

SYSTEMATIC REVIEW

Open Access



Community health worker-supported oral health promotion in low- and middle-income countries: a scoping review of roles, interventions, and outcomes

Junko Yasuoka^{1*}, Shunsuke Okada² and Yohei Takeshita³

Abstract

Background Oral diseases are among the most prevalent conditions worldwide and disproportionately affect populations in low- and middle-income countries (LMICs). The shortage and maldistribution of the oral health workforce have widened inequalities in prevention and treatment. Task-sharing through community health workers (CHWs) has been promoted as a cost-effective and sustainable strategy for extending services to underserved populations; however, evidence on their roles in oral health promotion in LMICs remains fragmented. This scoping review mapped evidence on CHW-supported oral health promotion and identified common roles, interventions, and system-level challenges.

Methods A comprehensive search was conducted in PubMed, CINAHL, CENTRAL, and Google Scholar, using keywords and MeSH terms related to “community health workers,” “oral health,” and LMICs, based on the EPOC LMIC filter of the World Bank’s classifications. No publication date restrictions were applied, and gray literature was included. The review followed the Joanna Briggs Institute (JBI) methodology for scoping reviews and was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. Data were charted on CHW characteristics, roles, target populations, oral conditions addressed, and implementation challenges, and synthesized narratively. This protocol was registered on Open Science Forum (<https://doi.org/10.17605/OSF.IO/NZPHA>).

Results Thirty-two studies from 11 LMICs were included, approximately half from India. The evidence mapped a wide range of CHW roles and interventions, most commonly focusing on oral cancer screening, followed by dental caries prevention and periodontal care. CHWs were involved in home visits, education, screening, basic treatment, and referrals. Some programs integrate mobile health (mHealth) tools for remote diagnosis. System-level challenges were variably reported across settings, including inadequate infrastructure, fragmented referral systems, limited supervision, and constrained career development opportunities for CHWs.

*Correspondence:

Junko Yasuoka
yasuoka@slcn.ac.jp

Full list of author information is available at the end of the article



© The Author(s) 2026. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

Conclusions This scoping review highlights the contributions of CHWs to oral health promotion in LMICs, while underscoring health system and workforce constraints. The available evidence is largely descriptive, suggesting the need for strengthened training, supervision, referral linkages, and career development to support CHWs' integration into oral health services. Family-centered and Continuum of Care approaches warrant further exploration to inform equitable and sustainable oral health within primary health care systems.

Keywords Community health worker, Oral health, Low- and middle-income countries

Background

Oral diseases are among the most prevalent diseases globally, affecting nearly half of the world's population, and the burden is rising particularly in low- and middle-income countries (LMICs) [1]. Over the past 30 years, global case numbers have risen by approximately one billion, underscoring the widespread lack of access to appropriate oral health care [1]. Among these, the number of cases of dental caries in permanent teeth has increased significantly by approximately 640 million, mainly in low- and lower-middle-income countries, where the number of cases increased by 121% and 74%, respectively [1]. Similarly, cases of severe periodontal disease have also grown by almost 540 million, with the greatest increase observed in low-income countries (130%) [2]. In addition, the number of deaths resulting from lip and oral cavity cancer among adults aged 70 years and older has increased by 167%, with South Asia experiencing the highest burden of new cases and deaths [3]. Driven by population growth and aging, the number of cases across these major oral diseases are projected to rise significantly in the coming decades [3–5].

Oral health is profoundly affected by social, economic, geographic, and service access inequalities, not only between but also within countries [6]. People most severely affected by oral diseases include children living in poverty, socially disadvantaged populations, and older adults who often live in rural and remote areas in LMICs [6, 7]. They face multiple challenges such as limited access to oral health services, an uneven distribution of the oral health workforce, weak health information systems, and inadequate or non-existent financing mechanisms for outpatient care [8]. The insufficient number and inequitable distribution of the oral health workforce remain significant challenges, particularly in lower-income countries where the implementation of workforce skill mix and task-sharing strategies is often inconsistent and limited [9].

To address oral health inequities and strengthen the global oral health agenda, a collective international effort to improve oral health and reduce disparities worldwide, the dental public health community has been advocating for the importance of integrated and community-based approaches [7, 10]. In particular, effectively utilizing the workforce skill mix, implementing task-sharing, and leveraging primary care workers, especially community

health workers (CHWs), are crucial strategies for achieving universal health coverage [9]. Working in collaboration with oral health professionals such as dentists, dental hygienists, dental therapists, dental assistants, dental prosthetic technicians, and dental aides, CHWs have the potential to extend oral health services to hard-to-reach populations and individuals residing in dental deserts, where access to dental care is minimal or absent [11, 12].

CHWs have demonstrated their effectiveness in delivering a wide range of health care services across LMICs, particularly in resource-limited settings [13]. The umbrella term “CHW” encompasses various types of community health aides who are selected, trained, and work within the communities from which they originate. A widely cited definition was proposed by a WHO Study Group in 1989: CHWs should be members of the communities where they work, selected by the communities, answerable to the communities for their activities, supported by the health system but not necessarily a part of its organization, and have shorter training than professional workers [14]. Substantial evidence demonstrated that CHWs play a vital role in addressing both communicable and non-communicable diseases, including the delivery of maternal and child health care services, early diagnosis and treatment of malaria, tuberculosis, and HIV, as well as implementing measures for the prevention and control of lifestyle-related diseases in resource-limited settings [15–17].

CHWs are increasingly being recognized for their potential to improve oral health and promote oral health equity [9, 18, 19]. Although several reviews have examined CHW-supported oral health promotion, most have focused on high-income countries such as the United States, Canada, and Australia [20–22], providing comparatively little coverage of the unique challenges and opportunities in resource-limited contexts. To date, there has been limited synthesis of evidence on the scope, nature, and outcomes of CHW-supported oral health interventions in the community settings of LMICs.

Therefore, this study aimed to address this gap by identifying existing evidence and intervention strategies, and highlighting implications for policy, practice, and future research to strengthen the role of CHWs in addressing the global oral health burden. Given the heterogeneity of study designs, intervention types, outcomes, and implementation contexts, as well as the exploratory nature of

the existing literature, a systematic review focused on effectiveness would be premature. In addition, a narrative synthesis alone would not adequately capture the breadth and structure of the heterogeneous evidence. Instead, a scoping review was considered appropriate to map the breadth of available evidence, clarify key concepts, and identify gaps in the literature.

The research question was constructed using the Population, Concept, Context (PCC) framework: What roles do CHWs (population) play in supporting oral health promotion (concept) among underserved populations, and how are these activities implemented within LMICs (context)?

The specific objectives of this review were as follows:

- To outline the role of CHW in promoting oral health in LMICs
- To specify the oral diseases or conditions targeted through CHWs' oral health promotion interventions
- To identify tools and materials used for these interventions
- To explore the challenges faced by CHWs as they conduct these interventions

Methods

This scoping review followed the methodological framework developed by Arksey and O'Malley, with enhancements proposed by Levac et al. [23]. The search and review processes were guided by the Joanna Briggs Institute (JBI) methodology for scoping reviews [24]. The study questions were structured using the PCC framework (i.e., CHWs engaged in oral health promotion as the population; oral health programs or interventions supported by CHWs as the concept; and LMICs as the context).

Study eligibility

In this scoping review, we focused on identifying oral health interventions supported by CHWs in LMICs. Studies were eligible for inclusion if they described oral health promotion interventions in which CHWs played an active role in delivering, facilitating, or implementing the intervention in LMIC settings, regardless of study design or year of publication. Programs addressing any oral health conditions, including but not limited to dental caries, periodontal disease, and oral cancer, were considered eligible. Conversely, studies were excluded if the interventions were primarily delivered by dental professionals such as dentists, dental hygienists, or dental assistants, or by other health professionals (e.g., nurses) or school teachers, with CHWs not involved in direct implementation. Studies without real-world field implementation, including those limited to training activities, curriculum development, or tool development without

subsequent program delivery, were also excluded, as were studies that assessed only CHWs' knowledge without program implementation. In addition, articles not published in English were excluded from this review.

Literature search strategy

The literature search was designed to capture both peer-reviewed and gray literature using PubMed, CINAHL, CENTRAL, and Google Scholar. In this review, a three-stage procedure was implemented. First, a preliminary search was conducted in PubMed and Google Scholar to identify potentially relevant articles. The titles, abstracts, and associated indexing terms from these initial results were examined to refine and develop a detailed PubMed search strategy. The complete PubMed search strategy, including all search terms and Boolean operators, is provided in Appendix 1. The search strategy combined controlled vocabulary (e.g., MeSH terms) and free-text terms related to "community health workers," "oral health," and the list of LMICs, using Boolean operators (AND/OR). The list of LMICs was based on the EPOC LMIC filter informed by the World Bank's annual country classifications. Second, the search strategy was then adapted to suit the specific requirements of each database and information source used in the review. Third, citations and reference lists of studies obtained through the database search were screened to identify additional eligible studies, including gray literature. The search was limited to articles published in English, and no publication date restrictions were applied.

Study selection

All retrieved records were imported into the Rayyan QCRI platform, where duplicate entries were removed and the screening process was conducted. During the first screening stage, two reviewers independently examined the titles and abstracts of each record to determine their relevance according to the pre-established inclusion criteria. Any study that appeared to meet these criteria, or for which eligibility was uncertain, proceeded to the second stage (full-text review). In the second stage, both reviewers independently assessed the articles in detail using the same inclusion criteria. The reasons for exclusion were systematically recorded at the full-text stage to ensure transparency. When discrepancies arose between the two reviewers at either the first or second screening stage, a third reviewer independently screened the articles in question. The assessments of all three reviewers were then compared and discussed to resolve disagreements until consensus was reached. The entire study selection process, along with the outcomes at each stage, were documented comprehensively in the final scoping review and visually summarized in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses

extension for Scoping Reviews (PRISMA-ScR) flow diagram [25] (Fig. 1).

Data extraction

For each eligible study, information on the first author, publication year, country, and characteristics of the CHWs involved was systematically charted. The principal variables of interest were the core components and reported outcomes of CHW-supported oral health initiatives, encompassing target populations, oral health conditions addressed, the roles undertaken by CHWs, and resources and materials employed. Additional variables related to the challenges faced by each program and recommendations for future implementation were also extracted.

To manage heterogeneity across studies, extracted data were organized into a structured charting framework in which each study was coded according to intervention type, oral health focus, CHW roles, target populations, and implementation context. This approach enabled comparison across diverse study designs and program models without aggregating outcomes quantitatively. The complete data extraction matrix is provided as Supplementary Table S1.

Given the substantial heterogeneity observed across studies, particularly regarding program content and the scope of CHW responsibilities, a narrative synthesis supported by a summary table, a map, and figures was deemed the most appropriate method for evidence

integration. Therefore, the synthesis seeks to elucidate the defining characteristics of CHW-driven oral health promotion interventions in LMICs.

Consistent with the principles of scoping review methodology, this review did not include a formal risk of bias evaluation, as the objective was to provide an overview of the available evidence rather than to assess the methodological rigor of individual studies. Because no meta-analysis was performed, effect size calculations were not applicable. The findings were summarized descriptively by grouping the studies according to the nature of the intervention strategies and the contexts in which they were applied. No statistical or other forms of quantitative synthesis were performed. Although variability among the included studies was anticipated, no formal heterogeneity assessment was performed given the descriptive scope of the review. Sensitivity analyses were not undertaken because there was no quantitative data synthesis.

Results

A total of 1,129 records were identified through database searches. After removing 81 duplicates, 1,048 titles and abstracts were screened, of which 994 were excluded. The full texts of 54 articles were then assessed for eligibility, and 30 were excluded. An additional 11 records were identified through a citation search and assessed at the full-text level, of which three were excluded. In total, 32 articles met the inclusion criteria and were included in

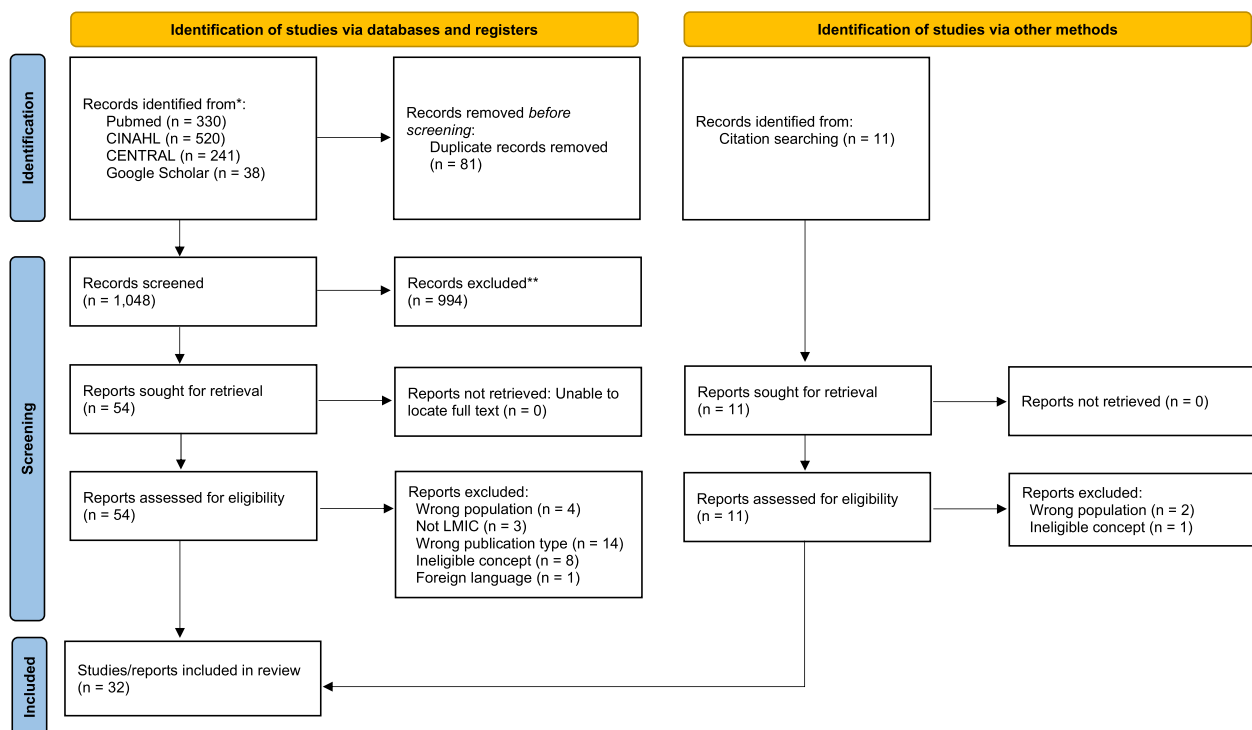


Fig. 1 PRISMA flow diagram of study selection process

this scoping review of CHW-supported oral health interventions in LMICs (Table 1).

Geographical distribution

The included studies covered six countries in Asia, one in South America, and four in Africa (Fig. 2). Of the 32 articles, half originated from India, five from Thailand, and two from Nepal. While most studies were conducted in rural provinces or districts, some focused on populations in urban settings, such as Manila [49] and Nairobi [56]. One study reported an oral health initiative for refugees living in camps in Kigoma, Tanzania [57].

Overall, the included studies were concentrated in a limited number of LMICs, with a strong geographic skew toward South and Southeast Asia, particularly India.

Target population and oral conditions

Most studies targeted specific age groups and focused on the oral health issues commonly observed within these stages of life, which inherently limited temporal continuity across different life stages (Fig. 3). Three studies addressed oral hygiene and caries prevention among preschool or school children [29, 36, 51]. Interventions targeting pregnant women focused primarily on periodontal disease [48, 55]. Three studies engaged mothers or caregivers of preschool children to improve their oral health awareness and prevent early childhood caries [37, 44, 45]. Half of the studies, mostly from India, focused on oral cancer as the primary target of CHW-supported interventions, predominantly among adults with a history of tobacco or alcohol use [26–28, 30–35, 38–43, 50]. Some interventions combined oral cancer screening with breast and cervical cancer screening for adult women [27, 30, 34]. Other interventions aimed to improve oral health knowledge and behaviors among homemakers [53] and enhance overall oral health conditions among the elderly [52], people living with HIV [56], individuals with type 2 diabetes mellitus [47], refugees [57], and other vulnerable groups [50].

Overall, the interventions largely targeted specific population groups and life stages, reflecting a cross-sectional focus rather than continuity across the life course.

CHWs' background characteristics

Most studies recruited CHWs already engaged in local health services. These included Accredited Social Health Activists [26, 27, 29, 31–33], Anganwadi workers (CHWs mainly for maternal and child health in India) [29, 33, 36, 37], Village Health Volunteers [42, 43], and Village Health Communicators [46]. In line with the inclusion criteria of the review, none of the CHWs had a dental background. All the CHWs received oral health education and training specific to the interventions. The number of CHWs

involved in the interventions ranged from two [32] to 25,338 [42].

Collectively, these studies indicate that CHWs involved in oral health promotion were predominantly existing community-based health workers who received intervention-specific training without formal dental backgrounds.

CHWs' roles

Home visits

More than half of the studies (18/32) reported that CHWs provided oral health services through home visits (32, 35–37, 39–41, 43, 44, 46–54). Several studies emphasized the importance of home visits in reaching caregivers [44] and reported associations with reduced loss to follow-up in some settings [26]. In addition to households, CHWs provided services in workplaces [32], community centers [29], schools [51], and temporary project camps [34, 57].

Overall, home visits were commonly reported as a key delivery platform for CHW-supported oral health activities across diverse community settings.

Community education

Approximately half of the studies described community education as a major role of CHWs [29, 36, 37, 44, 45, 53]. Educational content included information on the number and function of teeth, primary versus permanent dentition, and dietary habits to support oral health. Instructions on oral hygiene practices were common, including proper tooth brushing techniques, brushing twice daily, tongue cleaning, and mouth rinsing.

Taken together, community education emerged as a frequently reported role of CHWs, focusing primarily on basic oral health knowledge and hygiene practices.

Screening

Across studies, screening activities were implemented using diverse but conceptually similar approaches, primarily combining risk assessment interviews and direct oral examinations conducted by trained CHWs. The majority of studies (23/32) reported that CHWs conducted screening for oral diseases through face-to-face interviews [26, 42, 43, 55], oral examinations [28, 31, 32, 34, 35, 38–41, 46, 48, 50–52, 57], or both [27, 30, 33, 47]. Interviews were often used to identify tobacco and alcohol users as candidates for further oral examinations to detect cancer.

Following training on oral cancer etiology, epidemiology, clinical presentations, and hands-on oral inspections, CHWs screened for oral cancer through direct examination [27, 28, 30–35, 38–41, 46–48, 50–52, 57]. They were provided with tools, such as tongue depressors, gloves, masks, flashlights, hand sanitizers, mobile phones for data entry, and easy-to-use reference manuals. One study conducted in Brazil utilized the Revised

Table 1 Summary table of included studies

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs										Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes
					V	E	SQ	T	R	F	M						
Hariprasad et al. 2025 [26]	India (Assam); LMIC	Primary health care-linked, government-led CHW cancer screening program supported by mHealth	199 Accredited Social Health Activists	73630 individuals aged 30–65, tobacco/alcohol users; Oral cancer	✓	✓	✓	✓	✓	✓	✓	- Tablets with pre-installed Mobile Application - Education material			- Elderly CHWs had never used smartphones. - Continuous CHW retraining was needed.	- Tablet app enabled CHWs to effectively record data and track referrals. - Alert system and offline mode improved follow-up and usability. - Model proven feasible and scalable for other LMIC cancer screening programs.	
Palaniraja et al. 2025 [27]	India (Rajasthan, Kerala, Tamil Nadu); LMIC	Government-led, primary health care-linked CHW cancer screening and referral program	47 CHWs	Rural population; Oral cancer	✓	✓	✓	✓	✓	✓	-	- Insufficient formal training of CHWs - Inadequate health infrastructure and fragmented referral systems - Financial constraints and transportation barriers to screening services - Low health literacy and fear of cancer diagnosis - Family hierarchy and male-dominated decision-making patterns - Traditional treatment preferences and delay in seeking formal care			- CHWs play a vital role in early cancer detection but face multiple barriers. - Strengthened training, infrastructure, and CHW integration into referral systems are needed. - Evaluation of the impact, sustainability, and social determinants of CHW programs is needed.		

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs												Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes
					V	E	SQ	SE	T	R	F	M							
Thampi et al. 2022 [28]	India (Uttar Pradesh); LMIC	Community-based, primary health care-linked oral cancer screening program using mHealth, with dentist supervision	10 CHWs	1200 residents; Oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> - Mobile phone-app for screening - Screening tools (e.g. disposable masks, flashlight) - Manual for oral lesion identification - Referral cards 	<ul style="list-style-type: none"> - CHWs overlooked lesions in the lower oral regions because of inadequate retraction during examination. 	<ul style="list-style-type: none"> - Near-perfect agreement observed between CHWs and dentists in lesion identification. - Training CHWs for oral cancer screening in LMICs is feasible. - RCT is needed to evaluate effectiveness and cost-effectiveness. 	
Khanna et al. 2021 [29]	India (Rajasthan); LMIC	Primary health care-linked, community-based oral health promotion program delivered through Anganwadi and ASHA centers	52 Anganwadi workers and 35 ASHA workers	148 children aged 1–6 years; Decayed Missing Filled Teeth, Oral hygiene	✓												<ul style="list-style-type: none"> - Two months after CHW training, significant improvements were seen in children's oral hygiene indicators. - CHWs demonstrated strong potential to raise awareness and reduce oral diseases in India. 		
Basu et al. 2019 [30]	India (Rajasthan); LMIC	Community-based, primary health care-linked integrated NCD screening program delivered through CHW home visits	10 female CHWs (aged 25–45 at least 2nd-level education)	1998 men and 4997 women aged 30–60; Oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> - Education material (flipchart) - Screening tools (torch, wooden spatula) 	<ul style="list-style-type: none"> - CHWs are overloaded with numerous routine health programs. 	<ul style="list-style-type: none"> - CHWs can effectively promote oral health awareness; perform oral visual exam, and disease prevention in India. 		

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs												Key findings and reported outcomes	
					V	E	SQ	SE	T	R	F	M	Tools/materials used by CHWs	Reported implementation challenges				
Birur et al. 2018 [31]	India (Karnataka and three other states); LMIC	Community-based, mHealth-enabled oral cancer screening program linking CHWs to remote specialists	Frontline healthcare providers, e.g. Accredited Social Health Activists	42754 subjects; Oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> - Mobile phones - Poin Mapper (decision supported algorithm) - Screening software 	<ul style="list-style-type: none"> - Poor internet connectivity- Post-training dropout of CHWs- Low participation due to absence of male family members, social stigma, lack of time, perception being healthy - Unwillingness to travel for biopsy because of fear and long distance to facilities - Incomplete data and delayed communication between specialists and field providers 	<ul style="list-style-type: none"> - CHWs can use smartphone technology for oral cancer prevention but require further training. - Screening was highly cost-effective (<\$1 per person). - Recommendations: Focus on high-burden areas, maintain low-cost screening, establish referral linkages between rural and higher-level centers.
Birur et al. 2019 [32]	India (Karnataka and three other states); LMIC	Workplace-based, mHealth-enabled oral cancer screening program involving CHWs with onsite and remote specialist support	2 CHWs (high-school educated)	3445 male employees aged 18-57; Oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	<ul style="list-style-type: none"> - Mobile phone-based questionnaire 	<ul style="list-style-type: none"> - Remote consultation was time-consuming. - Some CHWs captured poor quality or incorrect images, missing the actual lesion. - Diagnostic accuracy depended on the quality of data and images provided by CHWs. 	<ul style="list-style-type: none"> - CHWs can support mHealth-based screening for oral precancer detection. - CHWs' demonstrated high sensitivity and specificity in diagnostic performance. - CHWs act as first contact points for high-risk groups, helping downstage cancer and improve survival.

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs	Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes						
					V	E	SQ	SE	T	R	F	M		
Philip et al. 2018 [33]	India (Kerala); LMIC	District-wide, government-led population-based oral cancer screening program integrated with primary health centers and specialist referral camps	6325 Accredited Social Health Activist workers, Anganwadi workers, self-help group, NGO members	1061088 people from 265272 houses in 48 panchayaths aged >15; Oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	- Survey forms	- Program success highlights the importance of CHWs in large-scale cancer initiatives. - Early detection of precancer and early-stage cancer should be prioritized.
Bhatt et al. 2018 [34]	India (Ruhsa, Mungeli, Padhar); LMIC	Community-based, mHealth-supported cervical and oral cancer screening program delivered by CHWs with nurse support	25 CHWs	8686 residents; Oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	- Mobile phone	- A simple, low-cost mHealth tool had high uptake and acceptance among trained CHWs. - CHWs reported improved screening reliability with the tool. - mHealth supports cancer screening in rural areas, but needs to be combined with community education.
Mishra and Bhatt 2017 [35]	India (Gujarat); LMIC	Large-scale, community-led head and neck cancer awareness and screening program using CHWs with referral to tertiary care	5214 voluntary village health workers (mean education: 8–9 th grade)	2610432 residents in 1862 villages; Head and neck cancers	✓	✓	✓	✓	✓	✓	✓	✓	- Education Manual/Booklet - Descriptive portrayal of performing examination	- CHWs successfully referred suspected individuals; 57% tested positive for cancer. - The program increased awareness, promoted tobacco cessation, and encouraged early clinic visits.
Raj et al. 2013 [36]	India (Chandigarh city); LMIC	Urban, community-based oral health promotion program delivered through CHWs to reach mothers and pre-school children	400 Anganwadi Workers	534 children aged 36–72 months; Oral health status in general, oral care practices	✓	✓	✓	✓	✓	✓	✓	✓	- Poster and story on oral hygiene	- Trained CHWs effectively deliver preventive oral healthcare. - Significant improvements in debris, plaque, caries activity, and oral hygiene practices. - Prevention-focused oral health policy is recommended for resource-limited settings.

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and character-istics of CHWs	Target population and oral health focus	Roles performed by CHWs						Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes		
					V	E	SQ	SE	T	R				F	M
Nair et al. 2009 [37]	India (Kerala); LMIC	Community-based oral health education program delivered through existing CHWs to mothers of young children	115 Community-level workers	232 mothers of children aged 0–6; Oral health awareness	✓								- Audiovisual aids, modules, charts, posters and brochures	- One-day training was insufficient to cover key topics (e.g., gum disease management).	- CHW-led education effectively improved mothers' oral health knowledge. - Existing primary care systems need to deliver community oral health services - Long-term follow-up to sustain behavior change is required.
Sankaranarayanan et al. 2005 [38]	India (Kerala); LMIC	Population-based, community-level oral cancer screening program delivered by CHWs with referral to clinical services	14 CHWs (non-medical university graduates)	87655 participants aged 35 or older with-out history of oral cancer; Oral cancer	✓	✓							- Manuals on visual inspection with photos of oral lesions	-	- CHWs' oral visual screening can reduce oral cancer deaths in high-risk populations (though not statistically significant in this study) - Screening should target high-risk individuals alongside preventive measures.
Ramadas et al. 2003 [39]	India (Kerala); LMIC	Population-based, community-level oral cancer screening program delivered by CHWs with referral to clinical services	15 CHWs (non-medical university graduates)	69896 subjects aged 35 or older; Oral cancer	✓	✓							- Manuals on visual inspection with photos of oral lesions	- Low compliance with referral	- Oral screening should be integrated into India's routine health services. - After completing two rounds of screening by CHWs, oral cancer mortality rates were similar in both study groups.
Sankaranarayanan et al. 2000 [40]	India (Kerala); LMIC	Population-based, community-level oral cancer screening program delivered through home-based oral visual inspection by CHWs with referral to clinical services	16 CHWs (non-medical university graduates)	49179 subjects; Oral cancer	✓	✓							- Manuals on visual inspection with photos of oral lesions	- Low compliance with referral	- Among 49179 individuals screened by CHWs, 7% had referable oral lesions. - Only 53% of referred individuals complied with referral, indicating need for improvement. - Intermediate outcomes showed satisfactory progress.
Mathew et al. 1997 [41]	India (Kerala); LMIC	Population-based, community-level oral cancer screening program delivered by CHWs with referral to clinical services	17 CHWs (non-medical university graduates)	9000 individuals aged 35–64; Oral cancer	✓	✓							-	-	- High concordance observed between CHWs and physicians in identifying oral precancerous lesions. - Trained CHWs can screen for oral lesions with accuracy comparable to doctors.

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs												Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes
					V	E	SQ	SE	T	R	F	M							
Klongnoi et al. 2022 [42]	Thailand (Buriram, Chaiyaphum, Nakhon Ratchasima, Surin); UMIC	Province-wide, government-led, stepwise oral cancer and OPMD screening program using CHWs with referral to sub-district and district hospitals	25338 Village Health Volunteers	330914 sub-jects aged 40 or older; Oral potentially malignant disorder (OPMD) and oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	- Low compliance with referral	- Trained CHWs can detect early lesions and facilitate timely care. - Common histopathological findings: epithelial dysplasia, hyperplasia, lichen planus, acanthosis		
Klongnoi et al. 2021 [43]	Thailand (Buriram, Chaiyaphum, Nakhon Ratchasima, Surin); UMIC	Province-wide, government-led, multi-tier community-based oral cancer screening program using CHWs, dental auxiliaries, and dentists with integrated digital data management	Village Healthcare Volunteers	392396 individuals aged 40 or older; Oral potentially malignant disorder and oral cancer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	- The program provided comprehensive care from screening to follow-up. - The community-based digital model proved effective and scalable.- Most suitable for countries with well-established healthcare networks.		
Vichayan-rat et al. 2013 [44]	Thailand (Chon Buri); UMIC	Community-based, multi-level children's oral health promotion program implemented through CHWs and primary care providers within a rural primary health care setting	49 Village Health Volunteers	Caregivers of children aged 6–36 months; Early childhood caries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	- Fluoride supplements, toothbrushes, toothpaste for caregivers every three months	- Difficulty conducting home visits due to families moving or being unlocatable - Assumption that caregivers already had sufficient oral health knowledge - Conflicting beliefs about oral health practices (e.g., fluoride use) - Lack of skills in counseling caregivers on healthy snacks for children.	- Barriers and facilitators for CHWs in oral health promotion were identified through 12 focus groups and 11 interviews. - Utilizing CHWs for oral health promotion is feasible and should be strengthened.		

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs	Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes						
					V	E	SQ	SE	T	R	F	M		
Vichayan-rat et al. 2012 [45]	Thailand (Chon Buri); UMIC	Community-based, multi-level oral health promotion intervention delivered through CHWs, health centers, and community mobilization within a primary health care setting	Lay Health Workers	114 pairs of caregivers and children aged 6–36; Oral health behavior associated with early child-hood caries	✓	✓							<ul style="list-style-type: none"> - Lack of time and human resources, system coordination, lack of ownership - Conflicting beliefs about oral health practices (e.g, fluoride use) - Lack of skills in counseling care-givers on healthy snacks for children - Training program was not adapted to local conditions. - Oral health workers were frustrated by being limited to scaling only. - Village scalars faced poor working conditions, low pay, no career ladder. - Logistical, financial, and organizational barriers hindered full implementation. 	<ul style="list-style-type: none"> - One-year intervention including CHWs' education improved childrens and caregivers' knowledge and oral care practices. - No significant effect observed on dental caries, bottle feeding, or snack consumption. - Multi-level factors influenced behaviors but not caries outcomes.
Anumanra-jadhon et al. 1996 [46]	Thailand (Chiang-mai, Lamphun); UMIC	Community-based, government-supported oral health service delivery model using CHWs (inc. village scalars) for basic preventive and curative care	Village Health Communi-cators, Village Health Volunteers, 18 Village scalars (who completed secondary school)	Community residents; Oral health in general	✓		✓	✓	✓				<ul style="list-style-type: none"> - CHWs can acquire effective oral care skills through performance simulation training. - Clear career pathways for CHWs should be established. - Oral health treatment should be integrated into existing health systems. - Community involvement and early financing arrangements are essential. 	

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs	Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes					
					V	E	SQ	SE	T	R	F	M	
Harada et al. 2025 [47]	Nepal (Kavrepa-lanchowk, Kathmandu); LMIC	Primary health care-based oral health promotion for people with type 2 diabetes, exploring integration through CHWs	11 CHWs (received up to 2 years of training, following high-school education)	Patients who visit health centers due to oral diseases or type 2 diabetes mellitus; Oral health in general	✓	✓	✓	✓	✓	✓	✓	✓	- CHWs can effectively deliver oral health services for people with T2DM in Nepal. - Strengthening the health system and supporting CHWs through training, supervision, incentives, and resources are essential. - Integrating oral health into T2DM care at the primary level is recommended.
Erchick et al. 2020 [48]	Nepal (Sarlahi); LMIC	Home-based periodontal assessment conducted by CHWs as part of a task-shifting approach within a rural primary health care context	5 female CHWs	21 pregnant women <26 weeks gestation; Periodontal disease	✓	✓	✓	✓	✓	✓	✓	✓	- Lack of policies and guidelines for oral health care, especially for people with T2DM - No standardized guidelines or training for CHWs - Limited oral health capacity among CHWs - Inadequate resources and supplies in primary health care settings - Difficulty performing periodontal examinations in community settings due to poor field conditions (e.g., lack of adequate lighting) - Oral exam tools (e.g. headlamps, Color Williams probe) - A list of government-run dental health care facilities - Acceptable agreement found between CHWs and dentists examination results. - CHWs can accurately perform periodontal exams in rural home settings, reducing reliance on dentists. - Task-shifting to CHWs should account for health system, community and national factors. - Expanded CHW roles are needed to improve oral health care in low-resource settings.

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs												Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes
					V	E	SQ	SE	T	R	F	M							
Parajas and Palacios, 1998 [49]	Philippines (Manila); LMIC	Community-based preventive oral health program implemented in urban poor settings, utilizing CHWs to deliver preventive services and facilitate referrals to formal dental care	28 CHWs/volunteers	Residents aged 3–14 and 20–34; Oral hygiene, periodontal disease	✓	✓												<ul style="list-style-type: none"> - Involving CHWs improves access to and affordability of dental care. - Participants showed increased knowledge and improved oral health. - Trained CHWs should be integrated into the oral health system. - CHW training should be extended to 1–2 months with practical field experience. 	
Saparamadu, 1984 [50]	Sri Lanka; LMIC	Community-oriented, prevention-focused oral health program led by CHWs, emphasizing education, screening, and referral within a national oral health context	Family Health Workers and Village Health Volunteers	29425 residents and vulnerable groups; Oral cavity, pre-carcinous oral mucosal lesions	✓	✓												<ul style="list-style-type: none"> - Achieving community-wide oral health requires a prevention-focused approach. - Field-based, community-oriented programs emphasizing prevention and education are practical for developing countries. 	
Ashtiani et al. 2024 [51]	Iran (Mashhad city); UMIC	School-based tele-dentistry screening program using CHWs, with remote dentist assessment	1 CHW with no prior dental training	131 children aged 8.7–11.6 years; Dental caries	✓													<ul style="list-style-type: none"> - Tele-dentistry by CHWs showed high diagnostic accuracy and was cost-effective for detecting caries in schoolchildren. - Task-shifting from pediatric dentists to CHWs should be promoted. - An innovative, sustainable model for school-based dental screening in LMICs is needed. 	

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs										Tools/materials used by CHWs	Reported implementation challenges	Key findings and reported outcomes
					V	E	SQ	SE	T	R	F	M					
Ribeiro et al. 2014 [52]	Brazil; UMIC	Primary health care-based oral health screening for elderly populations using CHWs within the Family Health Strategy	10 CHWs	110 elderly aged 60–94; Oral health in general	✓	✓	✓										- CHWs used the ROAG tool, which showed high sensitivity and specificity for assessing oral health in the elderly. - ROAG effectively evaluates voice, swallowing, tongue, and dental conditions. - The tool is valid and reliable for CHWs and can expand elderly patients' access to dental care within Brazil's health system.
Frazaio and Marques, 2009 [53]	Brazil (Rio Grande da Serra city); UMIC	Community-based oral health promotion program delivered by CHWs, integrated into local primary health services through capacity building and supervision	36 CHWs	Homemaker literate women and mothers aged 25–39; Oral health knowledge and behavior	✓	✓											- CHWs significantly enhanced participants' perceptions, self-efficacy, healthy behaviors, and service access. - Participants showed improved oral health knowledge and behaviors. - A comprehensive care model involving the full health team and community organizations is needed.
Morgan et al. 2023 [54]	Zambia; LMIC	Prevention-focused, community-based oral health outreach program integrated with local health system development	10 Community volunteers	5791 residents who sought dental care; Oral health in general	✓												- CHWs' education increased preventive oral health visits, particularly among younger males. - Collaboration with community partners improved water access and local health services. - Context-specific lessons support sustainable, community-driven oral health outreach models.
Antony et al. 2019 [55]	Malawi (Lilongwe); LIC	Facility-based oral health assessment integrated into maternal health services, supported by CHWs	CHWs (without formal health training)	387 pregnant and recently postpartum women; Caries and periodontal disease	✓												- CHWs' screening found high prevalence of dental caries and dental diseases. - Pregnant and postpartum women are key target groups for caries and periodontal disease prevention.

Table 1 (continued)

Author/year	Country (province/state) and World Bank income classification	Health system/implementation context	Type and characteristics of CHWs	Target population and oral health focus	Roles performed by CHWs											Reported implementation challenges	Key findings and reported outcomes	
					V	E	SQ	SE	T	R	F	M	Tools/materials used by CHWs					
Koyio et al. 2014 [56]	Kenya (Nairobi); LMIC	Training-based integration of oral lesion screening into HIV testing pathways at primary health care and community levels	519 CHWs	HIV-infected patients; HIV-related oral lesions	✓													<ul style="list-style-type: none"> - CHWs educated communities on the importance of HIV-related oral lesions (HROs) and early care seeking. - Training improved CHWs' knowledge and referral rates for HROs. - Despite higher referrals, diagnosis rates at health facilities did not increase.
Roucka 2011 [57]	Tanzania (Mtabila and Nyarugusu camps Kigoma); LMIC	CHW-delivered emergency dental care and health promotion program implemented in long-term refugee camp settings	12 refugee health-care workers and 12 students	Refugees in two long-term refugee camps; Dental caries, periodontal disease, etc.	✓		✓	✓	✓	✓								<ul style="list-style-type: none"> - Training CHWs enabled basic emergency dental care and oral health education in refugee camps. - Most patients received dental extractions; others received antibiotics, pain relief, periodontal care. - Such programs can help overcome limited dental care access in long-term refugee settings.

Abbreviations: CHW Community health worker, V Home visit, E Education, SQ Screening by questionnaire, SE Screening by oral examination, T Treatment, R Referral, F Follow-up, M mHealth World Bank income classification based on World Bank list of economies (July 2025); LIC Low-income country, LMIC Lower-middle-income country, UMIC Upper-middle-income country

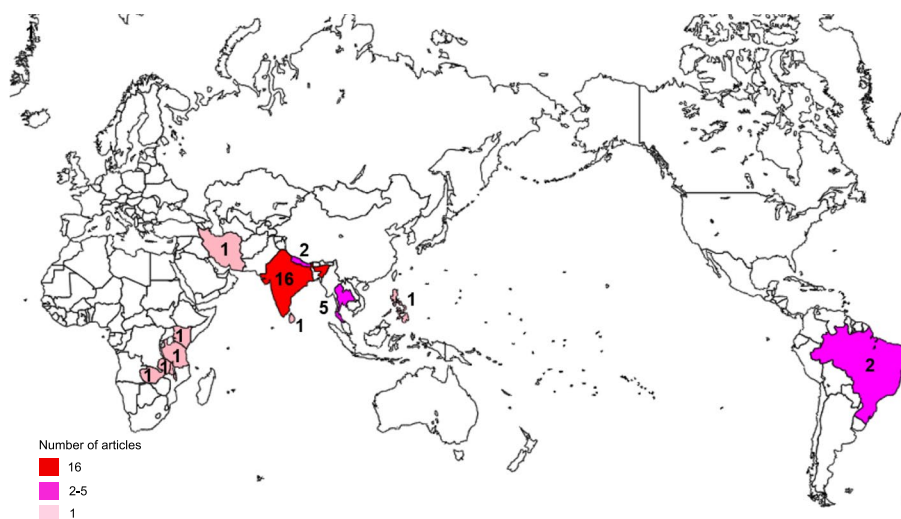


Fig. 2 Geographical distribution of studies included in this scoping review. Numbers shown within or near each country indicate the number of articles identified from that country

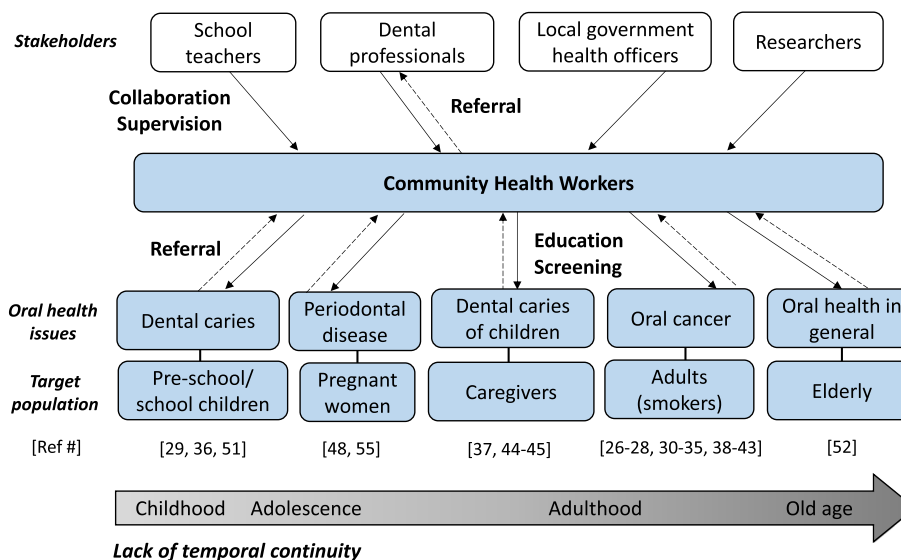


Fig. 3 Age groups and corresponding oral health issues addressed in the included studies. Most studies concentrated on specific age cohorts and examined oral health problems characteristic of those developmental stages, reflecting a cross-sectional rather than longitudinal approach that limits temporal continuity across the life course

Oral Assessment Guide (ROAG), a tool with eight categories (voice, lips, mucous membranes, tongue, gums, teeth/dentures, saliva, and swallowing) that is widely used internationally for the pre-diagnosis of oral health conditions among elderly populations [52].

Some interventions demonstrated the feasibility of combining oral cancer screening with breast and cervical cancer screening, with [26, 34] and without [27, 30] mobile Health (mHealth) tools.

Overall, screening activities represented one of the most frequently reported roles of CHWs, particularly for oral cancer detection among adult populations.

Treatment

A small number of studies described CHW involvement in basic oral health treatments, with the scope of practice varying by local context and training models. Three studies reported that CHWs provided treatment, including scaling [46, 57], tooth extraction [47, 57], antibiotics, and analgesics [47]. In Thailand, young people with secondary school education were trained for two weeks as “Village Scalers” to perform scaling, sterilization, infection control, referrals, and pain relief [46]. Refugee health workers in refugee camps in Tanzania were trained by dentists from the US to provide emergency dental care, extraction, and scaling for periodontal disease [57]. These

studies described the delivery of basic oral health treatments by CHWs in selected community settings.

Collectively, these studies describe a limited but diverse range of basic oral health treatments delivered by CHWs in selected contexts, noting that such tasks are unusual for CHWs in many settings.

Referral and follow-up

Referral was identified as a key role of CHWs in 18 studies [26–28, 30, 33, 35, 38–43, 46, 47, 49, 50, 56, 57]. Based on interviews and oral examinations, CHWs referred individuals with risk factors or suspicious lesions to dental clinics, hospitals, or research centers for further assessment and treatment. Three studies also reported CHWs following up on referred patients to improve adherence [26, 33, 42].

Overall, referral was a commonly described component of CHW-supported interventions, though their implementation varied across settings.

mHealth

Across studies, mHealth tools were applied in similar ways to support screening, documentation, referral, and follow-up within CHW-supported oral health initiatives. Between 2018 and 2025, six studies documented the use of mHealth technology in CHW-supported oral health initiatives [26, 28, 31, 32, 34, 51]. In most of these studies, CHWs conducted intraoral examinations, captured photographs, and uploaded the images for remote evaluation by dental professionals. For instance, a study conducted in Iran used smartphone-based photography to screen schoolchildren for dental caries. A CHW received two days of training on infection control, child positioning, retraction techniques, and secure data handling before screening 131 children. At least five intraoral photographs were taken per child and subsequently examined by two remote dentists [51].

Five of the included studies specifically employed mHealth approaches for oral cancer screening [26, 28, 31, 32, 34]. The most recent study, conducted in India, described the development and implementation of a mobile application-based cancer screening and surveillance system. This system integrates an Android-based mobile application and web portal designed for real-time data collection, monitoring, and rapid referral of screen-positive cases. Each CHW was equipped with a tablet preloaded with the screening application and performed door-to-door oral screening. Abnormal findings identified during oral examinations were recorded by touching pictorial icons within the application, and individuals with suspected oral lesions were referred for further evaluation. The application also generated automated reminders for the CHWs to facilitate the follow-up of the referred participants [26].

Taken together, mHealth tools were reported in a subset of studies to support screening, data collection, referral, and follow-up processes within CHW-supported oral health initiatives.

Challenges CHWs faced when providing oral health services

Reported challenges spanned multiple levels, including health system constraints, participant-related barriers, training limitations, CHW capacity issues, and mHealth-related challenges.

Health system

Health system-related challenges included the absence of clear policies and guidelines [47], limited health infrastructure [27, 46, 47], and inadequate provision of instruments and supplies [49]. Additional barriers included high workloads among healthcare providers [31, 56], insufficient supervision [49], and fragmented referral systems compounded by transportation difficulties [27].

Participants

Participant-related challenges included male-centric family decision-making structures [27], absence or migration of participants [31, 44], and fear of cancer or oral disease diagnoses [27, 56]. Financial burdens and time constraints, particularly in accessing advanced care, discouraged participation [27, 34, 57]. Additional difficulties involved low compliance with referrals [39, 40, 42], conflicting beliefs about oral health care, such as skepticism toward fluoride supplements [44, 45], and frustration when treatment options, such as fillings or extractions, were unavailable [46].

Training

Training-related challenges included insufficient training opportunities [27, 37], high dropout rates from training programs [31], and curricula not adequately adapted to local realities [46].

CHWs

CHW-related challenges encompassed missed identification of oral lesions, particularly in the lower vestibular mucosa, buccal mucosa, and lower lip, owing to inadequate retraction [28]. CHWs were also overburdened with existing responsibilities in routine health services [30, 46]. Furthermore, limited career advancement opportunities [46] and inadequate salaries [46] negatively affected their motivation and retention.

mHealth

mHealth-related challenges included difficulties using tablets or smartphones [26], poor internet connectivity, additional time required by dental professionals

for remote diagnosis [31], and poor quality of images captured by CHWs [32]. The inherent limitation of two-dimensional mobile phone photography further constrained accurate diagnoses [51].

Across studies, challenges related to health systems, participant engagement, training, CHW capacity, and mHealth implementation were variably reported.

Outcomes and implementation indicators

Across the included studies, reported outcomes varied substantially in type and depth. Most studies primarily assessed implementation-related indicators, such as feasibility, acceptability, coverage, and referral completion, rather than clinical or population-level oral health outcomes. Only a limited number of studies reported outcomes beyond implementation indicators, including intermediate outcomes such as oral health knowledge and screening uptake, as well as selected clinical indicators. Accordingly, the evidence synthesized in this review should be interpreted predominantly as reflecting implementation feasibility and process performance, rather than definitive effectiveness in improving oral health outcomes.

Discussion

This scoping review synthesized evidence from 32 studies conducted across LMICs and demonstrates that CHWs are actively engaged in a wide range of oral health promotion activities, most commonly in education, screening, referral, and follow-up, particularly for oral cancer, dental caries, and periodontal diseases. The findings illustrate that CHWs have been positioned as key front-line providers of community-based oral health services in settings characterized by limited oral health workforce capacity and constrained access to care. However, despite demonstrating feasibility and impact, these interventions faced challenges related to health system limitations, participant barriers, inadequate training, CHW workload and motivation, and technological constraints, highlighting both the potential and complexities of implementing CHW-supported oral health initiatives in LMICs. Notably, many of these challenges reflect fragmented and episodic approaches to oral health promotion, underscoring the need for more integrated models that ensure continuum of care across life stages and levels of the health system.

Overall, this scoping review demonstrated that CHWs play a vital role in oral health promotion at the community level. Globally, there is a critical shortage and maldistribution of the oral health workforce. For example, the global average is approximately 3.3 dentists per 10,000 people, with pronounced regional inequalities, particularly lower densities in LMICs such as Africa (0.44 per 10,000) and Southeast Asia (1.64 per 10,000) [9]. The

WHO Global Oral Health Status Report warns that, without stronger national investment, the gap in dentist availability between high- and low-income countries will widen [1]. The Lancet Oral Health Series and WHO projections indicate that these shortages are likely to persist [1, 58]. Furthermore, urban–rural disparities are unlikely to close quickly [9]. Therefore, CHWs are expected to play an increasingly important role as bridges between communities and professional oral health services.

This scoping review also complements and extends evidence from previous syntheses on task sharing and CHW integration in other health domains, such as maternal and child health [15], HIV [16], and tuberculosis [17]. Prior reviews have consistently shown that CHWs can effectively deliver preventive services, support early detection, promote treatment adherence, and strengthen links between communities and formal health systems when provided with appropriate training, supervision, and system support [13]. Similar enabling conditions were identified in the present review, including the importance of refresher training, supervision by professionals, and functional referral pathways.

However, oral health presents several domain-specific challenges that distinguish it from other areas of task sharing. Unlike maternal and child health or infectious disease programs, oral health interventions often involve invasive procedures, specialized instruments, and strict infection control requirements, which constrain the scope of tasks that can be safely delegated to CHWs [48]. Consequently, CHW-supported oral health initiatives in LMICs have predominantly focused on health promotion, screening, early detection, and referral rather than comprehensive treatment, a pattern less pronounced in other health domains [21]. By situating the findings of this review alongside previous syntheses on task sharing and CHW integration in other health domains, this scoping review highlights both shared principles and domain-specific differences relevant to oral health in LMICs.

CHWs demonstrated the ability to acquire essential competencies in oral health education, screening, and selected treatment procedures within relatively short training periods. Training initiatives ranged from a brief two-hour oral health training package focusing on oral health education [36] to more extensive courses (spanning 3–4 weeks) covering dental anatomy, oral pathology, and periodontal examination with supervised practice [48]. Although previous studies have emphasized the limitations of CHWs stemming from the absence of formal professional education [59, 60], evidence indicates that refresher and continuous training complemented by supervision from health care professionals can mitigate these challenges and substantially enhance CHW performance [47, 56, 61].

Another notable strength of CHWs lies in their ability to conduct home visits, effectively leveraging their community networks to reach target populations [44] and reduce loss to follow-up [26]. This close proximity to households enables CHWs to provide direct care in community settings, reinforcing their critical role in expanding access to oral health services [26, 28, 30, 31, 33, 34, 38–45, 48, 50, 52, 53]. Collectively, these findings underscore the adaptability of CHWs and highlight their potential to strengthen oral health service delivery in underserved areas, enabling them to effectively engage with communities and extend their care beyond conventional health facility boundaries.

Geographically, India has emerged as a leading country in community-based oral health initiatives targeting oral cancer, driven by strong government engagement through national programs, district health departments, and regional cancer centers [26, 32, 38–41]. This leadership style reflects the country's substantial disease burden, with nearly 60,000 new cases annually, the highest worldwide, and an 11% increase in mortality from 1990 to 2021 [62, 63]. Limited infrastructure and access to care in rural and underserved areas further necessitate community-level approaches [63]. India's experience offers valuable insights for other high-burden countries, provided that interventions are adapted to local health needs, sociocultural contexts, and resource availability, including CHWs.

Importantly, the predominance of studies from India reflects not only the country's high oral cancer burden but also its distinctive oral health workforce profile among LMICs. India hosts more than 300 colleges nationwide granting degrees in dentistry and produces one of the largest numbers of dental graduates globally each year, resulting in a comparatively larger pool of trained dental professionals than is available in many other LMICs [64]. This extensive dental training capacity has been accompanied by sustained political commitment to oral cancer control and the development of national and subnational programs that facilitate community-based screening and referral [26, 34, 38]. However, this workforce is unevenly distributed, with a strong concentration in urban areas and the private sector, leaving substantial gaps in access to care in rural and underserved regions [64, 65]. Within this context, CHWs have been positioned primarily as connectors who extend the reach of existing oral health services, rather than as substitutes for dental professionals [66]. In contrast, many LMICs, particularly in sub-Saharan Africa, face profound shortages of dental training institutions and qualified oral health personnel within already fragile health systems [67]. In such settings, CHWs may be required to assume more task-shifted roles, often with limited specialist supervision and referral capacity [18]. These contextual

differences, particularly India's exceptional political commitment to and investments in oral health, have important implications for how CHWs are integrated into oral health systems and underscore the need for caution against direct transfer of CHW-supported models developed in India to other LMICs without careful adaptation to local workforce capacity, health system infrastructure, and governance frameworks.

Regarding the scope of CHWs' services, although the provision of on-site dental treatment would be ideal, most interventions have primarily focused on prevention and early detection rather than treatment. These include preventive efforts targeting early childhood caries [29, 36–38, 44, 45] and the early detection of oral cancer [26–28, 30–35, 38–43, 50]. Some studies have documented treatment-related tasks, such as scaling for periodontal disease [46, 57], tooth extraction [47, 57], and the provision of antibiotics and analgesics [47]. These treatment-related roles were generally implemented under specific regulatory permissions, close professional supervision or demonstration projects, and should not be assumed to represent scalable models for routine service delivery. Despite the substantial unmet need for restorative care, such as dental fillings, which has often resulted in frustration among CHWs and community members [46], the expansion of treatment-related tasks remains limited. Considering that dental treatment requires surgical expertise, such competencies are generally not achievable through short-term CHW training alone. Moreover, because dental procedures often involve invasive interventions, it is essential to carefully consider the extent to which unlicensed personnel may be permitted to provide dental care. In line with the Global Strategy and Action Plan on Oral Health 2023–2030, which identifies oral health promotion and disease prevention as the second strategic goal, the future role of CHWs is likely to focus on strengthening preventive care and facilitating early detection and referral [68].

This review revealed the capability of CHWs to perform oral examinations using mHealth approaches in rural LMICs [26, 28, 31, 32, 34, 51]. Recent reviews have shown that the number of studies on oral health applications employing mobile technologies began to increase markedly after 2009, with multiple intervention studies emerging across various countries and regions from the early to the mid-2010s [69, 70]. Although considerable attention has been devoted to the accuracy of mHealth in detecting caries in different countries [71–73], only a limited number of studies have been conducted in LMICs [51]. Various devices, including computers, tablets, mobile phones, and satellite communication systems, have been used; however the studies included in this scoping review indicated that mobile phones were the most widely used tool for mHealth in oral health within LMICs. Although

some limitations of using mobile phones for oral examinations, such as the reliance on two-dimensional images, have been noted [51], evidence from recent reviews clearly demonstrates that application-based mHealth interventions have substantial potential to improve oral health knowledge and outcomes among diverse populations [74–76] and to support the early detection of oral cancer [77]. Taken together, these findings suggest that mHealth represents a promising and scalable strategy to strengthen oral health promotion and early detection in LMICs.

Referral emerged as a critical implementation bottleneck in CHW-supported oral health interventions in LMICs. Although referral is a key responsibility of CHWs [26–28, 30, 33, 35, 38–43, 46, 47, 49, 50, 56, 57], several studies reported poor adherence to referral advice, particularly for follow-up care related to oral cancer, periodontal disease, and other dental conditions [27, 39, 40, 42, 56, 57]. These findings suggest that structural, financial, and systemic barriers undermine referral pathways and limit the overall impact of CHW-supported oral health interventions. To address these constraints, prior evidence points to several system-oriented strategies applicable in resource-limited settings, including the integration of referral algorithms into mHealth platforms to standardize decision-making [78, 79]; collaborative models such as periodic outreach visits by oral health professionals or the co-location within community health centers to reduce travel burdens and improve follow-up [28, 80]; the combination of CHW training with system-level tools such as structured referral forms or electronic reporting [81]; and the establishment of regular feedback mechanisms among CHWs, physicians, and oral health professionals to enhance referral quality while sustaining CHW motivation and confidence [82, 83]. Collectively, these approaches represent promising strategies for strengthening referral pathways and enhancing the effectiveness of CHW-supported oral health interventions in resource-limited settings.

A further challenge identified in this scoping review is the unfavorable working conditions faced by CHWs, particularly the lack of career development opportunities. To optimize CHW contributions, substantial complementary investments in strengthening the health system and providing fair working conditions are required, together with opportunities for career advancement [84, 85]. Indeed, evidence indicates that CHWs are most effectively motivated by work that provides opportunities for personal growth and professional development, regardless of remuneration or the technical skills acquired [85]. The importance of establishing a career ladder for CHWs is also reflected in the WHO guidelines on health policy, which explicitly recommend providing structured opportunities for progressive advancement within the

health system [13]. Various approaches have been proposed to design and implement such pathways, including structured development programs and the recognition of lived experience in career progression [86, 87]. In the oral health field, the integration of CHWs into interprofessional teams has been emphasized as a way to bridge community-level interventions with clinical care while facilitating role expansion, such as task-shifting from dental professionals to CHWs [18, 27, 48]. Improving CHWs' working conditions and creating structured opportunities for career advancement are essential for sustaining motivation and reducing attrition. These measures ultimately enhance the long-term effectiveness of CHW programs.

Based on the findings of this scoping review, we recommend greater integration of the “Continuum of Care” concept into the field of oral health. The Continuum of Care, originally emphasized in maternal and child health, involves two dimensions. The first is, temporal continuity to ensure care across different life stages from pregnancy and childbirth to maternal, newborn, and child health. The second dimension involves spatial continuity linking care from the household to the community, and further, to health facilities. In this review, several studies highlighted the importance of spatial continuity in ensuring uninterrupted flow from screening to referral and treatment [26–28, 30, 33, 35, 38–43, 46, 47, 50, 57]. However, the importance of temporal continuity has been rarely addressed. Most studies have targeted specific age groups and focused on oral health issues commonly observed in these stages of life. Because oral health challenges evolve as individuals progress through life, it is essential to provide a Continuum of Care that views the family as an interconnected unit comprising members of different ages and roles. Delivering seamless, age-appropriate oral health education, screening, and care across generations is vital for achieving sustained improvements in oral health outcomes.

To integrate these findings and to situate CHW-supported oral health interventions within a broader service delivery perspective, we developed a conceptual framework illustrating CHW roles within the oral health workforce, informed by the evidence mapped in this review and aligned with a family-based package of care across the life course (Fig. 4). The proposed framework conceptualizes how CHWs deliver family-centered oral health promotion, prevention, and care at the household level, while working in coordination with dental and other health professionals within a continuum of care. The framework incorporates both spatial continuity, linking oral health services across the household, community, and primary care settings, and temporal continuity, reflecting sustained engagement with families over time.

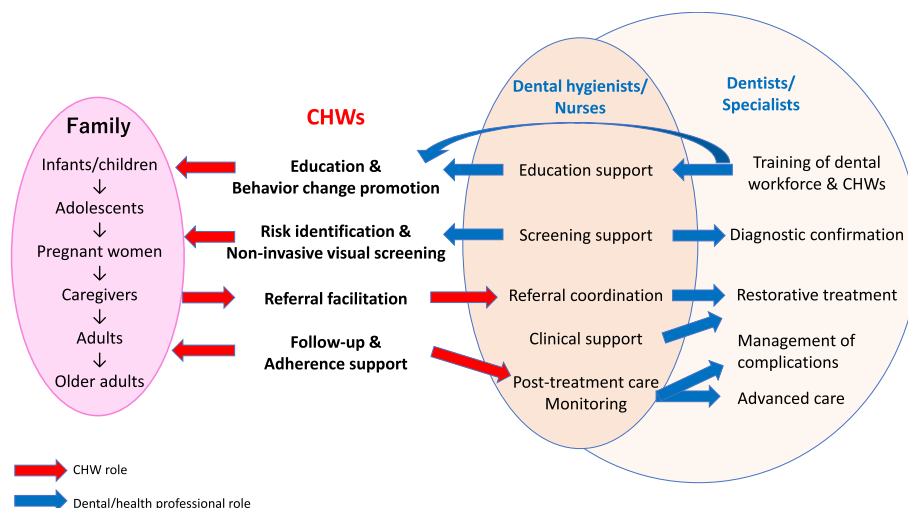


Fig. 4 Conceptual framework illustrating CHW roles within the oral health workforce, informed by the evidence mapped in this review and aligned with a family-based package of care that spans the life course

Therefore, we propose that CHWs deliver a “Family Package” of oral health services at the household level, tailored to the age and roles of individual family members. This package would integrate age-appropriate preventive education and oral health screening, thereby ensuring a Continuum of Care spanning childhood, adolescence, adulthood, and older age. Addressing all household members is important because oral health behaviors and risks are interdependent across generations; parents shape their children’s hygiene habits, while children and younger caregivers can support oral care for older adults. Engaging the entire family enables shared responsibility, reinforces consistent practices within the home environment, and helps sustain healthy behaviors, even as family roles change over time. Evidence from family-based oral health interventions has indicated that programs involving parents and children lead to greater behavioral adherence and sustained improvements compared to individual-focused interventions [88, 89]. By addressing the family as a unit, the Family Package seeks to strengthen intrahousehold support for healthy behaviors, maintain the continuity of oral health practices across the life course, and reinforce the family’s role as a foundation for community-wide health promotion.

To operationalize this approach, evidence from the included studies suggests that effective CHW training models require focused initial training combined with hands-on practice and/or role plays [26, 28–34, 36, 38–40, 44–46, 48–52, 56, 57] and refresher sessions [30, 36, 37]. Training content commonly encompassed oral health education, visual screening techniques, referral criteria, and communication skills [30, 33, 38–40, 46, 49, 54–56]. In addition, ongoing supervision, delivered through field visits, review meetings, or mHealth-enabled feedback from dental professionals, was reported

as critical for maintaining quality, confidence, and consistency in CHW performance [26, 28, 30–32, 34, 51]. Such structured training and supervisory models are particularly important for enabling CHWs to deliver family-centered interventions and to sustain a Continuum of Care across household, community, and primary health care settings, by supporting consistent role performance, effective referral, and continuity of engagement with households over time.

Specific strategies and system-level support are required to translate this concept into practice. Building on the training and supervisory approaches identified in the included studies, CHWs should be equipped with competencies in age-appropriate oral health education within the context of family dynamics, motivational interviewing, and effective educational principles [13, 85]. Beyond training and supervision, feedback mechanisms are essential to ensure fidelity and quality of implementation [84, 90], and outcome evaluation should include household-level indicators (e.g., brushing frequency, caries incidence, and screening uptake) and diffusion metrics (e.g., behavioral uptake among nearby households). Finally, sustainability can be enhanced through CHW incentives (especially career advancement) and integration within the existing primary health care structures [13, 91]. If effectively adopted and scaled, the “Family Package” model could become a platform for integrated health promotion, enabling CHWs’ co-delivery of oral health with nutrition, maternal and child health, and chronic disease modules. Over time, this model could inform policy toward embedding family-oriented prevention within national health systems.

While a comprehensive search strategy ensured broad coverage, several limitations should be noted. As is typical of scoping reviews, no formal appraisal of the study

quality or risk of bias was conducted, and the included studies showed wide variations in design, intervention type, and outcome indicators, thereby preventing direct comparisons or quantitative synthesis. Most focused on the short-term evaluation of interventions rather than sustained behavioral or clinical outcomes. Evidence was also unevenly distributed, with limited data from several LMIC regions. The restriction to English-language sources may have excluded relevant local or gray literature. Furthermore, differing definitions, training, and integration of CHWs across settings limit the generalizability of the findings. Accordingly, the findings should be interpreted primarily as evidence of implementation feasibility, with applicability to other settings contingent on local health system capacity and CHW roles. Nevertheless, this is among the few reviews that synthesize evidence of community-based oral health promotion programs involving CHWs in LMICs, and its findings can inform future research and policy efforts aimed at strengthening community-based oral health initiatives.

Conclusions

This scoping review highlights the growing potential of CHWs to strengthen oral health education, screening, and early detection in LMICs, particularly where shortages and inequities persist in the oral health workforce. Evidence demonstrates that CHWs can effectively deliver community-based interventions; conduct oral examinations, including those supported by mHealth technology; and facilitate referral and follow-up when adequately trained and supervised.

However, challenges remain, including limited health system support, weak referral mechanisms, insufficient training, and a lack of career development pathways that affect CHW motivation and retention. Addressing these constraints through structured supervision, system integration, and fair employment conditions is essential to sustaining the contributions of CHWs.

Furthermore, incorporating the Continuum of Care framework into oral health programs, by linking prevention, screening, and referral across all life stages and household members, could offer a promising approach to achieving equitable and sustained improvements in oral health among populations. The proposed “Family Package” model builds upon this concept by engaging entire households through integrated, family-centered oral health actions that can be delivered by CHWs. Future efforts should prioritize policy support, capacity building, and intersectoral collaboration to embed CHWs and the Continuum of Care for oral health within primary health care systems.

Abbreviations

CHW	Community health worker
CINAHL	Cumulated Index in Nursing and Allied Health Literature

JBI	Joanna Briggs Institute
LMICs	Low- and middle-income countries
MeSH	Medical Subject Headings
mHealth	Mobile Health
PRISMA-ScR	Preferred Items for Systematic Reviews and Meta-Analysis extension for Scoping Reviews
ROAG	Revised Oral Assessment Guide

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-026-27276-6>.

Supplementary Material 1: Appendix 1. Detailed PubMed search strategy.

Supplementary Material 2.

Acknowledgements

We would like to acknowledge Ms. Satoko Sayama, a librarian at the St. Luke's International University Library, for her contributions to designing the search strategy.

Authors' contributions

JY conceptualized and designed the review and performed the database search. The literature screening was conducted independently by JY and SO, with discrepancies resolved through independent review and consensus discussions involving YT. All authors were involved in the interpretation and analysis of the data. JY drafted the original manuscript. All authors contributed to the critical revision of the manuscript and approved the final version.

Funding

This work is supported by the Japan Society for the Promotion of Science (JSPS) KAKENHI Grant Number 24K02702. The funder had no role in the study design, data collection or analysis, the decision to publish, or the preparation of the manuscript.

Data availability

All data generated or analyzed during this study are included in this published article and its supplementary information file.

Declarations

Ethics approvals and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Division of Global Health Sciences, Graduate School of Public Health, St. Luke's International University, 3-6-2 Tsukiji, Chuo-Ku, Tokyo 1040045, Japan

²Department of Oral and Maxillofacial Radiology, Medical Development Field, Okayama University, 2-5-1 Shikata-Cho, Kita-Ku, Okayama 7008525, Japan

³Department of Oral and Maxillofacial Radiology, Faculty of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, 2-5-1 Shikata-Cho, Kita-Ku, Okayama 7008558, Japan

Received: 8 November 2025 / Accepted: 31 March 2026

Published online: 09 April 2026

References

- World Health Organization. Global oral health status report: towards universal health coverage for oral health by 2030: World Health Organization, Geneva; 2022.
- World Health Organization. Oral Health. 2025. <https://www.who.int/news-room/fact-sheets/detail/oral-health>. Accessed 20 Dec 2025.
- Chen S, Yang X, Huang L, Xie Y, Li Y, Lin Y. Increasing incidence, prevalence, and mortality of lip and oral cavity cancer in adults aged 70 and older globally: findings from GBD 2021. *World J Surg Oncol*. 2025;23(1):276.
- Li X, Li R, Wang H, Yang Z, Liu Y, Xue X, et al. Global burden of dental caries from 1990 to 2021 and future projections. *Int Dent J*. 2025;75(5):100904.
- Nascimento GG, Alves-Costa S, Romandini M. Burden of severe periodontitis and edentulism in 2021, with projections up to 2050: the global burden of disease 2021 study. *J Periodontol Res*. 2024;59(5):823–67.
- Guarnizo-Herreño CC, Celeste RK, Peres MA. The ongoing fight for population oral health. *Lancet*. 2024;404(10453):635–8.
- Peres MA, Macpherson LMD, Weyant RJ, Daly B, Venturelli R, Mathur MR, et al. Oral diseases: a global public health challenge. *Lancet*. 2019;394(10194):249–60.
- Acharya S, Mathur MR, Tadakamadla SK, Brand A. Assessing the status of oral health integration in South East Asian Regional Office countries' universal health coverage—a scoping review. *Int J Health Plann Manage*. 2024;39(2):262–77.
- Gallagher JE, Mattos Savage GC, Crummey SC, Sabbah W, Makino Y, Varenne B. Health workforce for oral health inequity: opportunity for action. *PLoS ONE*. 2024;19(6):e0292549.
- Watt RG. From victim blaming to upstream action: tackling the social determinants of oral health inequalities. *Community Dent Oral Epidemiol*. 2007;35(1):1–11.
- Molete MM, Malele-Kolisa Y, Thekiso M, Lang AY, Kong A, George A. The role of community health workers in promoting oral health at school settings: a scoping review. *J Public Health Dent*. 2024;84(2):175–86.
- Edwards JW, Bogale B, Gallagher JE. Tackling geographic barriers to primary dental care (dental deserts): a systematic review. *Br Dent J*. 2025. <https://doi.org/10.1038/s41415-025-8487-8>.
- Porignon D. WHO guideline on health policy and system support to optimize community health worker programmes. Genève, Switzerland: Organisation mondiale de la Santé; 2018.
- Lehmann U, Sanders D. CHWs: What Do We Know about Them? World Health Organization Published January 2007. Accessed 20 Dec 2025. <https://chwcen.who.org/wp-content/uploads/2013/07/Community-Health-Workers-What-do-we-know-about-them.pdf>
- Scharff D, Enard KR, Tao D, Strand G, Yakubu R, Cope V. Community health worker impact on knowledge, antenatal care, and birth outcomes: a systematic review. *Matern Child Health J*. 2022;26(1):79–101.
- Ngcobo S, Scheepers S, Mbatha N, Grobler E, Rossouw T. Roles, barriers, and recommendations for community health workers providing community-based HIV care in Sub-Saharan Africa: a review. *AIDS Patient Care STDS*. 2022;36(4):130–44.
- Evans J, Ha H, White PT. Evaluating the effectiveness of community health worker interventions on glycaemic control in type 2 diabetes mellitus: a systematic review and meta-analysis. *BMJ Open*. 2025;15(7):e096651.
- Folayan MO, Bhayat A, Ndembu N, Ishola AG, El Tantawi M. Essential role of community health workers in promoting oral health in Africa. *J Public Health Afr*. 2025;16(1):782.
- Shrestha AD. Can lay health workers help prevent oral cancer in Nepal? *Lancet Oncol*. 2017;18(7):e370 New York, New York: Elsevier B.V.;
- Villarosa AR, George D, Ramjan LM, Srinivas R, George A. The role of dental practitioners in addressing overweight and obesity among children: a scoping review of current interventions and strategies. *Obes Res Clin Pract*. 2018;12(5):405–15.
- Garcia DT, Lawson JA, Brody ER, McKernan SC, Raskin SE, Arauz NR, et al. A scoping review of the roles, training, and impact of community health workers in oral health. *Community Dent Health*. 2021;38(3):198–208.
- Faisal MR, Mishu MP, Jahangir F, Younes S, Dogar O, Siddiqi K, et al. The effectiveness of behaviour change interventions delivered by non-dental health workers in promoting children's oral health: a systematic review and meta-analysis. *PLoS ONE*. 2022;17(1):e0262118.
- Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implement Sci*. 2010;5:69.
- Munn Z, Pollock D, Khalil H, Alexander L, Mclnerney P, Godfrey CM, et al. What are scoping reviews? Providing a formal definition of scoping reviews as a type of evidence synthesis. *JBI Evid Synth*. 2022;20(4):950–2.
- Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467–73.
- Hariprasad R, Chalga MS, Kedar A, Kumar V, Goala S, Tapkire R, et al. Development of mobile application based system for improving population based cancer screening by community health workers. *Asian Pac J Cancer Prev*. 2025;26(1):127–36.
- Palaniraja S, Taghavi K, Kataria I, Oswal K, Vani NV, Liji AA, et al. Barriers and contributions of rural community health workers in enabling cancer early detection and subsequent care in India: a qualitative study. *BMC Public Health*. 2025;25(1):1527.
- Thampi V, Hariprasad R, John A, Nethan S, Dhanasekaran K, Kumar V, et al. Feasibility of training community health workers in the detection of oral cancer. *JAMA Network Open*. 2022;5(1):e2144022.
- Khanna S, Rao D, Panwar S, Ameen S, Khanna SR. Impact of oral hygiene training to Anganwadi and Accredited Social Health Activist workers on oral health of young children in tribal regions of Rajasthan State, India. *J Indian Soc Pedod Prev Dent*. 2021;39(4):429–35.
- Basu P, Mahajan M, Patira N, Prasad S, Mogri S, Muwonge R, et al. A pilot study to evaluate home-based screening for the common non-communicable diseases by a dedicated cadre of community health workers in a rural setting in India. *BMC Public Health*. 2019;19(1):14.
- Birur NP, Patrick S, Bajaj S, Raghavan S, Suresh A, Sunny SP, et al. A novel mobile health approach to early diagnosis of oral cancer. *J Contemp Dent Pract*. 2018;19(9):1122–8.
- Birur N, Gurushanth K, Patrick S, Sunny S, Raghavan S, Gurudath S, et al. Role of community health worker in a mobile health program for early detection of oral cancer. *Indian J Cancer*. 2019;56(2):107–13.
- Philip PM, Nayak P, Philip S, Parambil NA, Duraisamy K, Balasubramanian S. Population-based cancer screening through community participation: outcome of a district wide oral cancer screening program from rural Kannur, Kerala, India. *South Asian J Cancer*. 2018;7(4):244–8.
- Bhatt S, Isaac R, Finkel M, Evans J, Grant L, Paul B, et al. Mobile technology and cancer screening: Lessons from rural India. *J Glob Health*. 2018;8(2):1–9.
- Mishra GS, Bhatt SH. Novel program of using village health workers in early detection and awareness of head and neck cancers: audit of a community screening program. *Indian J Otolaryngol Head Neck Surg*. 2017;69(4):488–93.
- Raj S, Goel S, Sharma VL, Goel NK. Short-term impact of oral hygiene training package to Anganwadi workers on improving oral hygiene of preschool children in North Indian City. *BMC Oral Health*. 2013;13:67.
- Nair MK, Renjit M, Siju KE, Leena ML, George B, Kumar GS. Effectiveness of a community oral health awareness program. *Indian Pediatr*. 2009;46(Suppl):s86–90.
- Sankaranarayanan R, Ramadas K, Thomas G, Muwonge R, Thara S, Mathew B, et al. Effect of screening on oral cancer mortality in Kerala, India: a cluster-randomised controlled trial. *Lancet*. 2005;365(9475):1927–33.
- Ramadas K, Sankaranarayanan R, Jacob BJ, Thomas G, Somanathan T, Mahé C, et al. Interim results from a cluster randomized controlled oral cancer screening trial in Kerala. *India Oral Oncol*. 2003;39(6):580–8.
- Sankaranarayanan R, Mathew B, Jacob BJ, Thomas G, Somanathan T, Pisani P, et al. Early findings from a community-based, cluster-randomized, controlled oral cancer screening trial in Kerala, India. *Cancer*. 2000;88(3):664–73.
- Mathew B, Sankaranarayanan R, Sunilkumar KB, Kuruvila B, Pisani P, Nair MK. Reproducibility and validity of oral visual inspection by trained health workers in the detection of oral precancer and cancer. *Br J Cancer*. 1997;76(3):390–4.
- Klongnoi B, Sresumatchai V, Clypuing H, Wisutthajaree A, Pankam J, Srimaneekarn N, et al. Histopathological and risk factor analyses of oral potentially malignant disorders and oral cancer in a proactive screening in northeastern Thailand. *BMC Oral Health*. 2022;22(1):1–13.
- Klongnoi B, Sresumatchai V, Khovidhunkit SP, Fuangtharntip P, Leelaruangsun R, Shrestha B. Pilot model for community based oral cancer screening program: outcome from 4 Northeastern Provinces in Thailand. *Int J Environ Res Public Health*. 2021;18(17):9390.
- Vichayanrat T, Steckler A, Tanasugarn C. Barriers and facilitating factors among lay health workers and primary care providers to promote children's oral health in Chon Buri Province, Thailand. *Southeast Asian J Trop Med Public Health*. 2013;44(2):332–43.

45. Vichayanrat T, Steckler A, Tanasugarn C, Lecomboon D. The evaluation of a multi-level oral health intervention to improve oral health practices among caregivers of preschool children. *Southeast Asian J Trop Med Public Health*. 2012;43(2):526–39.
46. Anumanrajadhon T, Rajchagool S, Nitisiri P, Phantumvanit P, Songpaisan Y, Barmes DE, et al. The community care model of the Intercounty Centre for Oral Health at Chiangmai. *Thailand Int Dent J*. 1996;46(4):325–33.
47. Harada Y, Giri P, Prajapati D, Sakamoto H, Sugishita T, Rawal L. Engaging community health workers to promote oral health for people living with type 2 diabetes mellitus in Nepal: a qualitative study. *BMC Prim Care*. 2025;26(1):1–9.
48. Erchick DJ, Agrawal NK, Khatry SK, Katz J, LeClerq SC, Rai B, et al. Feasibility of training community health workers to conduct periodontal examinations: a validation study in rural Nepal. *BMC Health Serv Res*. 2020;20(1):1–10.
49. Parajas IL, Palacios CG. Community participation in dental health. *J Philipp Dent Assoc*. 1998;49(4):22–8.
50. Saparamadu KD. Prevention of oral diseases in developing countries. *Int Dent J*. 1984;34(3):166–9.
51. Ashtiani GH, Sabbagh S, Moradi S, Azimi S, Ravaghi V. Diagnostic accuracy of tele-dentistry in screening children for dental caries by community health workers in a lower-middle-income country. *Int J Paediatr Dent*. 2024;34(5):567–75.
52. Ribeiro MTF, Ferreira RC, Vargas AMD, E Ferreira EF, Ferreira e Ferreira E. Validity and reproducibility of the revised oral assessment guide applied by community health workers. *Gerodontology*. 2014;31(2):101–10.
53. Frazão P, Marques D. Effectiveness of a community health worker program on oral health promotion. *Rev Saude Publica*. 2009;43(3):463–71.
54. Morgan JP, Marino ON, Finkelman M, Mourão CF, Flubinda FS. Rural Zambian Oral Health Transition: a long-term retrospective examination of an outreach program's progress and impact. *Ann Glob Health*. 2023;89(1):1–10.
55. Antony KM, Kazembe PN, Pace RM, Levison J, Mlotha-Namarika J, Phiri H, et al. Population-based estimation of dental caries and periodontal disease rates of gravid and recently postpartum women in Lilongwe. *Malawi AJR Rep*. 2019;9(3):e268–74.
56. Koyio LN, Sanden WJ, Dimba E, Mulder J, Creugers NH, Merx MA, et al. Oral health training programs for community and professional health care workers in Nairobi East District increases identification of HIV-infected patients. *PLoS ONE*. 2014;9(3):e90927.
57. Roucka TM. Access to dental care in two long-term refugee camps in western Tanzania; programme development and assessment. *Int Dent J*. 2011;61(2):109–15.
58. Watt RG, Daly B, Allison P, Macpherson LMD, Venturelli R, Listl S, et al. Ending the neglect of global oral health: time for radical action. *Lancet*. 2019;394(10194):261–72.
59. Musoke D, Ssemugabo C, Ndejjo R, Atusingwize E, Mukama T, Gibson L. Strengthening the community health worker programme for health improvement through enhancing training, supervision and motivation in Wakiso district, Uganda. *BMC Res Notes*. 2019;12(1):812.
60. Joubert A, Reid M. Knowledge, skills, and training of community health workers to contribute to interprofessional education: a scoping review. *J Interprof Care*. 2024;38(2):308–18.
61. Kok MC, Dieleman M, Taegtmeier M, Broerse JE, Kane SS, Ormel H, et al. Which intervention design factors influence performance of community health workers in low- and middle-income countries? A systematic review. *Health Policy Plan*. 2015;30(9):1207–27.
62. Registry NOC. Oral Cancer in India. 2025.
63. Akashanand, Zahiruddin QS, Jena D, Ballal S, Kumar S, Bhat M, et al. Burden of oral cancer and associated risk factors at national and state levels: a systematic analysis from the global burden of disease in India, 1990–2021. *Oral Oncol*. 2024;159:107063.
64. Pravika R, Bharathwaj V, Prashanthi M, Sindhu R, Dinesh D, Prabu D, et al. Spatial distribution pattern of academic dental institutes in Indian states and the comparison with population pattern-a trend analysis. 2021.
65. Jaiswal AK, Srinivas P, Suresh S. Dental manpower in India: changing trends since 1920. *Int Dent J*. 2014;64(4):213–8.
66. Kshirsagar M, Dodamani A, Pimpale S, Sachdev SS, Patil D, Ghadage M, et al. Mobile dental clinics: bringing smiles on wheels. *Cureus*. 2025;17(5):e83873.
67. Foláyan MO, Bhayat A, Mikhail SS, Ndembu N, El Tantawi M. Resources for oral health in Africa. *Front Oral Health*. 2025;6:1540944.
68. World Health Organization. Global strategy and action plan on oral health 2023–2030: World Health Organization, Geneva; 2024.
69. Väyrynen E, Hakola S, Keski-Salmi A, Jämsä H, Vainionpää R, Karki S. The use of patient-oriented mobile phone apps in oral health: scoping review. *JMIR Mhealth Uhealth*. 2023;11:e46143.
70. Pascadopoli M, Zampetti P, Nardi MG, Pellegrini M, Scribante A. Smartphone applications in dentistry: a scoping review. *Dent J (Basel)*. 2023;11(10):243.
71. Boye U, Willasey A, Walsh T, Tickle M, Pretty IA. Comparison of an intra-oral photographic caries assessment with an established visual caries assessment method for use in dental epidemiological studies of children. *Community Dent Oral Epidemiol*. 2013;41(6):526–33.
72. Estai M, Kanagasigam Y, Mehdizadeh M, Vignarajan J, Norman R, Huang B, et al. Mobile photographic screening for dental caries in children: Diagnostic performance compared to unaided visual dental examination. *J Public Health Dent*. 2022;82(2):166–75.
73. AlShaya MS, Assery MK, Pani SC. Reliability of mobile phone teledentistry in dental diagnosis and treatment planning in mixed dentition. *J Telemed Telecare*. 2020;26(1–2):45–52.
74. Murariu A, Bobu L, Gelețu GL, Stoleriu S, Iovan G, Vasluianu RI, et al. The impact of mobile applications on improving oral hygiene knowledge and skills of adolescents: a scoping review. *J Clin Med*. 2025;14(9):2907.
75. Ajay K, Azevedo LB, Haste A, Morris AJ, Giles E, Gopu BP, et al. App-based oral health promotion interventions on modifiable risk factors associated with early childhood caries: A systematic review. *Front Oral Health*. 2023;4:1125070.
76. Kanmodi KK, Salami AA, Shah K, Zohoori FV, Nnyanzi LA. The types and effectiveness of mobile health applications used in improving oral cancer knowledge: a mixed methods systematic review. *Health Sci Rep*. 2024;7(11):e70171.
77. Dailah HG. Mobile health (mHealth) technology in early detection and diagnosis of oral cancer—a scoping review of the current scenario and feasibility. *J Healthc Eng*. 2022;2022:4383303.
78. Feroz A, Jabeen R, Saleem S. Using mobile phones to improve community health workers performance in low-and-middle-income countries. *BMC Public Health*. 2020;20(1):49.
79. Okop K, Delobelle P, Lambert EV, Getachew H, Howe R, Kedir K, et al. Implementing and evaluating community health worker-led cardiovascular disease risk screening intervention in Sub-Saharan Africa communities: a participatory implementation research protocol. *Int J Environ Res Public Health*. 2022;20(1):298.
80. Rao BS, Shenoy R, Dasson Bajaj P, Rao A, Pai M, Jodalli P, et al. A qualitative exploration of patients' perception regarding the comprehensive dental services availed at a primary health center. *F1000Res*. 2024;13:157.
81. Bolton Saghdaoui L, Lampridou S, Tavares S, Lear R, Davies AH, Wells M, et al. Interventions to improve referrals from primary care to outpatient specialist services for chronic conditions: a systematic review and framework synthesis update. *Syst Rev*. 2025;14(1):103.
82. Give C, Ndima S, Steege R, Ormel H, McCollum R, Theobald S, et al. Strengthening referral systems in community health programs: a qualitative study in two rural districts of Maputo Province, Mozambique. *BMC Health Serv Res*. 2019;19(1):263.
83. LeBan K, Kok M, Perry HB. Community health workers at the dawn of a new era: 9. CHWs' relationships with the health system and communities. *Health Res Policy Syst*. 2021;19(Suppl 3):116.
84. Ahmed S, Chase LE, Wagnild J, Akhter N, Sturridge S, Clarke A, et al. Community health workers and health equity in low- and middle-income countries: systematic review and recommendations for policy and practice. *Int J Equity Health*. 2022;21(1):49.
85. Colvin CJ, Hodgins S, Perry HB. Community health workers at the dawn of a new era: 8. Incentives and remuneration. *Health Res Policy Syst*. 2021;19(Suppl 3):106.
86. Anabui O, Carter T, Phillippi M, Ruggieri DG, Kangovi S. Developing sustainable community health worker career paths. New York, NY: Milbank Memorial Fund; 2021.
87. Smithwick J, Nance J, Covington-Kolb S, Rodriguez A, Young M. Community health workers bring value and deserve to be valued too: key considerations in improving CHW career advancement opportunities. *Front Public Health*. 2023;11:1036481.
88. Lumsden CL, Edelstein BL, Basch CE, Wolf RL, Koch PA, McKeague I, et al. Protocol for a family-centered behavioral intervention to reduce early childhood caries: the MySmileBuddy program efficacy trial. *BMC Oral Health*. 2021;21(1):1–12.
89. Hoeft KS, Barker JC, Shiboski S, Pantoja-Guzman E, Hiatt RA. Effectiveness evaluation of contra caries oral health education program for improving

Spanish-speaking parents' preventive oral health knowledge and behaviors for their young children. *Community Dent Oral Epidemiol.* 2016;44(6):564–76.

90. Ballard M, Montgomery P. Systematic review of interventions for improving the performance of community health workers in low-income and middle-income countries. *BMJ Open.* 2017;7(10):e014216.
91. Perry HB, Zulliger R, Rogers MM. Community health workers in low-, middle-, and high-income countries: an overview of their history, recent evolution, and current effectiveness. *Annu Rev Public Health.* 2014;35:399–421.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.