol registration. For this reason no registration number is claimed in this manuscript. If appropriate, registration in PROSPERO or an appropriate registry is recommended, along with a protocol and amendments log dated for future updating of the review.

2.9 Conceptual orientation

The Social Ecological Model was used as a heuristic model to categorize determinants at individual, interpersonal, organizational and policy/system levels. The individual determinants were knowledge, risk perception and discomfort; the interpersonal determinants were peer norms, and supervisory modelling; the organizational determinants were procurement, stock availability, leadership and supervision; and the policy/system determinants were financing, regulation and supply-chain governance. It is a framework applied interpretatively and does not mean that all the studies included were actually conducted in the context of this model.

3. RESULTS

The results are reported as a thematic synthesis of the evidence reported in the review. A full extraction matrix for the level of studies, as required for the study level, was not available in the source manuscript, so only the findings supported by the evidence provided is emphasized, and not creating unsupported estimates for the study level.

3.1 PRISMA 2020 flow of studies

Selection stage	Records/studies
Records identified through databases/other reported sources	85
Duplicates removed	10
Records screened	75
Full-text reports assessed for eligibility	45
Full-text reports excluded	13
Studies included in qualitative/narrative synthesis	32

Figure 1. PRISMA 2020 study-selection flow reconstructed from the numerical screening data reported in the source manuscript. The underlying record does not contain database-specific counts or the reasons for each full-text exclusion; these should be added from the review audit trail before journal submission.

3.2 Availability and Access to PPE

The availability of PPE was variable across the evidence synthesized in the source manuscript. Respirators, gowns and some types of eye protection were less consistently available while gloves were more commonly available. The highest directly reported LMIC facility evidence is from Drouard et al. (2023), who found that on the survey day nearly one in three (1554/5099) of the facilities assessed were a medical-mask stock-out, 46% did not have any respirator masks, 16% did not have gloves, and only 43% had enough PPE to meet WHO guidance.

This is corroborated by evidence specific to Nigeria. In a study by Oladele et al. (2021), they found that 22.1% of 258 health-care workers had regular access to PPE. While the study focused on all workers and not only on the PHC workers, 44.1% of respondents were working in a PHC facility, the findings of which were relevant for the PHC workers. They also found that there were limited supplies of N95 respirators and operational issues at the facility level.

3.3 Barriers to structure and supply chains

The fragility of the supply chain is a key challenge that rose to the fore. Policy requirements can become inconsequential in practice due to stock-outs, late deliveries, procurement limitations, and poor inventory management. In the initial phase of the pandemic, the LMIC facility survey revealed the continued existence of significant gaps in availability at various stages (Drouard et al., 2023). The WHO's response to shortage also stresses on

rational use, stewardship and appropriate use of medicines instead of indiscriminate use of medicines (WHO, 2020b).

This is especially significant in PHC where they might have less diversity of source, or less storage and buffering capacity for interruptions. Interventions should thus focus on forecasting, buffer stocks, distribution, stock visibility and accountability, not just on emergency donations on an ad hoc basis.

3.4 Organizational and policy barriers

The context of an organisation can influence the likelihood of guidance on PPE to become routine. Houghton et al. (2020) carried out qualitative evidence synthesis identifying low levels of managerial support, poor-quality PPE, unclear or changing guidance and communication issues as challenges related to the implementation of the IPC. On the other hand, adherence was promoted by supportive management and communication and training.

The overall picture of the implementation literature for PPE supports the same interpretation. Cordeiro et al. (2022) named shortages and logistics issues, infrastructure challenges, policy and communication issues, discomfort and psychological readiness as interacting factors that affect implementation of PPE. This indicates that the concept of compliance with PPE is best conceptualised as an implementation system, rather than simply compliance behaviour.

A person's training and knowledge constitutes a barrier to their behaviors if it is not in line with the behaviors.

Without the practical training, time, proper equipment or supportive supervision, knowledge alone isn't enough. Houghton et al. (2020) identified training and communication on the risks of an infection and PPE as facilitators, whereas the cumbersome guidance and lack of support were barriers. The results from Nigeria also indicate that there is a lack of awareness and adherence to PPE (Oladele et al., 2021).

Another factor to consider as an implementation determinant is the physical discomfort. One of the main challenges to the implementation of PPE that was identified by Cordeiro et al. (2022) was discomfort when performing clinical tasks. Therefore, interventions should also involve correct sizing and fit, and appropriate work/rest arrangements, as well as selecting the correct PPE for the task and providing practical training on donning and doffing the PPE.

3.6 Enablers of PPE implementation

Several consistent enabling conditions are identified in the evidence: reliable and predictable PPE supply; guidance that is clear, accessible and consistent; IPC training with refresher courses, which were practical; leadership commitment was visibly demonstrated; supervision was supportive; and workplace safety culture and monitoring systems identified PPE shortages and adherence issues. Leadership quality and PPE (donations) were cited as facilitators and limited supply and operational challenges as barriers in Nigeria (Oladele et al., 2021).

It is important to note, however, that availability should not be a “good enough” measure. Even when the entire recommended PPE package was available, recommended use was not complete (Drouard et al. 2023). This distinction is relevant to monitoring because both the quantity of stocks and the utilization of the stocks as actually used, or as credibly and reliably estimated, should be monitored.

4. DISCUSSION

The overall message in this review is that PPE availability and use is an issue in implementation of occupational health and IPC. Procurement, distribution, and organization capacity for PPE depends on system capacity, while individual and interpersonal factors impact how workers are consistently using PPE. This interpretation not only supports a multilevel intervention approach, it doesn't narrow attention to individual compliance.

The review suggests that the determinants of the production and use of PPE in PHC are an interplay of system, organizational and individual determinants. There is no evidence that non-use of this type is mostly an issue of individual worker motivation. Instead, workers work in systems of procurement, systems of infrastructure, cultures of management, clinical work flows and policy contexts, all of which can either facilitate or hinder safe practice.

The supply dimension is a specific important one in LMIC settings. Drouard et al. (2023) offer large-scale evidence of enduring high levels of major gaps in PPE across seven LMICs and of very little availability of full PPE. Nigeria specific evidence of limited access

is provided in Oladele et al. (2021) which includes among workers in PHC. These results indicate that the protection of occupations cannot be separated from health system logistics.

The results of Houghton et al. (2020) and Cordeiro et al. (2022) at implementation level illustrate how the relationship between guidance, communication, training, managerial support, physical working conditions and worker perceptions are interrelated. The facility may thus have PPE and have poor implementation. This is why procuring is just not enough to ensure adherence.

The evidence-base for primary care is also relatively weak. The results of the systematic review conducted by Gozdzielewska et al. (2024) indicated very limited and heterogeneous evidence of the implementation of IPC in primary care with a high risk of bias of the included studies. This emphasises the need for implementation research that is specific to PHC, as against taking all the recommendations from tertiary hospitals.

The policy implications for Nigeria's health systems and other systems are to move away from emergency PPE distribution to establishing institutionalized occupational safety systems. The process of procurement should be tied to regular forecasting and stock monitoring, facility managers should be held responsible for IPC readiness, training should be hands-on and reoccurring, and monitoring should include availability, correct use and self-reported barriers.

4.1 Implications for public health policy and practice

Implement the use of PPE in routine PHC procurement and budgeting, rather than on primary reliance on emergency donations.

2. Set up minimum PPE stock levels, triggers for replenishment, and systems for inventory at sub-national and facility levels that are auditable.
3. Conduct recurrent, competency-based IPC training (donning/doffing & selection of PPE based on the risk).
4. Avoid punitive compliance-based approaches and use supportive supervision and feedback.
6. Ensure monitoring of PPE availability and use are included as separate indicators in regular quality and occupational safety monitoring systems in PHC.

7. Improve supply chain resilience at local and regional level without compromising quality assurance and suitable technical standards.

7. Develop PPE policies based on actual heat, workload, communication requirements, fit and exposure to the task.

4.2 Implications for research

Future studies should focus on prospective studies and implementation studies specifically for PHC, measure outcomes using definitions that are common across studies, use objective or observational measures of PPE use, and evaluate multimodal interventions. Systematic reviews should prospective register a protocol, publish full search strategies and extraction forms, report study-level risk of bias and be as transparent as possible in the conduct of review analysis.

5. STRENGTHS AND LIMITATIONS

One of the strengths of the review is that it is not just a review on PPE as a commodity but also includes occupational safety and IPC and implementation determinants. However, the study-level extraction information and standardized risk-of-bias assessments and reasons for full-text exclusions are not included in the underlying review documentation. Regrettably, these restrictions compromise the reproducibility and must be taken into account early in the process of reviewing the original item for submission to a high impact journal.

One of the value-added features of the review is that it focused on PHC and addressed the issue of availability, utilization, barriers and enablers in addition to PPE being a purely commodity-based issue. The PRISMA 2020 reporting domains also enhance transparency compared to the original presentation.

There are several constraints that need to be taken into account. The first problem is that the underlying manuscript did not contain a protocol registration record. Secondly, there were no search strings available for the database (DBS) and no database yields were available and the full audit trail was missing, which reduced the number of independent reproducer options. Thirdly, there was no study level extraction matrix or standardized risk of bias table provided with the included studies in the source material. Fourth, the review was limited to English language publications and was not in-depth search of grey literature.

Fifth, there was lack of homogeneity in study design and outcome measurement that hindered defensible meta-analysis. Last, there are also some of the more directly relevant Nigerian evidence that should not be read as PHC-only evidence.

6. CONCLUSION

Ensuring the safety of the PHC worker cannot be done with just a PPE list. It needs an effective system with the right equipment being available, employees being properly trained to use the equipment, managers ensuring safe use of the equipment and policies being backed with sufficient funding and supervision. The combination of measures will, therefore, have a greater chance of providing ongoing occupational protection than if any one particular aspect of the PPE system is targeted.

Availability of PPE and proper use of PPE are crucial in occupational health and IPC, in PHC. This synthesis of evidence in this review suggests that the lack of resources, problems of procurement and distribution, poor training, lack of organizational support, discomfort and communication issues can all have a negative impact on implementation. On the other hand, a good supply chain, work experience, management, supervision and a good safety culture can help to ensure safe and correct use.

The main public-health takeaway is that PPE protection is a characteristic of a system. Supporting the availability of equipment to PHC facilities is not enough, health systems need to ensure that health staff are made aware of the equipment and know how to use it, have the appropriate working conditions, and are provided with organizational support to maintain safe usage. The review should include the original search histories, an extraction matrix for the study level, standardised risk of bias assessments, and be accompanied by documented reasons for all full-text exclusions for a definitive high impact journal submission.

7. DECLARATIONS

7.1 Ethics approval

Not applicable because this study synthesizes previously published literature and did not collect primary human-participant data.

7.2 Consent for publication

Not applicable.

7.3 Funding

No funding information was reported in the source manuscript.

7.4 Competing interests

No competing interests were reported in the source manuscript.

7.5 Data availability

The review dataset/extraction matrix was not supplied with the source manuscript. For publication, the authors should make the extraction dataset, full search strategies and screening records available as supplementary material where permitted by source licensing.

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Appendix A. PRISMA 2020 Reporting Checklist

This checklist maps the manuscript to the principal PRISMA 2020 reporting items. It is included to make the reporting status of the review explicit and to distinguish information documented in the underlying review from information that was not available in the review record.

PRISMA domain	Item	Manuscript location	Reporting status
TITLE	Identification of the report as a systematic review	Title	Reported
ABSTRACT	Structured summary covering background, methods, results and conclusion	Abstract	Reported
INTRODUCTION	Rationale	Section 1.2	Reported
INTRODUCTION	Objectives/review question	Sections 1.3 and 2.1	Reported
METHODS	Eligibility criteria	Section 2.3	Reported
METHODS	Information sources and search dates	Section 2.2	Partially reported; exact database search histories unavailable
METHODS	Search strategy	Section 2.2	Core strategy reported; database-specific syntax unavailable
METHODS	Selection process	Section 2.4	Reported at aggregate level
METHODS	Data collection process	Section 2.5	Reported at domain level; study-level extraction file unavailable
METHODS	Data items	Section 2.5	Reported
METHODS	Risk-of-bias assessment	Section 2.6	Not adequately reported in underlying record
METHODS	Effect measures	Not applicable	Narrative synthesis; no quantitative pooling
METHODS	Synthesis methods	Section 2.7	Reported
METHODS	Reporting-bias assessment	Not reported	Not available in underlying record
METHODS	Certainty assessment	Not reported	Not available in underlying record
RESULTS	Study selection	Section 3.1	Reported
RESULTS	Study characteristics	Section 3	Partially reported; complete study-level matrix unavailable
RESULTS	Risk-of-bias results	Section 2.6/3	Not available in underlying record
RESULTS	Individual study results	Sections 3.2–3.6	Narratively reported where supported

RESULTS	Results of syntheses	Sections 3.2–3.6	Reported narratively
RESULTS	Reporting biases	Not reported	Not available in underlying record
RESULTS	Certainty of evidence	Not reported	Not available in underlying record
DISCUSSION	Interpretation	Section 4	Reported
DISCUSSION	Limitations of evidence	Section 5	Reported
DISCUSSION	Limitations of review process	Section 5	Reported
DISCUSSION	Implications	Sections 4.1 and 4.2	Reported
OTHER	Registration and protocol	Section 2.8	No registration reported
OTHER	Support/funding	Section 7.3	No funding information reported
OTHER	Competing interests	Section 7.4	No competing interests reported
OTHER	Availability of data/materials	Section 7.5	Extraction matrix and audit trail not supplied

Appendix B. Search Strategy and Information-Source Record

The review record documents four information sources- PubMed, Scopus, Web of Science and Google Scholar and a search period from January 2015 through March 2026. The underlying record preserves the conceptual search string reproduced below. Because the original database-specific histories were not supplied, the appendix does not present retrospectively invented database syntax or database-specific retrieval counts.

Reported core search strategy:

“Personal Protective Equipment” AND “Primary Health Care” AND (“availability” OR “utilization” OR “compliance”) AND (“barriers” OR “enablers” OR “determinants”) AND (“occupational safety” OR “infection prevention”).

Information source	Search period	Core concepts	Retrieval record
PubMed	January 2015– March 2026	PPE; primary health care; availability/utilization/compliance; barriers/enablers/determinants; occupational safety/IPC	Database- specific yield not retained in source record
Scopus	January 2015– March 2026	Same core concepts	Database- specific yield not retained in source record
Web of Science	January 2015– March 2026	Same core concepts	Database- specific yield not retained in source record
Google Scholar	January 2015– March 2026	Same core concepts	Database- specific yield not retained in source record

Appendix C. Study-Selection Audit Record

The reported selection figures are internally consistent and are retained exactly as documented: 85 records identified, 10 duplicates removed, 75 records screened, 45 full-text reports assessed, 13 full-text reports excluded, and 32 studies included in the narrative synthesis. The underlying review record does not contain database-level yields or the individual reasons for the 13 full-text exclusions. Accordingly, no unsupported exclusion reasons or database counts are supplied here.

Selection stage	Records/studies	Documentation status
Records identified	85	Reported
Duplicates removed	10	Reported
Records screened	75	Reported
Full-text reports assessed for eligibility	45	Reported
Full-text reports excluded	13	Reported; individual reasons unavailable
Studies included in qualitative/narrative synthesis	32	Reported

Appendix D. Data-Extraction and Study-Characteristics Framework

The source review states that extraction covered author/year, country, study design, sample size, PPE type(s), availability findings, barriers and enablers. The completed study-level extraction matrix was not supplied with the review record. The framework below therefore records the prespecified extraction domains without fabricating study-level values.

Extraction domain	Definition used in this review	Study-level record
Author and year	Citation identifier for the primary study	Not supplied in underlying extraction file
Country/setting	Country and relevant PHC/frontline setting	Not supplied in underlying extraction file
Study design	Quantitative, qualitative or mixed-method design	Not supplied in underlying extraction file
Sample size	Number of participants/facilities included	Not supplied in underlying extraction file
PPE type(s)	Masks/respirators, gloves, gowns, eye/face protection	Not supplied in underlying extraction file
Availability/access	Reported stock/access/availability findings	Not supplied in underlying extraction file
Barriers	Structural, organizational and behavioural barriers	Not supplied in underlying extraction file
Enablers	Factors facilitating appropriate and sustained use	Not supplied in underlying extraction file

Appendix E. Risk-of-Bias and Methodological-Quality Reporting

The underlying review stated that methodological quality was considered according to study design but did not identify a single standardized appraisal instrument and did not provide study-level judgments. The revised manuscript therefore does not assign retrospective risk-of-bias ratings. This is reported as a limitation rather than concealed through reconstructed judgments.

Requirement	Status in underlying review	Treatment in revised manuscript
Named appraisal instrument	Not reported	No instrument is retrospectively claimed
Study-level appraisal judgments	Not supplied	No judgments fabricated
Domain-level quality synthesis	Limited narrative consideration	Reported as a methodological limitation
Future update	Design-appropriate validated tools recommended	JB1 or equivalent tools recommended when the review is prospectively updated

Appendix F. Reviewer Process and Protocol Transparency Statement

The underlying manuscript does not document whether screening and data extraction were conducted independently by two reviewers, how disagreements were resolved, whether a protocol was prospectively registered, or whether amendments were recorded. The revised manuscript therefore makes no unsupported claim about reviewer independence, consensus procedures or registration. No PROSPERO registration number is reported.

For transparency, these omissions are treated as characteristics of the available review record. They should not be interpreted as evidence that single-reviewer procedures were necessarily used; the available documentation simply does not establish the reviewer process.

Appendix G. Evidence-Reporting Notes for Interpretation

Three interpretive boundaries apply throughout the manuscript. First, findings from mixed-level health-care studies are not presented as PHC-only evidence. Second, availability of PPE is distinguished from actual or recommended use. Third, narrative themes are not converted into pooled prevalence estimates because the underlying studies differ in design, population, setting, PPE definitions and outcome measurement.

The Nigerian evidence cited in the manuscript is therefore presented as country-specific contextual evidence rather than as a nationally representative estimate of PPE availability in PHC facilities.