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Systematic Literature Review on the Quality of Human Resources for Health and Its Alignment with Healthcare Service Needs in Developing Countries

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Abstract

The quality of human resources for health (HRH) is a critical determinant of healthcare service performance, especially in developing countries facing persistent issues such as personnel shortages, maldistribution, limited competencies, and weak organizational support. These challenges hinder the ability of health systems to respond to routine service needs and public health emergencies. This systematic literature review aims to map current evidence on HRH quality, identify key determinants and challenges, and evaluate the extent to which HRH improvement strategies align with healthcare service needs. Using PRISMA 2020 guidelines, a comprehensive search across Google Scholar, ScienceDirect, and Scopus identified 411 studies; after screening and eligibility assessment, 25 studies published between 2018 and 2025 were included. Data extraction covered intervention types, HRH quality indicators, outcomes, and contextual factors. The findings indicate four major categories of interventions: curriculum and educational reforms, training and continuing professional development, policy and system-level strategies, and digital/eHealth innovations. Most interventions improved knowledge, skills, and performance, with several demonstrating alignment to service needs through enhanced clinical processes and patient outcomes. However, the translation of competence into practice was often limited by systemic barriers such as resource constraints, high workloads, and insufficient supervision. This review highlights the need for multi-component, context-sensitive strategies that integrate human capital development, organizational strengthening, and supportive policy environments to sustainably enhance HRH quality in developing countries.

Keywords: Human Resources for Health (HRH); Capacity Building; Healthcare Service Quality.

INTRODUCTION

The quality of human resources for health (HRH) is a key factor in ensuring safe, effective, and equitable health services. In many lowand middle-income countries, various classic challenges, such as shortages, maldistribution, and inadequate competencies among nursing, midwifery, medical, and community cadres, contribute to low access to and poor quality of essential services. This is evident, for example, in the disruption of clinical education for nursing students due to the nursing shortage crisis, the weak capacity of community health workers in disease promotion and prevention, and the limited systemic support for health workers in primary and community services (Ghimire & Sharma Neupane, 2024; Itambo et al., 2024; Joshi et al., 2024). The capacity of HRH to respond to cross-border health threats and public health emergencies for example, in the implementation of the International Health Regulations (IHR) at country entry points during the COVID-19 pandemic is largely determined by the quality of training, organizational support, and resource availability (Masuku & Huang, 2024). This situation underscores that discussions about HRH cannot stop at issues of quantity and distribution, but must also address aspects of quality: competence, performance, professionalism, motivation, and the ability to adapt to ever-changing service needs.

Various interventions have been developed to improve the quality of SDMK and align it with service needs. At the pre-service level, reforms to the midwifery and neonatal curriculum have been shown to improve students' readiness for complex clinical practice (Shikuku et al., 2024). On the other hand, short web-based training for mental health service providers, continuing professional development (CPD) programs, and structured training for breastfeeding support workers show the potential to improve the clinical capacity and behavior of health workers in responding to the needs of mothers, infants, and other vulnerable groups (Alao et al., 2024; Butt et al., 2024; Joseph et al., 2024). Other interventions focus on the use of digital technology, ranging from strengthening health information systems to clinical decision support at the frontline, which contributes to improving the quality of recording, data utilization, and rational use of antibiotics (Haque et al., 2024; Knittel et al., 2024; Tan et al., 2024). At the public health program level, studies on the implementation of mass drug administration, the role of community health volunteers, and the integration of mental health services at the district level show that the quality of HRH is greatly influenced by the clarity of their mandate, supervisory support, incentives, and the working conditions they face (Joshi et al., 2024; Odoi et al., 2024; Sakyi et al., 2024). These findings show that improving the quality of HRH requires an approach that focuses not only on individuals but also on the systems and policies that govern their practices.

Therefore, it is essential to have high-quality health human resources that are not only strong in terms of individual competence, but also supported by the organizational environment, incentive policies, and adequate practice opportunities, especially in developing countries that face a double burden of disease and limited resources. To address the issue systematically, this study places HRH at the intersection between the health workforce dimension (number, distribution, competence, motivation, and performance) and service needs as reflected in indicators of coverage, quality, patient safety, and user satisfaction. Within this framework, HRH quality is understood as a combination of ability, motivation, and opportunity to provide services that meet clinical standards and are relevant to the local context, including primary, secondary, referral, and community services. This study evaluates interventions and strategies aimed at improving the quality of HRH at various levels of the health system and types of health care facilities in developing countries, as well as assessing the extent to which these interventions are truly aligned with existing service needs.

Conceptually, this study utilizes the lens of Human Capital Theory, ResourceBased View (RBV), Donabedian's Structure–Process–Outcome (SPO) model, and the AMO (Ability–Motivation–Opportunity) approach. Human Capital Theory emphasizes that education, training, and competency development are investments that increase the productivity of health workers. RBV views the unique combination of individual competencies,

organizational culture, and management systems as a source of service excellence that is difficult to replicate. The SPO model places HRH quality in the context of the interrelationship between structure (e.g., regulations, policies, availability of facilities and technology), process (clinical practices, supervision, interprofessional collaboration, use of digital technology), and outcome (quality of service, patient safety, and health outcomes). The AMO approach highlights that interventions that only improve capabilities without considering motivation and practice opportunities often have limited impact and rarely translate into patient-level outcomes. By combining these four frameworks, HRH quality in this study is understood as the result of interactions between individual capabilities, organizational support, and the health system context.

Although there is a considerable amount of literature on HRH, most studies are still partial in nature: they focus on calculating the number and distribution of personnel, or evaluating training interventions without explicitly linking them to service needs and health outcomes. There have been few studies that systematically map how HRH quality is defined and measured, what the determinants of HRH quality are at various levels (individual, organizational, technological, policy), and how this quality is aligned with service needs in developing countries. This creates a research gap both at the conceptual level namely, the absence of a comprehensive framework on HRH quality and its alignment with service needs and at the practical level, namely, the limited amount of integrated evidence that can be used as a basis for formulating health human resources policies and health system strengthening strategies.

Therefore, the objectives of this Systematic Literature Review are: (1) to describe the trends and main findings of various studies related to the quality of healthcare human resources; (2) to identify the key determinants and major challenges in developing healthcare human resources in developing countries; and (3) to formulate policy recommendations and future research directions aimed at strengthening the capacity of healthcare personnel.

As an operational derivative, this study formulates three research questions as follows. RQ1: What types of interventions, programs, or strategies have been implemented in the literature to improve the quality of Health Human Resources (HHR) in developing countries? RQ2: How effective are these interventions in enhancing the quality of Health Human Resources as measured by competence, performance, and professionalism and in aligning with the needs of healthcare services? RQ3: What contextual factors have been identified in the literature as facilitators or barriers to the successful implementation of these interventions? The answers to these three questions are expected to provide a comprehensive overview of the types of interventions that have been carried out, their effectiveness in improving the quality of health human resources and their alignment with service needs, as well as the contextual factors that need to be considered in the formulation of policies and intervention designs in the future.

METHOD

Protocol and Guidelines

This systematic review was conducted using the PRISMA 2020 approach, which emphasizes transparency of the process, reproducibility, and comprehensive reporting through four main stages, namely identification, screening, eligibility assessment, and inclusion. The PRISMA approach is a widely recognized framework for conducting systematic reviews and meta-analyses in various fields of science, such as the quality of human resources for health, service quality, and system resilience. This method provides structured and transparent procedures in the literature selection process, so that the stages of data collection, screening, and reporting are carried out rigorously and can be replicated (Nezameslami et al., 2025). This study is a Systematic Literature Review (SLR) designed to answer research questions RQ1–RQ3 related to HRH quality and alignment with health service needs in developing countries. All steps of searching, selecting, extracting, and assessing study quality were systematically documented so that they could be replicated and audited by other researchers.

At the identification stage, a comprehensive literature search was conducted in a number of databases, followed by title and abstract screening, full-text reading, and determination of included studies. The selection process followed the four PRISMA stages: Identification → Screening → Eligibility → Inclusion, with reporting of the number of articles at each stage and reasons for exclusion in the full-text phase to provide a transparent overview of the study selection stages.

Eligibility Criteria

Inclusion and exclusion criteria were formulated using the PICOC (Population, Intervention, Comparison, Outcomes, Context) framework to ensure consistency between the SLR objectives and the selected studies.

Population: clinical and community health workers (Human Resources for Health/HRH) in developing countries/LMICs, working at the primary, secondary, referral, and community levels.

Intervention: HRH quality improvement interventions or strategies, such as training and capacity building, strengthening pre-service curricula, continuing professional development (CPD), supervision and performance management, incentive policies, organizational reform, use of digital technology/eHealth, and strengthening the work environment.

Comparison: standard practice/no specific intervention or comparable comparator group, including pre–post designs without an explicit control group.

Outcomes: HRH quality indicators (definition/measurement/determinants/interventions) and/or alignment with service needs/service outcomes (patient safety, efficiency, user satisfaction, coverage, program sustainability).

Context: health services in developing countries/LMICs, both government and private facilities.

Operationally, the inclusion criteria are:

Peer-reviewed articles (quantitative, qualitative, or mixed-methods);
Published between 2018 and 2025;
In English (and/or Indonesian, if relevant to the context);
Health workforce (clinical/community) populations in developing countries/LMICs;
Examining HRH quality (definition, measurement, determinants, interventions) and/or alignment with service needs/service outcomes;
Full-text available.

Studies were excluded if they were editorials, opinions, protocols, narrative reviews without systematic methods, case reports, grey literature, or conceptual articles that did not present empirical data; focused on high-income countries that were not relevant to the context; or full-text was not available. A summary of the inclusion and exclusion criteria is presented in Table 1. Inclusion/Exclusion Criteria (summary), while an overview of the study eligibility criteria and the eligibility determination flow is presented in Table 1.

Table 1. Inclusion-Exclusion Criteria

Criteria	Inclusion	Exclusion
Topic	Discussing interventions/strategies for improving the quality of Human Resources for Health (HRH) in developing countries/LMICs, including training, curriculum, supervision/performance management, incentive policies, and digital/eHealth.	Only discusses the number/distribution of human resources; focuses on high-income countries; not related to the quality of human resources.
Publication type	Peer-reviewed article	Grey literature, editorial, opinion, comment, book review, proceeding without

Criteria	Inclusion	Exclusion
		peer-review
Study design	Empirical study (quantitative, qualitative, mixed-methods)	Conceptual paper, protocol, review non-SLR
Language	English	Non-english
Publication year	2018–2025	<2018
Accessibility	Full-text available	Full-text non-available

The eligibility stage is the third step in the systematic review process, which focuses on an in-depth evaluation of articles that have passed the initial screening stage. Of the total 66 full-text articles accessed, the titles, abstracts, and contents of the articles were thoroughly read to assess their suitability to the main focus of the study, namely interventions or strategies to improve the quality of human resources for health in developing countries. At this stage, articles were assessed not only for topic relevance, but also for the clarity of the study design, the health workforce population studied, and the extent to which interventions or strategies for improving health human resource capacity were reported in detail. A number of articles were eliminated because they only described the HR situation (number, distribution, or workload) without any intervention components, focused on the context of developed countries, or did not provide sufficient methodological information for further analysis.

The articles that passed this eligibility stage reflect a variety of contexts and types of interventions, ranging from clinical and managerial training programs, competency strengthening through workplace-based CPD, the use of digital technology in services, to strengthening the role of community health workers in various lowand middle-income countries. This diversity is maintained to capture the spectrum of health workforce quality improvement strategies that have been implemented, while ensuring that each article makes a clear contribution to understanding the mechanisms, challenges, and impacts of interventions on the quality and performance of health workers and their alignment with health service needs in developing countries.

Information Sources & Search Strategy (Stage 1: Identification)

The application of the PRISMA protocol in this study was intended to ensure that the study identification process was conducted systematically and was traceable. At the identification stage, a literature search was conducted in three main databases, namely Google Scholar, ScienceDirect, and Scopus. These three platforms were chosen because of their broad coverage of international journals in the fields of public health, medicine, nursing, midwifery, and health policy.

The selection of keywords in this study was carefully designed to maintain the focus of the search while ensuring comprehensive coverage of relevant literature on HRH quality. This strategy took into account the complexity of the topic, which covers three main domains, namely health workforce-related terms, aspects of health workforce quality and capacity, and the context of developing countries and lowand middle-income countries (LMICs), which are the focus of this study. By combining Boolean AND and OR operators, the keyword combinations were constructed to explicitly link these three domains so that researchers could search for literature that not only discussed HRH in general, but also implicitly or explicitly examined improvements in the quality, competence, and performance of health workers in the context of lowand middle-income countries or settings with limited resources.

To ensure the quality and completeness of the literature, articles were searched without initial restrictions on study design and then filtered using inclusion criteria. The search was limited to articles published between 2018 and 2025, written in English, and available in full text. This time frame was chosen based on its relevance to the latest dynamics in the health workforce strengthening agenda, including the implementation of the Sustainable Development Goals (SDGs), the Universal Health Coverage (UHC)

commitment, and various post-COVID-19 global initiatives that emphasize the importance of health workforce capacity and resilience.

Study Selection (Stage 2–4: Screening, Eligibility, Included)

In the initial search phase (identification), 411 articles were obtained from the three databases. After removing duplicates, the remaining studies were selected based on a review of the titles and abstracts according to the predetermined inclusion and exclusion criteria. This initial screening resulted in 345 articles that were considered thematically and methodologically relevant.

The next stage was full-text assessment (eligibility), in which 345 articles were read in full to assess their suitability in terms of the focus of HRH quality improvement interventions or strategies in developing countries, the clarity of the research design, the health worker population, and the completeness of outcome reporting. At this stage, 66 articles met the initial eligibility criteria. After final screening based on the focus of the intervention/strategy for improving HRH quality and the completeness of the reporting of methods, 25 articles were obtained and used as the main material in the systematic synthesis in this study.

The inclusion stage was the final step in the article selection process, which aimed to ensure that all studies analyzed truly met the criteria of topic suitability, methodological quality, and empirical relevance. The articles were then classified into several main groups, for example, based on the type of intervention (clinical and managerial training, workplace-based continuing professional development, strengthening the role of community health workers, use of digital technology, and policy or incentive system reform), level of service (primary, secondary, tertiary, community), and target health worker category (doctors, nurses and midwives, public health workers, and community cadres/volunteers).

The study selection process was conducted systematically following the PRISMA steps (identification, screening, eligibility, and inclusion). The number of articles at each stage and the reasons for exclusion in the full-text phase are illustrated in the PRISMA diagram in Figure 1.

Data Extraction & Items

Data were systematically extracted from each included article, focusing on several key components, namely: author and year of publication, country and research setting, type of health care facility, category of health workers studied, study design and sample size, type of intervention or strategy for improving the quality of health human resources, indicators of quality of human resources (definition, instruments, and measurement methods), service need/outcome indicators (e.g., patient safety, service coverage, rational antibiotic use, or service utilization), and key findings and limitations reported.

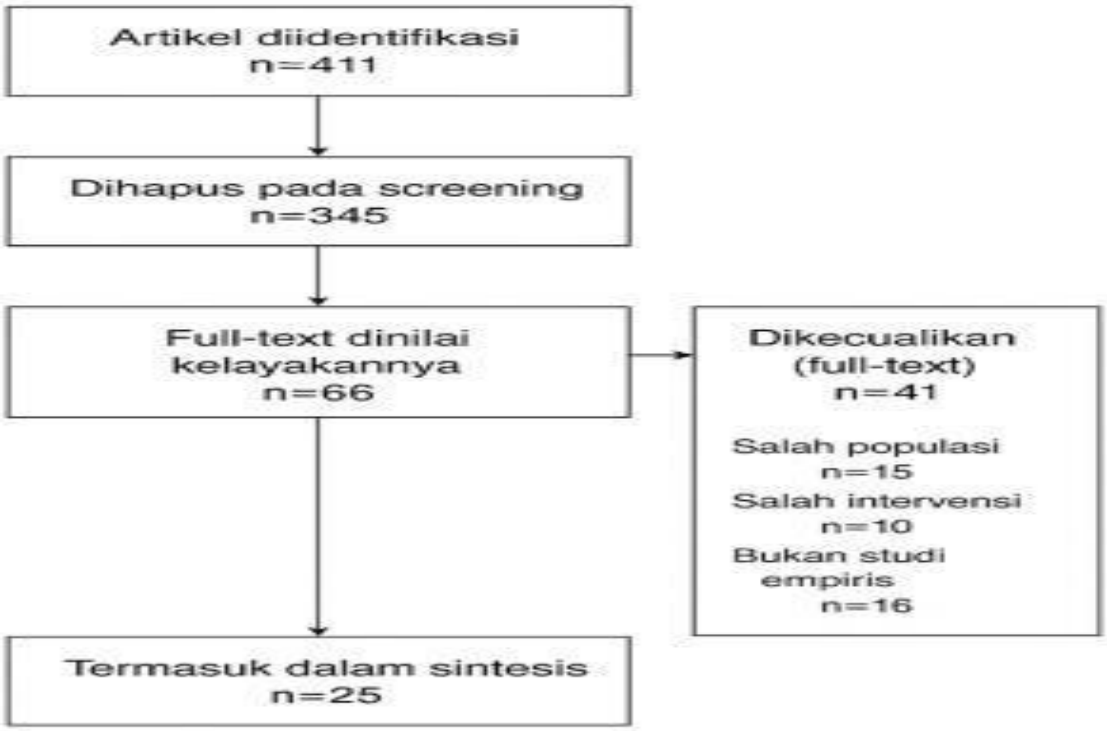

Figure 1. PRISMA Diagram

The extraction process was carried out using the same list of items for all articles so that the information collected was consistent and comparable. The extraction results were then summarized in a table of study characteristics and, where relevant, further organized into thematic tables based on the type of intervention.

RESULTS AND DISCUSSION

Result

Study Selection

At the identification stage, searches on Google Scholar, ScienceDirect, and Scopus yielded 411 articles. After removing duplicates and screening based on titles and abstracts according to inclusion–exclusion criteria, 345 articles were initially deemed relevant. Full-text reading was then conducted, resulting in 66 articles that met the eligibility criteria. In the final screening stage, based on the suitability of the focus on interventions/strategies for improving the quality of health human resources in developing countries and the completeness of the reporting methods, 25 articles were declared eligible and included in the final synthesis. The complete flow of the study selection process is presented in the PRISMA diagram.

Study Characteristics

Twenty-five of the included studies were mostly published between 2021 and 2024, with a sharp increase in publications in 2024. The studies mainly originated from lowand middle-income countries in Africa (e.g., Kenya, Uganda, Ghana, Nigeria, Tanzania, Eswatini, South Africa) and Asia (e.g., Nepal, Bangladesh, the Philippines, several other Asian countries), as well as some Latin American contexts.

The types of health workers studied included doctors, nurses, midwives, community health workers and volunteers, health information officers, mental health service providers, and communicable disease program cadres. The study designs were quite diverse: randomized controlled trials (RCTs), quasi-experimental, quantitative

cross-sectional studies, qualitative studies (interviews, FGDs, ethnography), mixedmethods, and several policy/program studies based on routine data.

The identified interventions/strategies for improving the quality of health human resources can be grouped into four main categories:

Training and capacity building (updated midwifery curriculum, IPC training, lactation training, workplace-based CPD, mental health training, interprofessional simulation);
Strengthening pre-service and in-service education and curriculum;
Policy and management (supervision, strengthening the role of community health workers, referral system arrangement, strengthening regulations and the work environment);
Digital interventions and information systems (application-based clinical algorithms, strengthening health information systems, use of data for performance improvement).

To facilitate interpretation, the 25 included studies were grouped based on the focus of the intervention/strategy for improving health human resources, namely: (a) education & curriculum/learning environment (Table A), (b) training & capacity building/CPD (Table B), (c) policy/management/community & system-level HRH (Table C), and (d) digital/eHealth & health information systems (Table D).

Table 2. Study Focus on Education & Curriculum/Learning Environment

No Study	Study (Author, Year)	Country	Target	Main Focus
1	Ghimire & Sharma Neupane (2024)	Nepal	Students & clinical nurse mentors	The impact of nurse shortages on the quality of clinical learning and supervision
2	Itambo et al. (2024)	Several sub-sahara African Country	Advanced practice nurses / APN candidates	The development and expansion of APN education post-COVID
3	Najjuma et al. (2024)	Uganda	Medical & nursing students, lecturers	Barriers and supporting factors for interprofessional simulation learning
8	Valmonte et al. (2024)	Philipine	Doctors, nurses, other health workers	The need for education on oligometastatic lung cancer
21	Moloko & Tshivhase (2024)	South Africa	Caregivers of children <5 years old (implications for primary health workers)	Caregivers' knowledge of pneumonia and diarrhea, the need for education by health workers

Table 3. Study Focus on Training & Capacity Building

No Study	Study (Author, Year)	Country	Target	Training Type	Outcome
9	Joseph et al. (2024)	South Asia	Non-specialist mental health support providers	Single-session therapy online training	Improved skills & confidence in providing SST interventions
10	Shikuku et al. (2024)	Kenya	Midwifery students and lecturers	New midwifery curriculum + faculty training & mentoring	Improved knowledge & performance in OSCE EmONC

No Study	Study (Author, Year)	Country	Target	Training Type	Outcome
11	Butt et al. (2024)	Pakistan	Lactation and maternal counselors	Structured breastfeeding training & counseling	Improved quality of counseling; increased IMD & exclusive breastfeeding
18	Limenyande et al. (2024)	Uganda	Healthcare professionals of various disciplines	IPC training & program (in the context of barriers/enablers)	IPC compliance influenced by training, PPE availability, safety culture
23	Haque et al. (2024)	Bangladesh	General practitioners and specialists	Antimicrobial stewardship education & program needs	Knowledge & practices related to AMR; need for CPD & feedback audits

Table 4. Study Focus on Policy / Management / Community & System-Level HRH

No Study	Study (Author, Year)	Country	Target	Main Focus
6	Arisanti et al. (2024)	Malaria-endemic countries in Asia	Malaria program officers & service providers	The impact of COVID-19 on malaria elimination strategies and program human resources
7	Aja et al. (2024)	LMICs in various regions	Mothers, cadres, health workers	The role of mothers and communities in preventing childhood TB; health worker support
12	Alao et al. (2024)	Nigeria – tertiary hospitals	Mothers with babies in the neonatal ward & staff	Breastfeeding support and its link to maternal mental health
13	Odjo et al. (2024)	Uganda – communities around Lake Albert	Community drug distributors, program officers	Programmatic factors affecting schistosomiasis MDA coverage
14	Wirawan et al. (2024)	Indonesia – regulatory review	Workers & policy makers	Legal protection of workers' mental health, including health workers
15	Masuku & Huang (2024)	Eswatini – international entry points	Health workers & IHR staff	IHR implementation capacity at HR strengthening needs at the point of entry
16	Okeke et al. (2024)	Nigeria – communities	Traditional birth attendants, mothers, health center staff	Demand & supply factors that trigger delays in referral to facilities
17	Dakpui et al. (2024)	Ghana – slums	Transgender women using HIV services	HIV testing experiences & treatment by health workers; issues of

No Study	Study (Author, Year)	Country	Target	Main Focus
				stigma & inclusivity
19	Metcalf et al. (2024)	Tanzania – pediatric cancer hospitals	Health workers & caregivers	Systemic factors (Three Delays) that affect access to pediatric cancer care
20	Montenegro et al. (2024)	Global / Latin America	Mental health researchers & practitioners	Global decolonization in mental health and implications for partnerships & HR capacity
22	Joshi et al. (2024)	Nepal – FCHV system	Community health volunteers (FCHV)	Perceptions of the role, work-load, support, and incentives of FCHVs in the health system
24	Sakyi et al. (2024)	Ghana – three districts	Primary health workers & mental health service users	Implementation of district mental health service plans; primary human resource needs
25	Elhassan et al. (2024)	Sudan – national malaria system	Doctors, nurses, malaria officers	Updating national malaria management guidelines and implications for clinical practice

Table 5. Study Focus on Digital / eHealth / Health Information Systems

No Study	Study (Author, Year)	Country	Target	Digital Intervention	Outcome
9	Knittel et al. (2024)	Ethiopia	Health information officer & program manager	HIS strengthening package (system harmonization, training, governance)	Improved quality and utilization of data for decision-making
11	Tan et al. (2024) – DYAMNC trial	Tanzania	Frontline health worker	Digital clinical algorithm for assessing children aged 2–59 months	Improved clinical assessment and reduced inappropriate use of antibiotics

Figure 2 shows the trend of publications related to the quality of health human resources by year and country/region. All 25 included studies were published in 2024, with contexts spanning various countries in Africa (e.g., Kenya, Uganda, Ghana, Nigeria, Tanzania, Sudan, South Africa) and Asia (Bangladesh, Nepal, Pakistan, Philippines, Indonesia), as well as several other developing country contexts.

From 2021 to 2023, research topics became more diverse, covering competency-based training evaluation, digital technology utilization, and managerial policies, with contributions from various African and Asian countries. Publication peaked in 2024, when all articles in this SLR were published, many of which evaluated the effectiveness of clinical training, technology-based supervision models, and post-COVID19 organizational policies. Overall, this trend illustrates a shift from conceptual studies to more evidence-based applied studies closely linked to national HR policies and the local needs of health systems in developing countries.

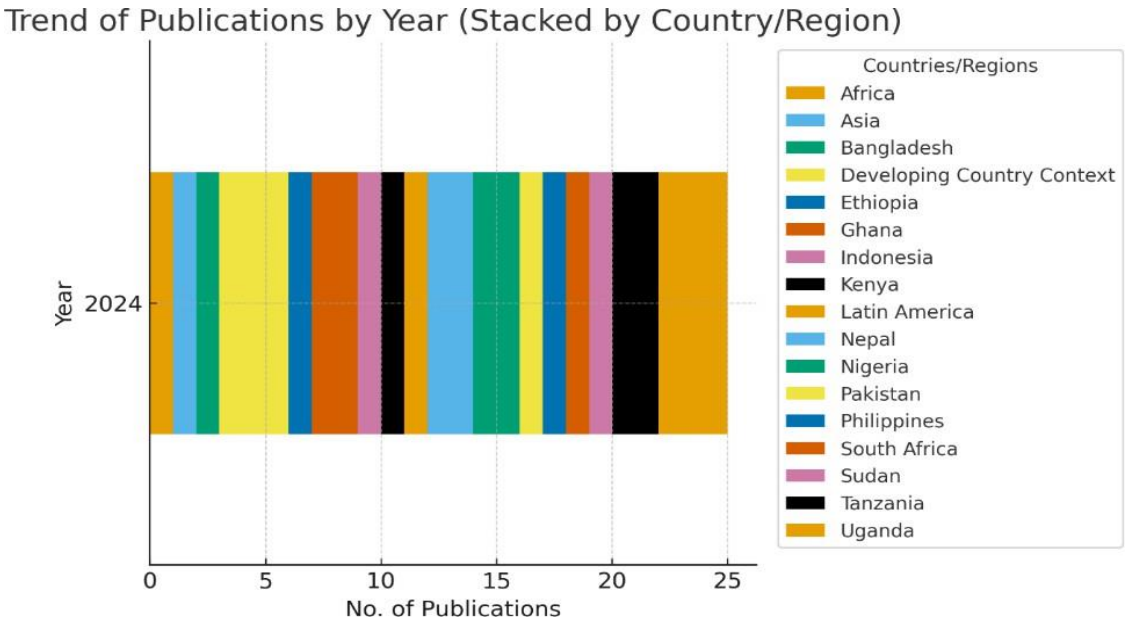

Figure 2. Trend of Publication Year

Furthermore, bibliometric analysis using VOSviewer shows that the number of publications began to increase in 2020 and peaked in 2024. The keyword co-occurrence map grouped research topics into several main clusters, namely: (1) training and capacity building of health workers, (2) the role of community health workers and infectious disease programs, (3) the use of digital technology and health information systems, and (4) health human resource policies and governance. The visualization of these keyword clusters is presented in Figure 3.

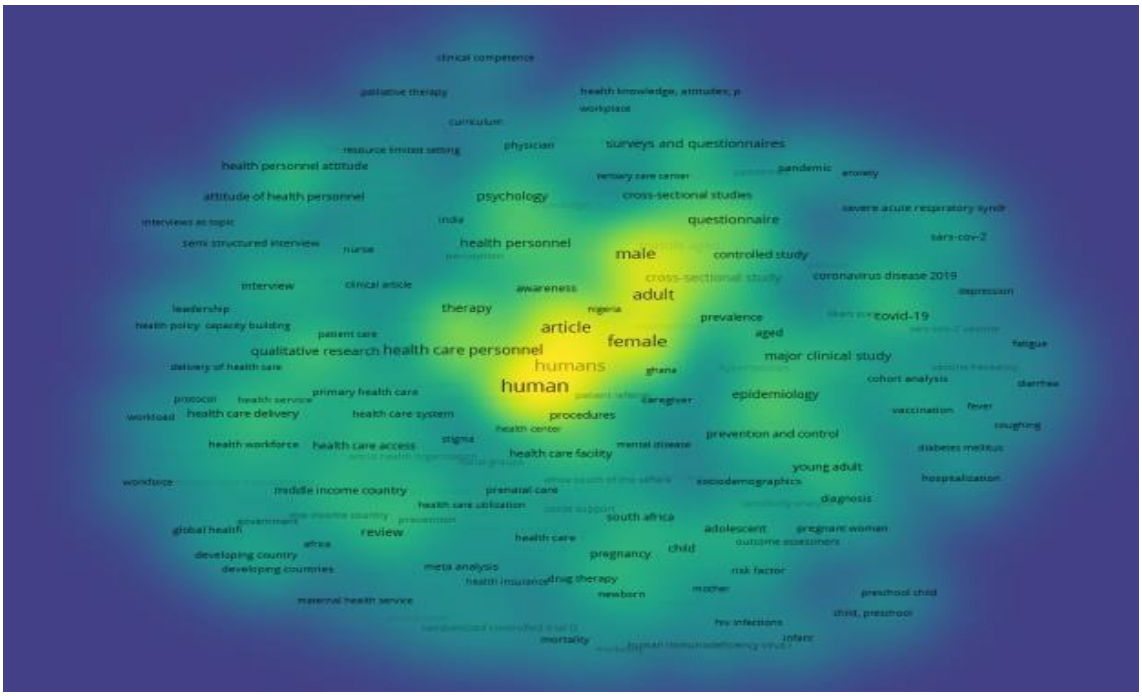

Figure 3. Bibliometric Analysis

The VOSviewer network map with a keyword threshold ≥5 identifies four main clusters. Cluster 1 (red) contains core concepts of human resources and health systems in developing countries, such as health workforce, health service, workload, leadership, and health policy, which confirms that many challenges are systemic and managerial in nature. Cluster 2 (yellow) focuses on training and education interventions, with keywords such as

clinical competence, curriculum, knowledge and attitudes, and the use of surveys/questionnaires as measurement methods directly related to the findings of RQ1 and RQ2. Cluster 3 (blue) highlights vulnerable patient populations, particularly maternal and child health (female, child, newborn, pregnant woman) and infectious diseases such as HIV, which describe service priorities in developing countries. Cluster 4 (green) reflects the methodological landscape and global issue context, with terms such as epidemiology, controlled study, cross-sectional study, and pandemic-related keywords (COVID-19, SARS-CoV-2), indicating that many health workforce quality studies are conducted in the context of a global health crisis.

Based on the VOSviewer bibliometric analysis, it shows that research on health human resources in developing countries is still dominated by descriptive studies and individual surveys, as reflected in common keywords such as human, female, male, and health care personnel. Conversely, keywords related to long-term system and capacity strengthening capacity building, leadership, policy, training, health workforce appear much less frequently, indicating a lack of empirical studies on the effectiveness of managerial interventions, HR policies, and digital innovation.

The emergence of keywords such as epidemiology, COVID-19, and prevention and control indicates that publications are still largely reactive to the pandemic, rather than oriented towards sustainable HR strengthening models. The majority of studies are also cross-sectional and survey-based, without assessing performance changes after intervention, resulting in a significant gap for longitudinal and evaluative research that tests the impact of training, supervision, and organizational support on health worker performance and evidence-based HR policies.

Synthesis of Findings

RQ1 – Types of Interventions, Programs, and Strategies to Improve HRH Quality A synthesis of 25 studies shows that various interventions, programs, and strategies have been implemented to improve the quality of health human resources in developing countries. Broadly speaking, these interventions can be grouped into four main categories:

Educational and curriculum interventions – including updating pre-service curricula (e.g., midwifery and neonatal care), strengthening clinical learning environments, and developing continuing education programs such as advanced practice nursing. These studies emphasize aligning curriculum content with the clinical and professional competencies required in the field, including collaborative and interprofessional competencies.

Training and capacity building/CPD – includes clinical and managerial training, simulation-based training, online training (e.g., single-session therapy for mental health), and workplace CPD programs to improve the knowledge, skills, and practices of health workers. Some interventions also integrate supervision and mentoring components to strengthen the transfer of competencies to everyday practice.

Policy, management, and system strengthening/community-level HRH – in the form of structuring the roles and workloads of community health workers and volunteers, strategies to retain and motivate cadres, strengthening referral systems and service coordination, strengthening IHR implementation capacity at the country entry point, and reviewing regulations related to mental health protection for workers. These interventions emphasize structural and governance aspects that influence how health workers operate.

Digital interventions and health information systems – including the use of digital clinical algorithms for frontline decision-making, strengthening health information systems (HIS) through platform harmonization and user training, and utilizing data for program planning and monitoring. These digital interventions aim to improve the quality of clinical and managerial processes while supporting the capacity of health workers in using technology.

These four categories address the need to improve the quality of health human resources from the individual to the system level, targeting doctors, nurses, midwives,

community health workers/volunteers, health information officers, and mental health service providers in various contexts in developing countries.

RQ2 – Effectiveness of Interventions in Enhancing HRH Quality and Aligning with Service Needs

In general, the majority of studies report that the interventions implemented have a positive impact on the quality of health human resources. At the individual level, training and CPD have been shown to improve the knowledge, clinical skills, and confidence of health workers in providing services, for example in obstetric and neonatal emergency management, breastfeeding counseling, infection prevention and control, management of certain infectious diseases (TB, malaria), and mental health services. Pre-service curriculum interventions show improvements in students' objective performance (e.g., OSCE scores) and practice readiness.

A number of studies also show that improvements in the quality of human resources are in line with service needs, as reflected in improvements in service process and outcome quality indicators, such as increased early breastfeeding initiation and exclusive breastfeeding, improved quality of clinical assessment of children, reduced irrational use of antibiotics, increased compliance with IPC measures, improved quality and utilization of program data, and improved patient access to and experience of services, especially among vulnerable groups.

However, the effectiveness of interventions is not always uniform. Several studies report that increased knowledge or skills do not fully translate into changes in practice or service outcomes, especially when interventions are not followed by adequate structural support for example, limited facilities and logistics, high workloads, and weak supervision mechanisms. This shows that the success of interventions is greatly influenced by the extent to which program design considers service needs and the health system context in which health workers operate.

RQ3 – Contextual Factors as Facilitators or Barriers to Successful Implementation

A cross-study synthesis identified various contextual factors that act as facilitators or barriers in the implementation of interventions to improve the quality of health human resources.

At the organizational and facility levels, managerial support, availability of resources (medicines, equipment, PPE), safety culture, and regular supervision and mentoring are key drivers of successful practice change. Conversely, staff shortages, high workloads, contract uncertainty, and lack of opportunities to participate in CPD are often cited as barriers to the application of newly acquired competencies.

At the community and system levels, public trust in health workers, cultural norms (e.g., belief in traditional birth attendants or stigma against minority groups), and the quality of the relationship between health workers and service users influence the extent to which interventions can be implemented effectively. In community-based programs, the role and motivation of cadres or volunteers are greatly influenced by incentives, supervisory support, and formal recognition from the health system.

In the context of technology and policy, the success of digital interventions and HIS strengthening is highly dependent on adequate infrastructure, ongoing training and technical support, and clear policies on data use and system integration. National policies, clinical guidelines, and government commitment to specific agendas (e.g., malaria elimination or mental health integration in primary care) also emerge as important factors that can strengthen or weaken the impact of interventions on the quality of health human resources.

Overall, the findings of RQ3 confirm that interventions to improve the quality of health human resources will be more effective if they are designed with these contextual conditions in mind, so that the proposed strategies are aligned with the capacity of facilities, community dynamics, and policy frameworks in each developing country.

Discussion

Interpretation of Main Findings

This SLR shows that efforts to improve the quality of health human resources in developing countries are dominated by four main intervention groups, namely: (1) education and curriculum, (2) training and capacity building/CPD, (3) policy, management, and system/community strengthening, and (4) digital interventions and health information systems. Curriculum and learning environment interventions, such as the renewal of the midwifery curriculum integrated with obstetric-neonatal emergency care in Kenya, have shown improvements in student performance on the Objective Structured Clinical Examination (OSCE) and clinical practice readiness (Shikuku et al., 2024). Another study highlights the development of advanced practice nurses in SubSaharan Africa in response to workforce shortages and increasing service complexity (Itambo et al., 2024).

Addressing RQ1, the mapping shows that the quality of health human resources is generally operationalized through a combination of indicators of knowledge, clinical competence, adherence to guidelines, communication skills, and in some studies digital competence. For example, lactation counseling training in Pakistan measured workforce quality through knowledge scores, communication skills, and consistency in counseling delivery (Butt et al., 2024), while a digital clinical algorithm trial in Tanzania used indicators of care process quality and antibiotic use as proxies for clinical decision quality (Tan et al., 2024).

Regarding RQ2, most studies reported that training and CPD interventions improved the knowledge and skills of health workers, whether in the context of mental health (Joseph et al., 2024), infection prevention (Limenyande et al., 2024), or the use of health data and information systems (Binsaleh et al., 2024; Binyaruka et al., 2024). Several studies also associate improvements in human resource quality with improvements in service indicators, such as increased IMD and exclusive breastfeeding after strengthening breastfeeding counseling (Butt et al., 2024), or decreased irrational antibiotic use after digital algorithm interventions (Tan et al., 2024).

Answering RQ3, contextual factors that facilitate or hinder intervention implementation include managerial support, availability of facilities and infrastructure, workload, cultural norms, and policy structures. A study on the implementation of the International Health Regulations (IHR) in Eswatini shows that human resource capacity at points of entry is greatly influenced by the clarity of mandates, the availability of training, and cross-sectoral support (Masuku & Huang, 2024). A review of FCHV volunteers in Nepal highlights the role of incentives, supervision, and formal recognition in maintaining the motivation and effectiveness of cadres (Joshi et al., 2024), while studies on community health workers in malaria and MDA schistosomiasis programs in Africa emphasize the importance of social context and community trust (Alao et al., 2024; Odoi et al., 2024).

However, interpretation of these findings must consider the methodological quality of the studies. Assessment using the JBI showed that only one study was of high quality, seven were of moderate quality, and the majority (17 studies) were of low quality. The predominance of descriptive, qualitative, and observational studies with limited sample sizes and incomplete reporting of methods limits the strength of causal inference; thus, the findings of this SLR are stronger as a mapping of intervention types, patterns of effectiveness, and contextual factors than as a basis for drawing definitive causal conclusions.

Comparison with Previous Literature

These findings are consistent with global literature emphasizing that investment in health human resources is an important prerequisite for achieving Universal Health Coverage and health system resilience, especially in lowand middle-income countries. Previous reports and studies have highlighted the need to strengthen the capacity of community health workers, reform health worker education, and digitize information

systems, but they generally discuss these issues separately and do not systematically link interventions to service outcomes and contextual factors in the field.

This SLR enriches the literature by synthesizing cross-country empirical evidence on various forms of interventions ranging from curriculum renewal (Shikuku et al., 2024), strengthening the role of community health workers (Joshi et al., 2024; Odoi et al., 2024), services for vulnerable groups such as women with mental disorders and mothers and children (Elhassan et al., 2024; Rapatsa & Tshivhase, 2024), to digital interventions and HIS (Binyaruka et al., 2024; Tan et al., 2024). Bibliometric analysis with VOSviewer confirmed that the focus of the studies was still concentrated on the African and Asian contexts, with priority given to maternal and child health, infectious diseases, and the implications of the COVID-19 pandemic on human resource capacity (Alao et al., 2024; Ghimire & Neupane, 2024).

Unlike previous narrative reviews, this SLR explicitly assesses the methodological quality of each study using the JBI, thereby providing a more transparent picture of the strengths and limitations of the existing evidence base. The fact that most studies are of low quality indicates that this field is still in an exploratory phase and requires studies with stronger designs.

Theoretical Implications (Human Capital, RBV, and Donabedian's Model

From the perspective of Human Capital Theory, findings regarding the dominance of education and training interventions confirm that improving the knowledge and skills of health workers is still seen as the main form of human capital investment. Studies on midwifery curricula, breastfeeding counseling training, IPC training, and digital health training all show that these interventions increase the "stock" of human capital in the form of new competencies (Butt et al., 2024; Limenyande et al., 2024; Shikuku et al., 2024; Tan et al., 2024).

From a Resource-Based View (RBV) perspective, the combination of health worker competencies, organizational culture, and management systems (e.g., supervision, HIS utilization, and incentive policies) can be seen as organizational capabilities that are sources of service excellence. Studies on the implementation of mental health service plans in Ghana, for example, show that service quality is highly dependent on the interaction between the competence of primary health workers, referral system support, and the availability of resources at facilities (Agyapong et al., 2016).

Donabedian's Structure–Process–Outcome model provides an important framework for understanding how healthcare human resource quality interventions work. In the context of SLR, structure includes the availability and distribution of personnel, policies, infrastructure, and information systems (Binyaruka et al., 2024; Masuku & Huang, 2024; Odoi et al., 2024). Process is reflected in clinical competence, adherence to guidelines, communication behavior, and technology utilization by health workers (Butt et al., 2024; Limenyande et al., 2024; Tan et al., 2024). Outcomes include service and patient indicators such as exclusive breastfeeding/breast milk, rational use of antibiotics, IPC compliance, and service user experience (Butt et al., 2024; Rapatsa & Tshivhase, 2024; Tan et al., 2024).

Several studies show that improving individual competence (process) does not always lead to improved service outcomes when the structure is still weak for example, when the workload is high, facilities are inadequate, or supporting policies are not yet strong (Alao et al., 2024; Ghimire & Neupane, 2024; Joshi et al., 2024). These findings reinforce Donabedian's argument that quality interventions that only target clinical processes without improving system structures will have a limited impact on service outcomes (Donabedian, 1966, 1988). Conceptually, RQ1 primarily maps indicators at the process level, RQ2 highlights determinants at the structural and process levels, while RQ3 examines the relationship between the two and service outcomes.

Practical Implications

The SLR findings offer several practical implications. First, health human resource capacity-building interventions should be designed as multi-component packages that combine training, supervision, information system strengthening, and workflow adjustments, rather than stand-alone training. Studies on IPC adherence and the use of digital algorithms indicate that the sustainability of practice changes depends heavily on organizational support, availability of resources, and consistent performance monitoring (Limenyande et al., 2024; Tan et al., 2024).

Second, health workforce planning needs to consider dimensions of quality clinical competence, professionalism, and digital capacity rather than just quantity, as demonstrated by studies on the nursing shortage in Nepal and the need for advanced practice nurses in Africa (Ghimire & Neupane, 2024; Itambo et al., 2024). Third, strengthening the role of community health workers and volunteers requires a clear mandate, oversight mechanisms, and equitable incentive policies to ensure the sustainability of community-based interventions (e.g., malaria and schistosomiasis programs) (Elhassan et al., 2024; Joshi et al., 2024; Odoi et al., 2024).

Fourth, studies that explicitly link human resource quality to service outcomes such as breastfeeding interventions, digital clinical algorithms, and various infection prevention programs show that these indicators can be integrated into health human resource performance monitoring systems at facilities (Butt et al., 2024; Limenyande et al., 2024; Tan et al., 2024). However, given the low methodological quality of most studies, the implementation of findings into policy needs to be gradual through pilot projects accompanied by rigorous evaluation.

Limitations of the Evidence Base and This Review

Many studies had limitations in design (e.g., the lack of a comparison group), sample size, and reporting methods, increasing the risk of bias. This implies that the findings of this SLR should be viewed as preliminary indications and pattern mapping, rather than as a basis for strong causal claims.

Limitations of this SLR include the use of three primary databases and the restriction to peer-reviewed articles, which potentially introduce publication bias and exclude programmatic grey literature. Furthermore, the predominance of studies published in 2024 makes the findings largely reflective of the post-COVID-19 context and may underrepresent long-term trends. Heterogeneity in design and outcome indicators also hindered quantitative meta-analysis, resulting in a narrative and thematic synthesis.

Recommendations for Future Research

Based on these findings and limitations, future research is recommended to: (1) develop studies with more robust designs, such as high-quality RCTs and quasi-experimental studies, to more conclusively evaluate the effectiveness of interventions to improve the quality of human resources for health; (2) conduct longitudinal studies to assess the sustainability of intervention impacts on service outcomes and public health;

(3) conduct comparative studies across countries or across regions within a country to understand how policy context and health system structures moderate intervention success; and (4) explore more deeply digital competency and the use of new technologies by health workers, including their impact on workload and the health worker-patient relationship.

Overall, despite being supported by evidence of mixed and relatively low methodological quality, this SLR still makes an important contribution in mapping the types of interventions, their initial effectiveness, and the contextual factors that influence the improvement of human resources for health in developing countries. The integration of the Human Capital Theory framework, the RBV, and the Donabedian model helps place these findings in a cohesive theoretical perspective and provides a foundation for designing more comprehensive and sustainable health worker capacity building strategies.

CONCLUSION

This systematic review maps 25 studies on interventions, programs, and strategies for improving the quality of human resources for health in developing countries. Addressing RQ1, it was found that the most frequently reported interventions included curriculum and learning environment updates, training and capacity building/CPD, strengthening human resources policies and governance, and utilizing digital technology and health information systems. Regarding RQ2, most studies demonstrated improvements in the competence, performance, and professionalism of health workers, and in some cases, these improvements aligned with health service needs, as evidenced by improvements in process and outcome indicators. Addressing RQ3, contextual factors such as managerial support, availability of resources, workload, cultural norms, and national policy frameworks emerged as key determinants of the success or failure of intervention implementation.

Scientifically, this SLR contributes by synthesizing previously fragmented evidence and linking it to the frameworks of Human Capital Theory, the Resource-Based View, and Donabedian's Structure–Process–Outcome model. This synthesis confirms that interventions to improve the quality of human resources for health cannot be understood solely as individual training, but as a combination of investments in human capital, organizational strengthening, and system restructuring. Methodological quality assessment using the JBI indicates that most studies are still categorized as low-moderate. Therefore, findings should be interpreted cautiously and should be viewed more appropriately as mapping intervention patterns, initial effectiveness, and contextual factors.

From a policy perspective, the key implications flowing from RQ1–RQ3 are the importance of designing health human resource improvement interventions as a package that: (i) clearly targets the quality dimensions to be improved (competence, performance, professionalism), (ii) is linked from the outset to priority service needs and relevant outcome indicators, and (iii) consciously considers contextual factors as part of the design, not simply as post-implementation findings. This means that the formulation of training programs, curriculum reforms, and digital interventions need to be integrated with strengthened supervision, workload management, incentive mechanisms, and community engagement to ensure that changes in health worker behavior are truly translated into improved service quality. Furthermore, the monitoring and evaluation system for health human resource policies should include indicators that directly reflect the alignment between workforce quality and service needs, in line with the focus of RQ2 and RQ3.z

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