What are the public health benefits of community-based education in dentistry? A scoping review

Vivian Ayibuofu-Uwandi*[1] and Thomas A. Dyer[2]

Key points

Community-based education (CBE) in dentistry has potential public health benefits, including increasing access to care in five dimensions: availability, affordability, accessibility, accommodation, and acceptability. Other potential benefits include improved awareness/health literacy of students and communities, and improved clinical outcomes.

Students' intended practising location may be influenced by the duration of CBE and their rural and socioeconomic backgrounds. These findings may be useful to reorient CBE to benefit communities and students more, and may help improve access and reduce health inequalities.

More research is needed using appropriate methods for measuring outcomes including: students' practising intentions; actual practising locations; and the acceptability, affordability, accommodation and accessibility of services (especially for vulnerable groups). This research should include communities' perspectives.

Abstract

Aim To examine what is known about the public health benefits of community-based education in dentistry.

Method A scoping review was conducted using a modified Arksey and O'Malley framework. Database searches were undertaken on PubMed, Medline via Ovid, CINAHL via EBSCO and ERIC, and a grey literature search was undertaken on OpenGrey, Medlar, BASE and the British Library. Reference lists of included studies were also searched. Although no formal quality assessment was undertaken, observations on methodological rigour were recorded.

Results In total, 31 studies from nine countries met the inclusion criteria. Most were from high-income countries. Methodologies of included studies varied: quantitative (n = 17); qualitative (n = 5); mixed methods (n = 6); and reviews (n = 3). Several potential public health benefits were reported: increased access to dental services (including improvements in their availability, affordability, acceptability, accessibility, and accommodation); improved awareness/health literacy of students and communities; and improved clinical outcomes. The overall quality of the evidence was low and had little community engagement.

Conclusion Notwithstanding the methodological limitations of the included studies, several potential public health benefits have been associated with community-based education in dentistry. Rigorously designed, methodologically appropriate research is needed, which should include engagement with communities.

Introduction

Community-based education (CBE) refers to an approach where healthcare students receive training and experience in community settings.[1] It is consistent with experiential learning theory,[2] constructivism and social cultural theory,[3] where learning is enhanced when it is situated where most students will practise after graduating.[4] Ideally, CBE should involve communities in developing learning outcomes so active citizenship and social responsibility is promoted in healthcare professionals who are more aware of their needs.[5] Consequently, CBE has been seen as not only beneficial for students, but beneficial to public health too. For example, it has been postulated that it would increase healthcare professionals' willingness to work in more remote communities, particularly where access is poor.[1,5]

In dentistry, the benefits of CBE to students and to training institutions are well-established. Although their design, rigour and generalisability vary, studies have reported consistent findings. Students see more patients with diverse needs and perform a wider variety of procedures.[6,7] Aside from improving technical competence, communication skills, dispute resolution[8,9] and confidence,[10,11,12] students also learn to work in a team.[10,13] There is less emphasis on 'textbook treatment' and more on feasible treatment plans that are adaptable to patients' sociocultural needs ie care is more patient-centred.[14,15] As well as being important in students' social development,[16] CBE can also enhance academic performance.[17,18] Students perceive a range of benefits, including support for learning, exposure to 'real world' dentistry and better preparation for practice.[19] Finally, CBE provides opportunities to discuss and observe workplace cultures, attitudes, perceptions, professional beliefs and values, and how these translate into ethical practice.[20] Benefits for training institutions include increasing training capacity and providing a wider range of patients than would otherwise be possible,[21] particularly where there are challenges recruiting clinical teaching staff.[22] Indeed, in the UK, CBE is seen as important in preparing dental undergraduates for independent practice by academics and the General Dental Council.[23]

[1]Alumni School of Clinical Dentistry, University of Sheffield, Sheffield, UK; [2]Senior Clinical Teacher, School of Clinical Dentistry, University of Sheffield, 19 Claremont Crescent, Sheffield, S10 2TA, UK.
*Correspondence to: Vivian Ayibuofu-Uwandi
Email address: vivianohonbamu@yahoo.com

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The public health and community benefits of CBE in dentistry are less well-established. Although CBE may enhance students' social development, awareness of social cultural needs and patient-centred care,[14,15,16] its impact on communities is less clear. Providing training opportunities for dental students in communities with higher care needs could increase the likelihood of them practising in similar settings after they graduate[24,25] and improve the equitable distribution of, and access to, healthcare. Access has been conceptualised with five dimensions: availability, accessibility, accommodation, acceptability and affordability.[26] CBE in dentistry could impact several of these, as well as providing other public health benefits, including health outcomes. The overall aim of this study was therefore to examine what is known about the public health benefits of CBE in dentistry.

Method

A scoping review was deemed appropriate to meet the research objectives: to investigate the extent and variety of literature available on the public health benefits of CBE in dentistry; identify knowledge gaps for future research; and to determine if a systematic review would be beneficial. A modified framework for scoping reviews initially proposed by Arksey and O'Malley[27] was used but amended to include later guidance,[28] and informed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) extension for Scoping Reviews.[29] This comprised five main stages: identification of the research question; identifying relevant studies; selecting studies for review; data analysis; and presenting results.

Data sources

In order to identify likely keywords, an initial search was performed on Medline using keywords such as 'education', 'undergraduate', 'community-based', 'clinical training', 'benefits', 'community-based dental education', 'dental outreach', 'access', 'health literacy' and 'utilisation'. An analysis of words in the title and abstract of articles obtained from this initial search was done to obtain a comprehensive search strategy. Boolean operators (AND and OR) were applied to refine the relevance of retrieved records (Table 1).

The search strategy was then adapted and used on six electronic databases (PubMed, Medline via Ovid, CINAHL via EBSCO, Scopus, Wiley and ERIC). A grey literature search was undertaken on OpenGrey, Medlar, BASE and British Library. Searches were undertaken with no time limits applied. Finally, the reference lists of all included studies were searched. Records obtained from database searches and other methods were inputted into reference manager software (EndNote 20) and duplicates were deleted.

Data selection

Studies were considered for inclusion that fulfilled the following criteria:

- Articles on any public health benefit of CBE in dentistry
- Articles written in English
- Articles accessible in electronic format with full texts.

There was no restriction on study design or date of publication. Studies of dental professionals and other healthcare workers were included as it was assumed there would be relatively few studies of dental professionals alone and their findings could still be relevant to this review's aims. Studies meeting the inclusion criteria were scrutinised in two steps: title and abstract screening, followed by full-text review. The first involved the screening of titles and abstracts by one author (VA-U). The second step was to review full texts of the selected studies from step one. Their references lists were also searched. Both authors (VA-U, TD) screened studies for suitability for final inclusion. Reasons for exclusion were documented in line with PRISMA guidelines.[29]

Table 1 Search strategy for electronic databases

Database	Search terms
PubMed Medline via Ovid CINAHL Scopus	Dental education OR education, dent OR dentistry OR dental student OR dental graduate OR schools, dental AND Community-related keywords (Community-based education OR community-based teaching OR outreach OR service learning OR extramural experience OR internship OR community-based clinic OR outreach placement OR community engagement OR community inclusion OR community involvement OR rural placement OR outplacement OR community externship OR community learning OR external training OR practice placement) AND Public health benefit keywords Public health benefit OR public health outcomes OR community benefit OR access or accessibility OR affordability OR availability OR acceptability OR workforce OR work locations

Data extraction

All data relevant to the aims of the review were extracted and tabulated by one author (VA-U) using a data extraction sheet that had been piloted ahead of the study. Where there was doubt, this was discussed with the second author (TD). In addition, gaps in the literature and any methodological strengths and limitations of included studies were noted.

Data synthesis

Given the heterogeneity in methods and outcomes in the included studies, data were tabulated and a narrative synthesis was produced relating to themes of potential public health benefit of CBE in dentistry.

Results

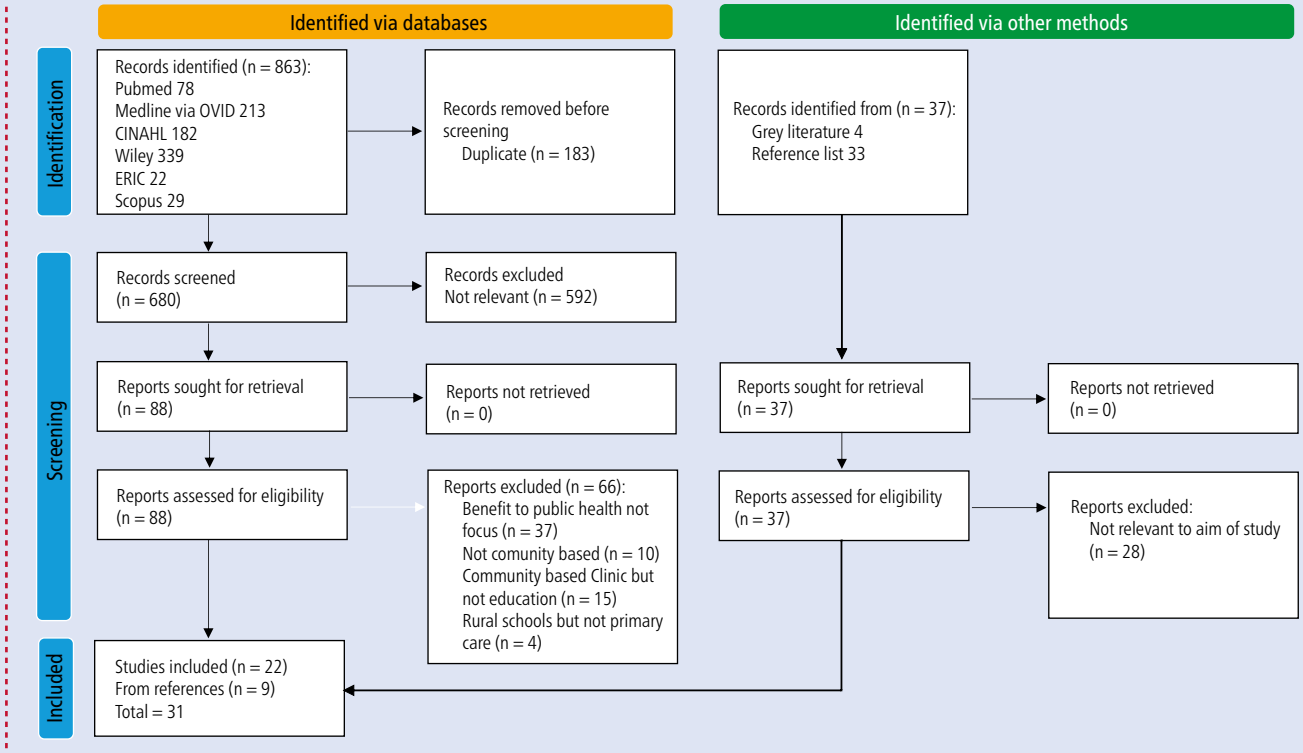
Overviews of included studies

Database searching (6 January 2024) identified 863 records, from which 183 duplicates were removed. The titles and abstracts of the remaining records were screened and 592 were removed as they were not relevant to the study. Full texts of 88 records were retrieved and a further 66 were excluded as they did not meet the inclusion criteria, resulting in 22 relevant articles. Other searches (grey literature and reference list searching) identified 37 records, of which 28 were not relevant and excluded, resulting in 31 articles to be included in the review published between 2006 and 2023 (Fig. 1). Summaries of the included studies are provided in online Supplementary Table 1.

Study designs of included studies varied: systematic reviews (n = 2); scoping review (n = 1); quantitative (n = 17); qualitative (n = 5); and mixed method (n = 6). Of these, 29 focused solely on dental education. Two studies included other health professions' education.

Several terms were used to describe CBE in the included studies: 'community-based education' (n = 11); 'rural placements' (n = 9);

Fig. 1 PRISMA 2020 flow diagram of literature search process[29]



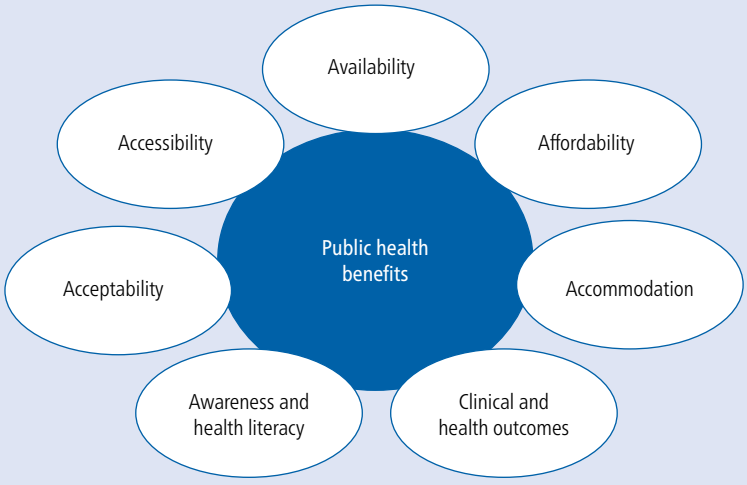
'outreach'(n = 5); 'service learning' (n = 5); and 'extramural experience' (n = 1). The definition of community varied in the included studies. Some specified the locations as either rural (n = 12), or both rural and urban (n = 8), while some did not specify (n = 11). However, all were described as underserved areas. The duration of CBE varied from one day to three years and the timings also varied from the first to the final year of study.

Studies were conducted in nine countries: USA (n = 15); Australia (n = 7); Canada (n = 2); India (n = 2); Saudi Arabia (n = 2); UK (n = 1); Malaysia (n = 1); South Africa (n = 1); and Uganda (n = 1).

Thematic reporting of results

Seven themes were identified in the results, five of which were consistent with dimensions of healthcare access[26] (Fig. 2).

Fig. 2 Themes of potential public health benefits of community-based dental education



Availability

Availability has been defined as the relationship between the quantity (and variety) of services and healthcare needs in an area. This can be influenced by ratios of healthcare professionals and by numbers of clinics to the population.[26]

Although 22 articles reported that CBE led to a potential increase in the availability of dental services,[30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51] many of these assessed students' intentions to practise in underserved areas or treat vulnerable groups,[30,31,32,33,34,35,36,37,38,39] rather than actual practising locations post-graduation. Two studies[40,41] came to different conclusions. In a scoping review, Furlini *et al.* analysed multiple factors, including whether CBE influenced dental students returning to practise in underserved areas.[40] One study[33] included in the scoping review of Furlini *et al.* has also been included in this study. The authors reported that heterogeneity of studies made it difficult to compare results and make conclusions. Holtzman *et al.* reported a decrease in students' perceived responsibility to provide care for underserved areas following CBE.[41] This longitudinal study surveyed 144 dental students and their attitudes towards healthcare at three time points: before, during and after CBE. At baseline, students scored a mean of 91.1 points out of a maximum of 115, suggesting they had idealistic views about providing care for underserved communities. This dropped to 88.3 and 84.9 points at second and third administrations of questionnaires,

respectively. While acknowledging social desirability bias risks, the authors reported that though the mean scores remained high, the differences between them were statistically significant.

Four studies assessed students' practising locations following graduation.[42,43,44,45] All concluded that those who experienced CBE were more likely to practise in rural or underserved locations. Johnson *et al.* surveyed 75 dental students graduating in 2008 (none of whom experienced CBE) and 83 in 2009 from University of Sydney (32 of whom had experienced CBE).[42] By 2011, when compared with 2008 graduates, more of the 2009 graduates worked in rural areas. In addition, of the 2009 graduates, 44.8% of those who experienced CBE worked in a rural or remote region compared to 17% of graduates who did not. By 2012, the comparable proportions were 43.3% and 14.9%. All differences were reported as statistically significant.[42] In their later study, 135 graduates of the University of Sydney (90 who had rural placements and 45 who did not) were surveyed to assess their practice location. Although not meeting statistical significance, 33.3% of graduates who had student rural placements practised in rural communities compared with 17.8% who had not.[43]

One study considered student intentions and subsequent practising locations.[46] Having experienced CBE, new graduates (n = 148) who had not started to practise were surveyed on practice location intentions, of which 72 (46%) participated in a follow-up survey that assessed their practice location. The authors reported that although 32% initially intended to practise in a rural location, 50% did so.[46]

Seven studies reported that students working in communities increased the workforce, thereby increasing availability.[39,47,48,49,50,51,52] For example, Mofidi *et al.* reported a 47% increase in HIV (human immunodeficiency virus) patients receiving dental care when CBE was introduced. They also identified that 'no show' rates declined from 20–25% to 6%.[47] Similarly, Elkind *et al.* reported that 49% of patients attending a CBE dental clinic had not attended a dentist in more than two years.[48]

Two studies reported that duration of CBE was associated with dental students' willingness to practise in underserved areas.[34,45] Piskorowski *et al.* reported that when CBE was 3–5 weeks, 5.6% planned to practise in underserved communities. However, following an increase in CBE duration to eight weeks, the proportion increased to 11.8% in 2009 and 16.5% in 2010.[34] Skinner *et al.* reported similar findings after evaluating CBE in medical, dental and other health professionals.[45]

In summary, study designs, models of CBE and their duration varied. Although most studies reported that CBE was likely to increase the availability of services in underserved areas, the findings of longitudinal studies were less clear.

Acceptability

Acceptability has been defined as the measure of how well users' expectations of a service align with what is actually provided.[26] Six studies considered the acceptability of CBE to community members.[36,37,48,49,53,54] In their cross-sectional study, Bhat *et al.* surveyed 271 patients and reported that 64.4% and 58.4% rated the services and attitude of providers as 'good', respectively.[53] The setting's general performance was also rated 'good' by 64.4% of participants. Elkind *et al.* argued that the willingness of 96% of patients to return to a CBE clinic implied patient satisfaction.[48] In their qualitative study, Mbalinda *et al.*, reported that patients viewed engagements with students as culturally appropriate with effective communication, resulting in appropriate interventions that initiated positive health changes.[54]

Finally, Partido *et al.* argued that strong partnership between CBE dental clinics and community members had led to more facilities (increasing from 18 facilities in seven counties to 29 facilities in 19 counties over a 15-year period) and suggested community acceptance of the programme.[49]

In summary, six studies assessed acceptability in some form by seeking patients' and community members' views using a range of methods, including focus groups, interviews, self-administered questionnaires and reviewing literature. Broadly, they concluded that communities were satisfied with services provided as part of CBE.

Affordability

Affordability has been defined as the relationship between price of service and users' ability to pay.[26] No study directly assessed affordability of CBE clinics. However, 11 studies reported whether services were free, graduates' current practice, or students' willingness to treat financially disadvantaged groups.[31,32,33,34,41,44,48,49,50,51,52] One US study surveyed dentists and reported that those who had experienced CBE were more likely to provide *pro bono* care for patients with no insurance or those on Medicaid (52% vs 16%; $p < 0.001$).[44] Four studies reported that CBE services were either free or at reduced cost to patients.[48,49,50,51] In all four studies, services targeted vulnerable populations, including those uninsured and receiving Medicaid. For example, Partido *et al.* reported 73.5% of patients received Medicaid or were treated free of charge.[49]

Four studies surveyed dental students on their willingness to treat low-income groups, which may lead to less costly care provided in the future. Those that had experienced CBE were more willing to treat such groups.[31,32,33,34] In contrast, Holtzman *et al.* surveyed students before and after CBE and reported that they were less interested in treating those without the ability to pay afterwards.[41] In another study, it was unclear whether students who experienced CBE were more willing to provide care for similar groups.[40]

To summarise, nine studies referred to CBE services being free at point of service, or that students who experienced CBE were more willing to treat financially disadvantaged groups once qualified. This may indicate that CBE can improve service affordability. Two studies were either unclear or negative about CBE's impact on students' willingness to treat financially disadvantaged groups.

Accommodation

Accommodation has been defined as the way a service is organised and provided so it is convenient for users.[26] Five studies referred to the way services were organised to meet the constraints and preferences of patients.[42,50,51,53,54] Students carried out home visits for patients[54] and helped to extend opening hours and reduce waiting times.[42,51,53] Mangoyana *et al.* reported that community representatives reported that care delivered as part of CBE was provided in 'their own safe space'.[50]

Accessibility

Accessibility has been defined as the relationship between the location of services and location of people that require them.[26] Only two studies referred to impacts on aspects of accessibility. Elkind *et al.* reported that convenience of location was one of the main reasons patients cited for using services.[48] Mangoya *et al.* reported that accessibility to oral healthcare services was improved for the community where CBE was situated and for the whole region due to an associated free transport service.[50]

Awareness and health literacy

This theme encompasses awareness and health literacy of students and communities. Seven studies considered how CBE made students more aware of the community's oral health needs and increased their awareness of their civic or social responsibility to serve the community.[17,38,55,56,57,58,59]

One study identified that health awareness/literacy of community members had been influenced by CBE. Mangoya *et al*. reported benefits in general and oral health awareness and attributed positive health-related behaviour changes to attending CBE clinics.[50]

Clinical and health outcomes

Two studies reported service activity and clinical outcome data of some form.[51,52] One reported a shift from mainly restorative to preventive care, citing a 165% increase in diagnostic and preventive services. The authors postulated that this indicated an improvement in oral health but provided no other supporting data.[51]

Discussion

To the authors' knowledge, this is the first scoping review to consider the public health benefits of CBE in dentistry. It identified 31 studies from nine countries that employed different study designs. Models of CBE, facilities, location and duration also varied. Consequently, the generalisability of the findings is questionable. Nonetheless, many reported potential public health benefits, most of which were thematically consistent with structural dimensions of access.[26]

Given the inequity in access to oral healthcare worldwide,[60] the finding that CBE may increase availability is important. Several included studies reported increased willingness of students to treat underserved populations after graduation.[30,31,32,33,34,35,36,37,38,39] However, there was no evidence presented in these studies that such intentions would translate into actual practising outcomes.

Studies that assessed practice location after graduation did not consider the time between the CBE experience and the research, resulting in most only assessing short-term impacts. In one study, the CBE programmes were still relatively new at the time of assessment.[46] Some studies included recent graduates.[42,44] Another assessed all graduates at the same time but did not consider the length of time they had been practising.[43] The time since graduation is important, as approximately 70% may change their career plans and 40% may do so during the first years following graduation.[61] To understand the public health benefits of CBE, it would be useful to evaluate its long-term impacts. In addition, duration of CBE in medicine appears to influence the likelihood of students working in rural, underserved areas after graduation.[62] Only two studies assessed the impact of duration in dentistry and their findings were unclear;[39,42] consequently, more research on this would be beneficial.

Some studies reported that CBE may increase access and utilisation of services for some vulnerable groups.[40] Such groups can suffer from oral health and healthcare inequalities.[63,64] CBE has been proposed as one way of tackling this in general,[65] and in dentistry.[66] The findings of this review provide some support for this.

Rural background (ie living part of life in rural areas) can predict the practising location of medical and dental graduates.[67,68] Only one study considered rural background of students as an effect modifier.[33] In addition, the socioeconomic status of students and high education-related debt have also been shown to predict choice of practice location.[68,69] All these factors could lead to the effect of CBE being overestimated as they may be more important predictors.

In general, studies assessing availability had methodological limitations. Only four had control or comparison groups[42,43,44,46,] and all evaluations had little, if any, statistical analysis. Although descriptive statistics were used, tests to compare proportions in groups were rarely undertaken. Also, few included pre-placement surveys, which would have been useful in understanding students' attitudes before CBE and to identify potential effect modifiers and confounders. Most assessed only one CBE programme in one location and had small sample sizes or low response rates, limiting generalisability. Given that one assumed benefit of CBE is that it increases availability of oral healthcare services in underserved communities, there is a need for rigorously designed studies to evaluate this.

All studies that assessed the acceptability of CBE used some form of patient satisfaction data and their findings were positive. However, these are difficult to interpret as many factors influence patient satisfaction.[70] In addition, healthcare acceptability is now recognised as a broader concept that is challenging to define and research.[71,72] Arguably, trust in the clinicians/service providers and CBE services would also be important in any assessment of acceptability too.[70] Ideally, CBE should provide care that is relevant to local needs, for which community engagement before and during its establishment has been recommended.[1] Most included studies did not engage with communities, yet it could contribute to research that focuses on community health needs and oral healthcare interventions and their acceptability.

Almost all CBE programmes in the included studies were in areas of limited economic resources and increased affordability of services was reported. Several studies only assessed students' willingness to treat those unable to afford care after they graduated, which could also have been categorised as increasing availability of services.[30,31,32,33,34,35,36,38,39] Intentions may not translate into practice as students may change their minds and the findings may have been subject to social desirability bias.

Clearly, the model of CBE would be pivotal in affordability ie whether treatment provided by students is free at the point of delivery or otherwise. Nonetheless, improved affordability could still be achieved where patient charges apply if they are lower than other local providers. Ideally, future evaluations should use mixed methods to seek patients' and communities' opinions on affordability. For example, surveys and qualitative research could investigate and explore opinions on whether they would use a service, given that it is free or at a reduced cost and compare costs of similar services in a location without CBE.

Little research assessing CBE's effect on the accommodation of services was identified. Examples of accommodation include hours of operation, being able to access services without appointments, waiting times and booking systems. There were frequent reports of shorter waiting times in the included studies, which is consistent with findings in the nursing literature.[73] As CBE is intended to meet specific health needs of communities,[1] assessing this dimension of access in future research should be considered and would suit a mixed-method approach. No studies were identified that assessed CBE's impact on accessibility. Some patient groups (those with physical disabilities and older and medically complex patients) have accessibility challenges.[61,62] As CBE is expected to improve accessibility[1] and may complement other approaches,[63] this is also an area for future research.

Improving health awareness and literacy is an important factor in promoting global health.[74] Only one study researched health awareness/literacy in this review and it reported that it was enhanced by CBE.[50] However, as it used a cross-sectional design, it was methodologically limited. Ideally, future research should be multi-phased (before and after the introduction of CBE), perhaps using a quasi-experimental design (eg interrupted times series, controlled before and after study) or other recommended framework that identifies community health needs, analyses these data and prioritises needs.[75] Two studies assessed health outcomes following CBE but also lacked methodological rigour.[51,52] For example, as May and Maguire's study was retrospective, measurement of outcomes was limited. A prospective study could more easily assess clinical outcomes, such as prevalence of disease or health-related states before and after CBE (for instance, in oral health, prevalence of untreated caries, oral hygiene or periodontal indices, oral health-related quality of life), particularly if the data were compared to another location with no CBE services.

Given the methodological limitations of the included studies, it is difficult to draw clear conclusions about the public health benefits of CBE in dentistry. More methodologically rigorous studies are needed that use a mix of methods appropriate to the research question. In particular, more longitudinal studies are required with larger sample sizes and more detailed analysis. In addition, more qualitative research to explore views, opinions and experiences would be beneficial.

This scoping review used methodological frameworks[27,28,29] to guide the method and comprehensively searched six databases, grey literature and reference lists, without time limits. Nonetheless, some articles may have been omitted given the range of terms used for CBE and some may have been published in languages other than English and not available in electronic format. The analysis and narrative summary, though systematic, are subjective. In addition, methodological quality was not assessed formally and an optional consultation stage[27] was not undertaken. Another limitation is some studies that combined CBE in medicine and dentistry[45,54] were included due to the scarcity of relevant literature. Their findings may not be generalisable to CBE in dentistry alone.

Conclusion

Notwithstanding the methodological limitations of the included studies, several potential public health benefits have been associated with CBE in dentistry. However, current data do not support the need for a systematic review. Rigorously designed, methodologically appropriate research that includes engagement with communities is required.

Ethics declaration

The authors declare no conflicts of interest.

As the study is a scoping review of published research, no ethical approval was required. There was no direct human participation or primary data collection. All literature sources used were obtained from publicly accessible databases and publications, adhering to copyright and citation guidelines.

Data availability

The data included in the review are available from authors on request.

Author contributions

Vivian Ayibuofu-Uwandi and Thomas A. Dyer conceptualised the study, conducted the research methodology, performed the literature search, obtained and verified the extracted data, analysed the results, drafted the manuscript, and reviewed and approved the final version.

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