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Review

The role of oral health care professionals in preventing and managing obesity: A systematic review of current practices and perceived barriers

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ABSTRACT

Introduction: There is a growing interest to expand the role of oral health care professionals in obesity prevention and management. The aim of this systematic review was to synthesise the evidence on current practices of, and perceived barriers to, oral health care professionals' involvement in obesity screening and management.
Methods: Key search strings were developed and used in seven databases from inception through February 6, 2019. Data were screened against inclusion criteria, independently extracted, and quality appraised by two reviewers based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
Results: Ten studies were included in this review. The practices of oral health care professionals in relation to obesity assessment, counseling, and specialist referrals were found to be very limited. Oral health care professionals believed in their role to support patients for achieving weight-loss goals, however just over one-third were trained in anthropometry. Perceived barriers included lack of time, limited knowledge or training, patients' unwillingness to listen to oral health care professionals' advice, and lack of appropriate specialist referrals.
Conclusion: Oral health care professionals are well-positioned and supportive in undertaking healthy weight interventions in their clinical practice; however, their practices are limited due to barriers such as lack of time, limited training and lack of referrals.

Contents

Abbreviations: BMI, body mass index; SSBs, sugar sweetened beverages; OHCPs, oral health care professionals; UK, United Kingdom; USA, United States of America; CRFA, common risk factor approach; GP, general practitioner.

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Introduction

The increased burden of obesity threatens the existing healthcare system in both developed and developing countries [1,2]. Therefore, tackling obesity through innovative health policies, multidisciplinary health care interventions, and environmental and behavioral changes is crucial [3].

In recent years, primary health care providers have been encouraged to integrate anthropometric assessments and health promotion advice on nutrition and physical activity, into their routine scope of practice [3]. However, compliance to such recommended practices receives a lower priority [4], primarily because of health care providers' time constraints [5]. Lately, there has been a renewed interest in expanding the role of oral health care professionals (OHCPs) in anthropometric assessments and obesity management. The term OHCPs basically refers to a dentist, dental therapist, oral health therapist, dental hygienist, dental assistant, dental student, or a dental nurse, and will be used synonymously throughout this review. The primary reason for this interest in the role of OHCPs is that both obesity and dental caries share common risk factors such as a high sugar diet [6,7]. Therefore, primary healthcare professionals such as dieticians, nutritionists, and OHCPs have a significant role to play in the prevention and management of public health issues such as obesity. The OHCPs are in an excellent position to recognise and address lifestyle behaviours which may increase the risk of chronic diseases [8] through their regular and sustainable in-patient contact with children and families [9]. The expansion in the scope of practice of OHCPs would provide an additional source of screening individuals who are at an increased risk of being overweight and/or obese and provide referral to general medical practitioners [10]. Furthermore, this would also support health professionals involved in obesity prevention and management and assist in oral health service workforce development to prevent and manage obesity. Therefore, a preventive and early management strategy involving OHCPs might serve as an innovative and effective method for reducing the burden of obesity and dental diseases.

To date, studies have examined obesity-related formal training for OHCPs [11], skills and tools that OHCPs require to promote dietary changes [12], as well as their efforts both at the policy and practice level, to provide health assessment and patient counseling services for various medical conditions including obesity [13]. A large proportion of people visit dental practices annually in many countries [14–17], and OHCPs are already actively involved in providing nutritional advice in their routine scope of practice [18,19]. Hence, utilisation of OHCPs in identifying individuals at-risk for obesity, and providing healthy weight interventions, can potentially support the primary health care providers in reducing the burden of obesity and its subsequent comorbidities [4].

To the best of our knowledge, no systematic reviews have focused on the current practices of OHCPs relating to anthropometric assessment, and weight management counseling and specialist referrals services specific for patients with overweight and obesity. Therefore, the focus of this systematic review was to synthesise the evidence on current practices of OHCPs for anthropometric assessment and management of overweight and obesity in dental settings, and perceived barriers against such practices.

Material and methods

A systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines [20]. A protocol for this review was developed and registered in the PROSPERO database (CRD42018090171).

Search strategy

We searched the following seven databases: Medline (via Ovid), PubMed, Embase, CINAHL, Scopus, ProQuest (Health & Medical Collection and Public Health Database), and The Cochrane Library from inception through to March 8, 2018 and then updated until February 6, 2019. The initial search string was developed for Medline (see Supporting Information Table S1) and refined for each database with assistance of a university librarian. Diverse terminologies and spellings of keywords were considered to aid in the identification of relevant literature. Keywords used for the search strategy included: dentist, dental hygienist, oral health/dental therapist, oral health care professional/dental care professionals, attitudes and practices, overweight, obesity, and body mass index. Combinations of keywords and terms using Boolean operators, truncation, phrase searching, and Medical Subject Heading (MeSH) were used in the search strategies. The search included all relevant published literature available in the English language. In addition, the reference lists of all relevant studies obtained from the searches were reviewed to search for other potential publications.

Selection criteria

Studies which met the following selection criteria were included in this review:

1) primary research published in English language;
2) covering practices or perceived barriers of OHCPs in the prevention/ reduction/ management of overweight or obesity,

Table 1
Summary of the studies included in this review.

Author, year, country	Study design, sample	Study aims	Main results
Braithwaite et al. 2008, USA [27]	Survey, N = 70 paediatric dentists, RR 69% 65 item questionnaire	Document nutrition/healthy life style counselling practices and examine factors associated with those practices	• Majority did not routinely document weight (67%) or height (94%) measurements • Nearly one-fourth (24%) provided nutrition and lifestyle counselling services • Majority of the participants (81%) never referred children for counselling/weight management although most (67%) knew to whom to refer • Respondents with higher overall knowledge (OR = 18.2), those comfortable discussing weight related issues (OR = 47.7), those in practice >10 years (OR = 20.6), and females (OR = 17.3) were more likely to provide nutrition/healthy lifestyle counselling • Majority (77%) received nutrition/lifestyle related information in dental school • More than half (54%) believed patients are receptive to obesity counselling • Major barriers included lack of trained staff (60%), lack of time (55%), uncertainty on how to implement nutritional counselling services (50%) and lack of nutritional knowledge (47%)
Clark et al. 2018, UK [29]	Survey, N = 49, paediatric dentists, RR 42%	Identify practices regarding diagnosis and management of children who are underweight or overweight or obese	• All paediatric dentists felt they had a responsibility to identify underweight or overweight/obese children. • Around a quarter (26%) measured BMI 'always' or 'often', while 37% did not measure BMI. • Only 41% of paediatric dentists who measured BMI took action (management/referral) more than twice in a year. • The most common action taken was informing the child's GP (90%); providing dietary advice (48%); or referring to a paediatrician (41%).
Cole et al. 2018 [30]	Survey, N = 919 RR = 89% 71 item validated questionnaire (modified from previously used questionnaire)	Explore knowledge beliefs, attitudes, current practices, and barriers for assessing and educating patients about childhood obesity.	• Majority dental hygienists understood the risk of chronic disease and obesity (99%), role sugar-sweetened beverages (SSBs) in diet (76%), and the amount of SSBs consumed by youth (91%). • Most dental hygienists never measured height and weight (91%) or plot BMI (94%). • Fifty-one percent always provide nutritional counselling to reduce consumption of SSBs, but only sometimes provide nutritional counselling for healthy eating (61%). • Respondents had a slightly positive attitude (mean score = 4.15, SD = 14.58) about assessing and educating for childhood obesity. • Major barriers reported were time constraints (63%), and fear of offending the patient or parent (47%). Insufficient knowledge about the guidelines for prevention and management of childhood obesity (52%), lack of confidence in addressing obesity issue (51%), lack of training to counsel on healthy eating for weight management (45%), lack of patient acceptance from a dental professional (51%), and lack of knowledge about making the appropriate referral (53%).
Curran et al. 2010, USA [26]	National Survey, N = 2965 (general dentists and paediatric dentists), RR 37.1% 113 item validated questionnaire	Assess interest and barriers in providing obesity counselling	• Few general dentists and paediatric dentists (4.8%) offered weight related screening/counselling • Paediatric dentists were more likely than general dentists to refer patients for weight loss (3.2% vs 0.5%) • Most commonly reported practices were brief discussion by a general dentist, followed by nutritional counselling by a dental hygienist or referral by a paediatric dentist to a medical specialist for weight-loss • Paediatric dentists felt more confident than general dentists in calculating and interpreting BMI scores (45% vs 32.4%, P < .001), applying nutritional counselling skills (45.9% vs 35.4%, P < .001) and, behaviour modification skills related to weight loss (21.9% vs 19.2%, P = .10) • Paediatric dentists were more likely to have received education/training than general dentists in: BMI calculation and interpretation (30% vs 15.3%), nutrition counselling (80.4% vs 60.6%) and behaviour modification (17.0% vs 11.9%) • Major barriers reported included fear of offending (53.8%) or appearing judgmental (52%) of the patient or parent; lack of trained personnel (46.3%); and patients' rejection of weight loss advice (45.7%)
da Silva Gomes et al. 2016, Portugal [24]	Survey, N = 141 general dentists, RR 35.3% 113 item validated questionnaire	Assess practices, attitudes and barriers in addressing obesity	• Fewer (22%) reported offering weight related screening/counselling services • The most common intervention was referral to a medical specialist for weight loss, followed by a brief discussion initiated by the dentist • Most dentists felt confident in calculating and interpreting a BMI score (61%), giving advice about personal weight loss (47.5%); however, fewer were confident in applying behaviour modification (33.3%) or nutritional counselling (28.4%) skills to weight loss • Of respondents who did not offer an obesity intervention, 58.9% were interested in establishing a plan to advise their patients on healthy weight goals. • The main intervention method was initiating a referral to a medical specialist to help with weight loss and distributing pamphlets on weight loss • No dentist measured new or recall paediatric patients' weight in the office; talking with parents or the child about their obesity was reported to be the most common practice • Major barriers included: lack of trained personnel; not enough time in daily schedule; insufficient knowledge about obesity and lack of training about weight loss counselling

Table 1 (*Continued*)

Author, year, country	Study design, sample	Study aims	Main results
Henderson. 2014, UK [32]	Qualitative- focus groups with dental practice staff (N = 23)	Assess the acceptability of the delivery of dietary advice in a dental setting	• General acceptance among dental professionals on delivering obesity interventions • Participants felt that contradictions in guidance (dietary advice between oral health and obesity) posed a challenge • Perceived barriers of the clinicians included: unwillingness of the patients to listen to health advice; lack of time, funding, and training in public health issues; the priority of providing treatment over preventive measures • Staff perceived that patients might get 'insulted', 'upset', feel 'ashamed' or feel 'embarrassed' by discussing obesity • No consensus among dental practice staff as to what causes obesity and what families need from public health and health-care providers. • Parents were receptive for obesity interventions in dental setting and believed it may help to 'reinforce' health messages
Kading et al. 2009, USA [28]	Survey- N = 246 dental hygienists, RR 71.3%	Assess confidence, attitudes, opinion and education preparedness in prevention and management of obesity	• Majority (95%) agreed on their role to improve patients' nutrition but less (36%) believed they have a role in supporting patients for weight loss • Most (65%) were confident in discussing obesity and the importance of weight loss but fewer (18%) in getting patients to follow their advice • Dental hygienists in special practices were more confident than those in general practices in planning an obesity intervention ($p = 0.04$) and initiating conversations about obesity ($p = 0.002$) • Most (90%) were trained in nutritional counselling but fewer in measuring height and weight (14%), or interpreting a BMI (25%) • One third (37%) had been taught behaviour modifications skills for weight loss (37%), and 29% knew how to identify risk factors for obesity, but fewer (18%) knew about referral processes
Lee et al.2012, USA [25]	Survey, N = 1779 paediatric dentists, RR 48% 113 item validated questionnaire	Explore attitudes, practices and barriers to providing weight related counselling	• Fewer respondents (10%) reported offering weight related counselling • The most common weight related intervention included a brief discussion initiated by the paediatric dentist followed by referral to a medical specialist for weight loss and provision of weight loss counselling by dental hygienist • Majority (86%) of those who provided weight related counselling believed in their role to help patients to achieve weight loss • Of those who offered counselling, most were trained (dental education) in nutrition counselling (87.8%), measuring weight (72.1%) and height (69.8%) but fewer were trained in interpreting BMI (46.5%), referrals (40.5%) and behaviour modification skills (43.5%) • Major barriers reported by paediatric dentist included fear of offending the patient/parent and fear of appearing judgmental of the patient/parent
Tavares et al. 2009, USA [31]	Pilot study (intervention in children 6-13 years) and focus group with dentists and dental hygienists	Assess feasibility of adapting Healthy Weight Intervention	• Dental hygienists collected information about obesity risk factors, measured BMI and provided healthy behaviour modification recommendations • Dental hygienists and dentists also provided medical referrals for children with BMI $\geq$ 85% • Intervention found to be feasible and well-accepted among Dental hygienists • Dental hygienists completed the whole visit including the Healthy Weight Intervention in <40 min. (mean time) • Nearly all the caregivers made changes to the child's food to meet goals
Wright et al. 2017, USA [23]	Survey, N = 1615 paediatric dentists, RR 22%	Assess practices and perceived barriers regarding obesity and sugar-sweetened beverages	• Fewer paediatric dentists (17%) reported providing obesity information/ healthy weight interventions • Services included charting if a child showed signs of obesity (4.1%), measuring weight and height (3.7%) and talking to parents of children with overweight and obesity (3.7%) • Majority (73%) agreed for their role in helping children to maintain healthy weight • Majority (78.9%) agreed that patients are receptive to education on nutrition (74%) or obesity (54%), think it is important for them to screen for obesity, and also consider the paediatric dentist as credible for nutrition education and obesity screening (all P-values <0.0001) • Nearly all (94%) offered information/interventions on consumption of sugar sweetened beverages • Majority (67%) of those not offering obesity interventions were interested in establishing a plan to advise parents on healthy weight goals for children • Barriers to obesity education included: lack of time, trained personnel, knowledge or training about childhood obesity/weight education and about how to start the conversation and appropriate referral options

RR: response rate, BMI: body mass index.

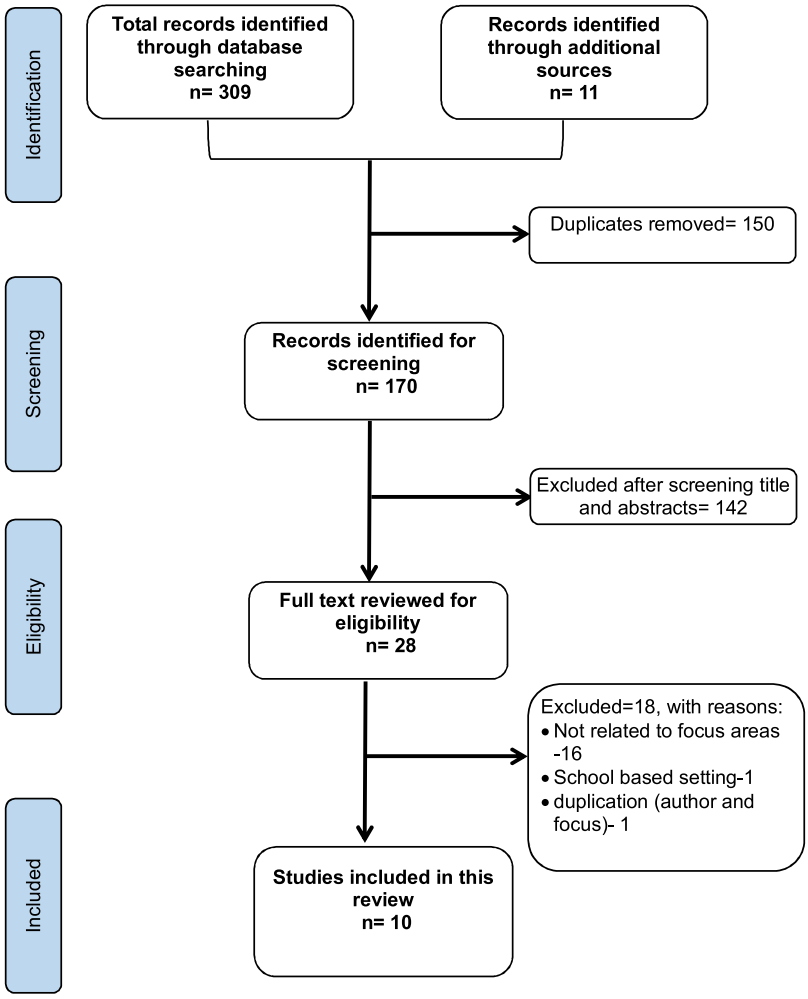

Fig. 1. PRISMA flow chart of study selection process.

including but not limited to: measuring BMI or education or counseling on nutrition, behavior modification such as healthy eating and active living behaviors, or referrals to other health care providers;

3) discussed in reference to dental settings;
4) no restriction on the quality, design, and date of publication of the studies.

Selection of studies and data extraction

The search yielded 320 articles which reduced to 170 after duplicates were removed using Endnote X8 Bibliographic Software. Two authors (AA and PP) independently examined the titles, abstracts and full-text articles. Any discrepancy was resolved through discussion with a third author (NM). After screening titles and abstracts, 142 articles were excluded. A total of 28 full-text articles were screened for eligibility, of which 18 were excluded for a range of reasons (see Supporting information Table S2). Ten publications met the selection criteria and were included in this review (Fig. 1).

A data extraction form was developed and piloted independently by two authors (AA and PP) and modified accordingly (see Supporting information Table S3). The information was extracted independently by two authors (AA and PP) including information on the authors, year of publication, location, study design, sample characteristics including sample size and participants' details, and key findings of the study. Data were collated, summarised, and reported using text and table (Table 1). The results have been presented in two focus areas. The first focus area looked at the evidence on current practices of OHCPs in overweight and obesity screening and management in dental practices. The second focus area explored the perceived barriers of OHCPs in providing services for early identification, prevention and/or management of overweight and obesity.

Quality of included studies

Two reviewers (AA and PP) independently appraised the methodological quality of included studies using the Joanna Briggs Institute (JBI) critical appraisal checklist for appropriate study designs [21] (see Supporting information Table S4). Data quality was scored one point for each applicable item, with a maximum score of 8. Any disagreement was resolved through a consensus involving a third author (NM). The methodological quality score of each paper was calculated as a percentage and rated as good (score of 80–100%), fair (50–79%), or low (<50%) [22].

Results

Most studies (n = 8) included in this review were of cross-sectional study design [23–30] while two studies employed qualitative research methods using focus groups [31,32]. Studies originated from three countries (USA, UK, and Portugal) and involved a total of 7807 OHCPs in nine out of the total ten studies; one was a pilot study [31] and did not report any information on

its sample size. Only five studies provided information about their questionnaires; amongst these, four studies included a validated 113-item questionnaire [24–26,30], and one included a 65-item questionnaire [27]. All studies involved OHCPs except one study [32] which also involved parents and public health commissioners to assess their acceptability of OHCPs providing dietary advice. Based on methodological quality appraisal, nine studies scored a *fair* quality (score of 50–80%) [23–30] whereas one study was rated as of *low* quality (<50%) [31]. There were great differences in reporting the results and interpretation of findings amongst the included studies. Furthermore, all included studies did not provide sufficient statistical information (such as means and confidence intervals) on similar outcome measures, which limited the scope for a meta-analysis. Therefore, only a narrative synthesis was performed. Overall, findings of this review have been presented in two focus areas:

Current practices of OHCPs towards screening and management of overweight and/or obesity

Seven studies explored the current practices of OHCPs in addressing overweight and obesity burden within the dental settings [23–27,29,30]. OHCPs' practices consisted of screening patients for overweight and obesity risk, and counseling patients and parents of child patients on nutrition, lifestyle-related behaviors, consumption of sugar sweetened beverages (SSBs) and high sugar diets. Similarly, OHCPs also distributed education leaflets on weight loss and provided referrals to general practitioners and specialists for weight management. For this review, the practices of weight and height measurements (screening) were grouped into 'anthropometry', and nutritional and lifestyle counseling activities were grouped into 'counseling services'.

Anthropometric and counseling practices were reported in seven studies [23–27,29,30]. Approximately, one-fourth or less (range 5–26%) of OHCPs in the included studies performed weight and height measurements and/or provided weight-related counseling to their patients and caregivers at their dental practices [23–27]. Five studies reported on providing specialist referrals to patients with overweight and obesity [23,24,26,27,29]. These studies reported that limited number of OHCPs (range 2.9–41.0%) were providing specialist referrals for weight management [23,24,26,27,29]. A pilot study (n = 139) conducted in the USA [31], assessed the feasibility of a dental office-based healthy weight intervention (consisting of screening, counseling and referrals to specialists) among child patients. In this study, dental hygienists collected information about risk factors for obesity, measured BMI, assisted the overweight and/or at-risk child and their caregivers to set up a healthy goal through behavior modifications, and provided appropriate specialist referrals to children with obesity (with a BMI $\geq$85th percentile). Such an intervention was found to be feasible and a complete dental visit, including the healthy weight intervention, could be completed in less than 40 min appointment time [31]. At the end of the pilot study (6 months), the survey of caregivers showed that most of them (95.5%) made positive changes in children's food choices to meet their health goals. Similarly, focus group results indicated that dental hygienists were receptive and prepared to make minor adjustments in their clinical appointments to accommodate for additional duties [31].

Some studies also reported on the factors associated with the current practices of OHCPs in anthropometric and counseling services. Braithwaite et al. reported that OHCPs with higher knowledge of fundamentals of pediatric obesity assessment, and female professionals were significantly more likely to provide such services [27]. Similarly, a study by Curran et al. reported that in comparison to general dentists, the pediatric dentists were more supportive towards helping patients to achieve their respective weight-loss goals [26]. Furthermore, pediatric dentists were more confident in measuring the BMI and providing weight counseling services [26]. Some studies also reported that OHCPs received training on anthropometry and counseling services as part of their dental school curriculum [24–26,28]. The results of these studies (n = 4) showed that, more than half of OHCPs (range 50.4–90.0%) studied nutritional counseling [24–26,28] as part of their educational coursework. However, the training on weight and height measurements and BMI interpretation varied across the studies i.e. the range of OHCPs trained for weight measurement varied from 14.0% to 72.1% and that for height measurement varied from 14.0% to 69.8%) [24,25,28]. Somewhere between just over one-fifth (21.1%) to more than two-third (61.7%) OHCPs were trained on how to interpret BMI [22–24,26]. Similarly, there were limited number of OHCPs (range 14.0–43.5%) learnt behavior modification skills during their dental school education [22–24]. The study by Kadling et al. identified that about one-fourth of OHCPs (29.0%) were able to effectively apply the weight management skills learnt during their dental school, and also identify the risk factors for overweight and obesity, while only a few study participants (18.0%) had knowledge about subsequent specialist referral processes [28].

A USA study found that most dental hygienists were confident in discussing overweight- and obesity-related issues, and the importance of weight loss with their patients; however they believed that patients' compliance to such advice was poor [28]. When compared between types of dental practices, dental hygienists working in specialist dental practices reported significantly higher levels of confidence ($p = 0.002$) compared to those that worked in general dental practices [28]. Another USA study [23] also compared the perceptions of dentists currently providing childhood obesity intervention with those who did not. The results of the study revealed that those who were providing childhood obesity intervention perceived that parents of pediatric patients were receptive to obesity education, thought dental screening for obesity was relevant, and would consider the dentist credible for nutrition education and obesity screening (all p-values <0.0001) [23]. Similar results were obtained from a qualitative study in which the OHCPs observed a positive parental reception towards their role in obesity management [32]. Studies also reported that the majority of OHCPs who did not offer obesity-related interventions (67.0%) were still interested in establishing a plan to assist parents towards weight management goals for their children [23] and believed that they have a role in helping children maintain a healthy weight (73.0%) [23] or achieve their weight-loss goals [25].

Perceived barriers for OHCPs in overweight and/or obesity screening and management

Seven studies identified the perceived barriers for OHCPs in undertaking anthropometric assessments and provision of nutrition and behavior modification-related counseling services in dental practices. In summary, the major barriers included: lack of knowledge or training in anthropometry and counseling skills, lack of time in clinics, patients' rejection or unwillingness to hear about weight-loss advice, lack of reimbursement from third-party payers and lack of appropriate referral processes [10,25–28,30,31].

Two studies reported that dentists perceived fear of offending (53.8%) or appearing judgmental (52.0%) towards patients, lack of trained personnel (46.3%), and patients' rejection of weight-loss advice (45.7%) as important barriers [25,26]. Similarly, Braithwaite et al. reported lack of trained staff (60.0%), insufficient time (55.0%), uncertainty on how to implement the awareness program (50.0%), and lack of nutritional knowledge (47.0%) as the major barriers [27]. Furthermore, OHCPs believed that patients might feel humiliated or embarrassed by discussing obesity-related issues [32].

A UK-based qualitative study involving dental staff and parents of child patients observed a lack of knowledge amongst the dental practice staff about the causes of obesity, and understanding of assistance that families may require from health care providers [32]. One interesting barrier was the apparent contradictions in relation to applicability of the common risk factor approach to reduce both obesity and dental disease burden, since the dental staff believed that providing additional health promotion messages may conflict with their priorities of promoting oral health. From the families' perspective, the parents felt that repeated overemphasis (at schools, GP office, and dental practices) on weight screening and obesity-management messages might cause children to develop a 'complex' or 'obsession' about their weight and body size [32].

Discussion

This systematic review aimed to report the current practices of OHCPs in anthropometric assessments and managing obesity in dental settings, and to identify the perceived barriers to undertaking such services in their routine clinical practice. Eight quantitative and two qualitative studies met the inclusion criteria, with nine studies rated as 'fair' and one rated as 'low' on the methodological quality scale. In summary, the practices of OHCPs in relation to obesity screening, weight-management counseling and providing specialist referrals to patients in dental settings were found to be limited. The majority of OHCPs believed in their role to support patients to achieve weight-loss goals, however, limited number of them were trained in anthropometry and the interpretation of BMI as part of their dental school curricula and postgraduate training. Perceived barriers towards undertaking obesity-related interventions included: lack of time in clinics, knowledge, or training specific to causes of overweight and obesity, and its screening and counseling methods, patients' unwillingness towards OHCPs' advice, and lack of appropriate referral pathways to general practitioners, medical specialists, or dietitians.

In recent years, there has been an increasing emphasis on the role of OHCPs in identifying patients affected by obesity, promoting weight management through nutritional and behavior modification methods and providing referrals to other health professionals [10,33]. However, the findings of this review suggest that relatively few OHCPs undertake such practices in their clinical routine. Two-fifth or less OHCPs performed anthropometric assessments and provided specialist referrals to patients for weight management [23–27,29,30]. Since poor diet is a common risk factor for both obesity and dental decay [6,7], the involvement of OHCPs becomes even more pivotal in not only identifying patients who are at-risk of obesity, but also to provide suitable interventions such as nutrition counseling, behavior modification, establishing weight-loss goals or providing referrals to medical specialists or other health care providers [33].

This review showed that there was a greater acceptance among OHCPs of the need to provide anticipatory guidance to pediatric patients at-risk of obesity [24,26] and firmly agreed on their role to support patients by offering obesity-related services [23,25,27,32]. Furthermore, one study from the USA showed that dental practitioners can effectively incorporate BMI screening, counseling and referral services with minor adjustments in their routine working schedule; and such services significantly influence caregivers in adopting positive health behaviors to ensure their children's weight-loss goals are achieved [31].

We also found that the majority of OHCPs had received formal training on nutrition-based education and counseling skills in dental school; however, just the training on height and weight measurements, BMI interpretation, and behavior modification skills varied significantly across the studies [24–26,28]. A recent scoping review which evaluated the obesity and dietetic-related (particularly SSBs consumption) curricula in dental schools of USA and Saudi Arabia, indicated there is limited coverage of these topics [11]. Similarly, another recent review which evaluated the skills and tools that OHCPs can employ to encourage obesity prevention and reduction of SSB consumption reported the need for active listening and motivational interviewing techniques to promote nutrition and lifestyle and/or behavior modification messages amongst children and parents [12]. These techniques have the potential to be effectively adopted and applied by OHCPs in their routine scope of practice [34].

It is worthy to note that the introduction of targeted screening, prevention and management for medical conditions such as obesity in dental settings would require the cooperation of policy- and law makers, support from medical and dental professional organisations, buy-in from patients as payers for services, and changes in education and training in dental schools. The potential future shortage of general medical practitioners, nurses, and other health professionals provides a unique opportunity to expand the scope of OHCPs beyond traditional oral health services [35,36]. One of the included studies indicated that obesity screening for height and weight measurements was conducted in a 40 min appointment and would be a part of standard consultation [31]. This may have some financial implications for health care providers and families. It is worthy to note that child oral health services in some countries are supported by the government and therefore the cost of performing screening for medical conditions in the dental setting may result in significant savings [37]. In countries where child oral health services are out-of-pocket expense to families, there is some research to suggest that patients are willing to pay for medical screening in dental settings [38,39]. However, this is subject to future research to test its cost-effectiveness.

The OHCPs perceived several barriers in providing anthropometric assessments and management services (such as anticipatory guidance, counseling and specialist referrals) in their routine practices to tackle the childhood obesity burden. This included lack of training or knowledge about obesity and its causes, limited time in clinics, and lack of clarity about referral options [23–27,32]. A study by Hoffmann et al. reported that lack of education on dietary counseling during tertiary education was a key limiting factor to obesity prevention and management advice given by general medical practitioners [40]. Some guidance for OHCPs in addressing obesity such as evidence-based curriculum on managing patients with obesity is available [41]. However, this does not include training on how to address obesity with sensitivity to avoid stigmatisation. With appropriate training, the OHCPs could possibly initiate discussions that are compassionate, culturally sensitive, and general health focused. Kushner suggested that a multi-disciplinary approach to nutrition counseling in medical settings which could also be possibly applied to dental settings highlighting that preventative services require a team effort between clinicians, patients and policy makers [42].

Several studies have assessed the attitudes of dental and medical students, general medical practitioners, nurses, and dietitians towards patients with obesity [43–47]. These studies have indicated that health professionals may view patients with obesity as awkward, unattractive, ugly, non-compliant [43–46] which may create stigma towards patients with obesity [47]. This negative behavior will lead to body image concerns among people and may lead to low body esteem and low perceived cognitive ability [48]. It is worthy to note that the stigma associated with overweight and obesity put an overemphasis on individual victim blaming rather than the well-established multifactorial causes of obesity including the genetic, behavioral, social-environmental and economic determinants [49]. To overcome the stigma, the OHCPs who are

in contact of patients with an increased risk of being overweight and/obesity may benefit from training on behavioral strategies for overcoming bias and health care providers must facilitate a non-judgmental environment to support patients with an increased risk of overweight and/or obesity. In this context, it is reasonable to think that such biases ultimately lead OHCPs to perceive that patients with obesity might be unwilling to accept weight-related advice. In our review both pediatric and general dentists were receptive to undertaking role in obesity screening, prevention and management. However, it is worthy to note that when working with pediatric populations, parents should be involved in counseling and referral activities and this is subject to future research.

In summary, the current documented practices of OHCPs to address obesity within dental settings are limited. However, it is encouraging to note that the majority of OHCPs positively perceive, and support, their role in assisting patients towards healthy weight management. Furthermore, they also expressed their interest in acquiring appropriate knowledge and skills on obesity-related screening (anthropometry) and counseling activities. Effective and mandatory training should be provided to OHCPs, as part of their dental school curricula, as well as in postgraduate training, in order to build their capacity in anthropometry, anticipatory guidance technique and lifestyle-related modification counseling. Developing clear referral pathways is also needed. Furthermore, providing incentives and/or reimbursements to OHCPs to compensate for their time in incorporating obesity-related activities in their clinical routine might also prove beneficial.

Limitations

There are several common methodological limitations in this review. These include: lack of information in all studies about respondents vs non-respondents, varying questionnaires used to measure study outcomes, limited use of validated questionnaires, and inadequate discussion of other factors that may have affected study findings, such as length of work experience, training/education level, and dental specialties. All studies included in this review were from high income countries and therefore it is not known whether the practices vary with different education standards, healthcare systems, and cultural beliefs across nations. Self-reported data from the studies also limit the generalisation of the review findings. The current systematic review also did not look for unpublished literature nor those published in other languages, and hence there is a possibility that we may have not been able to retrieve all studies in this topic area. There is also a possibility of outcome reporting bias.

Future research

Future studies in this area should be designed, considering the above-mentioned limitations, to ensure high quality evidence which is reproducible and generalisable. Future studies should scope the acceptability of OHCPs working with both adult and child populations in both high and low- and middle-income countries to ascertain differences. It is further recommended that health professionals are provided consistent training on obesity screening, prevention, and management. An economic evaluation of this expansion in role of OHCPs in obesity prevention and management is warranted. Furthermore, it is recommended that OHCPs, general medical practitioners, and other health professionals work together using an inter-professional care approach. Future studies should also evaluate obesity training provided to OHCPs and patient experiences in obesity screening, prevention and management.

Conclusions

OHCPs are well-positioned and supportive in undertaking healthy weight interventions in their scope of clinical practice; however, their current practices in this regard are limited. Several barriers related to such restricted practices have been identified, which can be effectively addressed by incorporating education and training in anthropometric assessments, anticipatory guidance, behavior-modification and patient counseling aimed towards obesity management, as part of dental school and postgraduate training curricula. Such a role will also depend on measures to encourage OHCPs to capacity build on healthy weight interventions, manage their appointment times, and establish strong referral pathways with other health professionals.

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Conflict ofinterest statement

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.orcp.2019.03.005.

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