

REVIEW ARTICLE



Non-utilization of oral health services and associated factors among children and adolescents: an integrative review

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ABSTRACT

Objective: To review publications exploring non-utilization of oral health services and to identify factors associated with non-utilization of oral health services among children and adolescents.

Materials and methods: An integrative review design was adopted. A search was conducted for research articles published during the period from 2000 to April 2021 in five databases, Medline via Ovid, Scopus, CINAHL, Cochrane Library and Web of Science. Inclusion criteria were original articles examining non-utilization of oral health services among 0–19 years old and studies published in peer-reviewed journals in English. Thematic analysis was undertaken to identify common themes. The Newcastle-Ottawa scale was used to evaluate the quality of the studies.

Results: Twenty-one geographically diverse articles were included. Nineteen studies were cross-sectional, one was a prospective cohort and one a case-control study. Non-utilization of dental health services tended to be higher in children than adolescents. There were predisposing (age, gender, ethnicity, parent's level of education), enabling (family income, dental insurance) and need factors (subjective and objective oral health related parameters) that had been shown to be associated with non-utilization of dental services among children and adolescents.

Conclusions: This integrative review found predisposing, enabling and need factors to be associated with dental health service non-utilization.

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Introduction

Dental health care services are available free of charge to children and adolescents of certain age in Nordic and some European countries [1]. On the contrary, low- and middle-income nations are not even able to provide for the prevention and treatment of oral health conditions [2]. The previous epidemiological studies reported oral health disparities based on disadvantaged socio-economic backgrounds [3], racial/ethnic minorities [4], uninsured population [5] and geographical variation [6].

Oral diseases are still a serious public health problem in many parts of the world, even though largely preventable [7]. A recent review of 72 worldwide studies reported the caries prevalence in pre-school children ranged from 12 to 98% [8]. Early detection of dental caries presents better opportunity for preventive care and general well-being of a child [9]. Untreated caries in the primary dentition may increase the risk for dental caries in the permanent dentition [10]. Among adolescents, avoidance behaviour can lead to invasive dental procedures and emergency dental visits [11].

Treating caries is expensive [12]. The expenditure varies by country which can exacerbate inequity and access to dental services [13]. Preventable hospitalizations impose an extra burden on the healthcare system.

Poor and marginalized communities with less access to oral health prevention and care are disproportionately affected by caries [12]. The non-utilization of oral health services, irrespective of any reason, is driving the marginalized community even further into oral health inequities and adversity. Preventing oral diseases and providing oral health care can be prioritized based on population disparities in oral health care demands. For the same, it is important to assess the utilization pattern of the oral health services and there is a need to understand the factors behind non-utilization of oral health services. Moreover, the impact of non-utilization of dental health services on children and adolescent population across the globe needs to be assessed for the proper allocation of the available resources according to the need of the population, with an aim to improve oral health along with low treatment costs. Therefore, the aim of this

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integrative review is to review the literature exploring non-utilization of oral health services among children and adolescents, and to identify factors associated with the non-utilization.

Methods

Study design

This integrative review included articles that have assessed any sort of non-utilization of oral health services such as dental non-attendance/absenteeism, poor/irregular dental attendance pattern/dental visits, dental avoidance, missed or cancelled dental appointments, low/no use of preventive dental care, limited dental care accessibility and availability and other similar concepts among children and adolescents. This type of review allows the inclusion of various research designs and proceeds in five stages starting with 'problem identification, literature search, data evaluation, data analysis, and presentation of the results' [14]. It refers to the systematic data assimilation and analysis on a specific topic [15]. The strength of the integrative review lies on the extensive set of primary sources emphasizing on inclusion and diversity [16], unlike, systematic review where emphasis is more on the consistency of study design. The integrative review achieves the better and comprehensive understanding of the topic and has an impact on policy, protocol and procedure formulation [15].

Problem identification

To explore non-utilization of oral health services and associated factors among children and adolescents.

Search methods

One author (SG) searched five online databases (Supplementary Table 1): Medline via Ovid, Scopus, CINAHL, Cochrane Library and Web of Science. The following search terms were used in the search strategy: dental health services, dental care, oral health services, public dental services, preventive dental services, dental hospital AND non-utili*, utili*, underutili*, underuse, noshow*, unmet, avoid*, fail* or cancel* or missed appointment* AND child* or adolescen*.

Original articles published between January 2000 and April 2021 were included. Any additional filter of 'NOT adult* OR elder*' was not implemented in the search strategy to avoid missing relevant studies that examined non-utilization of oral health services among both children and adults. Additional studies were identified from references cited in the relevant studies. The grey literature searched were theses/dissertations, World Health Organization (WHO), government agencies and non-governmental organizations published reports.

Inclusion and exclusion criteria

The criteria are based on the Population, Intervention, Comparison and Outcome (PICO) elements of the review question [17] (Supplementary Table 2). The original articles were included in the review based on inclusion and exclusion criteria (Table 1).

Study selection

The process of article selection followed steps described in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram [18] (Figure 1). In total, 1852 articles were identified during the search of electronic databases. Two reviewers (SG and BT) independently screened the titles and the abstracts to select potentially relevant records using the Rayyan QCRI application [19]. Any discrepancies in the selection of articles were resolved by a third reviewer (MK). The total number of agreed articles were 266. Another nine articles were under conflict. Using Miles and Huberman formula [20] which is dividing the number of agreements by the total number of agreements plus disagreements, 97% of reconciliation rate was achieved on the reliability of the study. A total of 21 articles were included in the narrative synthesis.

Data extraction

Piloting of data extraction form in excel was done by one of the authors (SG) on five articles. Both (SG, BT) agreed on the format of the data extraction form. Study characteristics and information of all articles were further extracted using the DistillerSR software (version 2.35, Evidence Partners, 2021) and described by SG. The following was recorded for each study: (a) authors and year of publication; (b) country; (c) objectives; (d) age; (e) study design; (f) sample size; (g) data collection; (h) key findings.

Quality assessment of the included articles

Quality of the included studies was evaluated using Newcastle-Ottawa Scale (NOS) for cohort, case-control [21] and adapted form of the NOS scale for cross-sectional studies [22]. The NOS consists of three categories (selection, comparability, exposure in case control studies and outcome in cohort studies and cross-sectional studies) with eight items to assess the quality of articles. The minimum and maximum scores are 0 and 9, respectively, for the cohort and case-control studies; the maximum for cross-sectional studies is 10. The quality of the included studies (NOS score) is low (1–3), medium (4–6) and high quality (score 7–9) [23]. For the cross-sectional studies, the score was high (7–10), moderate (5–6) or low (0–4). Risk of bias was assessed by SG guided by BT (scoring details in Supplementary Table 3).

Table 1. Inclusion and exclusion criteria for the integrative review.

Inclusion criteria	Children and adolescents up to 19 years of age Studies published from 2000 till search run date Observational epidemiological studies (cohort studies; case control studies; cross-sectional studies) Any sort of non-utilization of oral health services such as dental non-attendance/absenteeism, poor/irregular dental attendance pattern/dental visits, dental avoidance, missed or cancelled dental appointments, low/no use of preventive dental care, limited dental care accessibility and availability and other similar concepts Oral health related parameters (dental caries, dental infections, dental pain, dental emergency) English language
Exclusion criteria	Reviews Experimental studies Studies specific to adult subjects Studies with incomplete data Outcome not significant to the review Studies other than English language

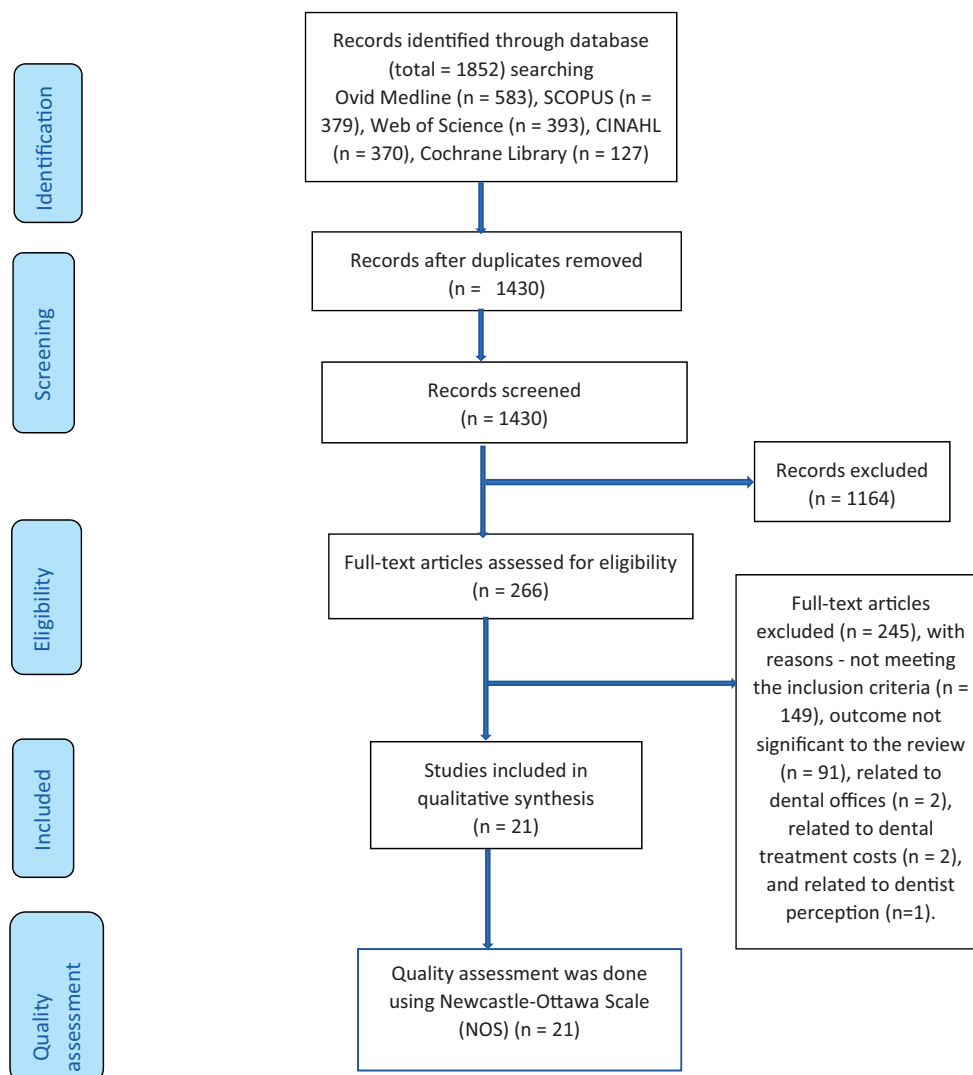


Figure 1. Flowchart of the literature search according to PRISMA flowchart: the identification, screening, inclusion and quality assessment of studies.

Data analysis

The term 'thematic analysis' refers to 'a method for identifying, analysing and reporting patterns (themes) within data' [24]. Four themes with 11 sub-themes were identified. The first theme was measurement of non-utilization (not visited a

dentist or dental hygienist in the past year (12 months), not visited a dentist or dental hygienist in past years for more than 12 months to over 3 years, never visited a dentist or dental hygienist) and the remaining three themes were in accordance with the Andersen's behavioural model [25] that

Table 2. Non-utilization of oral health services categorized into four themes and 11 sub-themes among children and adolescents.

Themes	Sub themes	Number of studies	Studies
Measurement of non-utilization	Not visited a dentist or dental hygienist in the past year (12 months)	5	[26–30]
	Not visited a dentist or dental hygienist in past years (more than 12 months to over 3 years)	6	[11,31–35]
	Never visited a dentist or dental hygienist	10	[33,36–44]
Predisposing factors	Age	9	[26,30,35–38,42,43,45]
	Gender	5	[11,32–34,39]
	Ethnicity	5	[26,31–33,40]
	Parents' level of education	8	[30,31,37,38,41,43–45]
Enabling factors	Family income	10	[27,30,31,35,36,38,39,43–45]
	Place of residence	6	[27,30,31,34,40,45]
Need factors (subjective and objective oral health)	Dental caries	13	[11,26,28,30–32,34,37–40,43,44]
	Dental pain	3	[39,40,42]

focuses on three components – (1) predisposing factors – demographic variables (age, gender), ethnicity, parents' level of education; (2) enabling factors – family income, place of residence; (3) need factors – subjective need factors were pain and discomfort that led to dental visit apart from preventive reasons. The objective need factors were presence of dental caries (Table 2).

Results

Study characteristics

The included studies are categorized in three groups according to the age, namely, children (0–12 years), adolescents (13–19 years), both children and adolescents (0–19 years). The characteristics of the 21 included studies are summarized in Table 3. Table 4 shows the distribution of the studies according to age group, country by income level and study design. The non-utilization of dental services was measured from the included articles in terms of 'not visited a dentist or dental hygienist in the past year (12 months)', 'not visited a dentist or dental hygienist in past years (more than 12 months to over 3 years)' and 'never visited dentist or dental hygienist' (Supplementary Table 4).

Factors related to non-utilization of oral health services

The factors presented are categorized as predisposing, enabling and need factors (subjective need factors were pain and discomfort that led to dental visit apart from preventive reasons and the objective need factors were presence of dental caries).

Predisposing factors

The six predisposing factors are age, gender, ethnicity, language, parents' level of education, oral health beliefs (attitudes, values and knowledge of oral health and oral health services).

Among children, four studies showed that the utilization of dental services was lower in younger than the older children [26,36–38]. With a focus on gender, one study found a

link between male schoolchildren and less utilization of dental health services [39].

With regard to ethnicity, Indigenous children were twice more likely to not utilize dental services than non-Indigenous children [26]. Non-Hispanic White race turned out to be the significant predictor for less utilization of dental services until the end of 5-year New England Children's Amalgam Trial in the urban Boston area [31]. A study conducted among 5-year-olds in Brazil reported the use of dental care services for check-up/prevention was lower among black and brown skin colour children than other ethnic groups [40]. However, one study showed no significant association between ethnicity and non-utilization of dental services [36].

Other identified predisposing factors included low parental/caregiver level of education [31,37,38,41], language other than the host language [26], lower parental/guardian sense of coherence [39], crowded households [41], time constraints [27] and oral health beliefs [28].

Among adolescents, four studies found a link between being male and lower odds of receiving dental care [32], less dental visits in the last two years [33], more missing [11] and forgotten [34] dental appointments. Other reported predisposing factors include overall sociodemographic load [11], neither of parents [29], negative belief of dentist [34], working/not going to school [34] and large family size [33].

Studies including both children and adolescents showed less dental service utilization in the lower age group than the higher ones [30,35,42,43,45]. Being young, black or multi-racial were less likely to receive preventive dental care than being white [45]. However, two studies did not find a significant association between gender and the non-utilization of dental services [35,42]. Other barriers observed among the articles comprised of lower-educated households [30,43–45], language other than the host language [45], not going to school/kindergarten and oral health beliefs [42].

Enabling factors

The enabling factors include family income, dental insurance and accessibility to oral health services.

Among children, lower socioeconomic status was associated with the non-utilization of dental services use in four studies [27,31,36,39]. Children from low-income households

Table 3. Summary of included articles associated with the non-utilization of oral health services categorized as children (0–12), adolescents (13–19) and both children and adolescents (0–19 years old).

Author and year	Country	Objectives	Age	Study design	Sample size	Data collection	Key findings
Maffioletti et al. [39]	Manaus, Brazil, South America	To test the relationship of predisposing, enabling and need characteristics with dental services utilization and pattern of dental attendance among 12-year-old schoolchildren living in a socially deprived urban area	12-year-old children	Children (0–12 years) Cross-sectional study	358 children	Stratified random sampling; self-administered questionnaire and clinical examination	15.9% never visited a dentist Predisposing: gender – male, parents/guardian sense of coherence – low Enabling: socio-economic status – low Need: oral clinical status – poor, dental pain – 12.8%, tooth extraction 13.4%, dental treatment – 26.8%
Souza et al. [40]	Brazil, South America	To describe the use of dental care service during early childhood and the possible socioeconomic inequalities in this use	5-year-old	Cross-sectional study	7241 children	Multistage probability cluster sampling; interviews with the children's parents and clinical examinations of the children	46.8% never visited a dentist Reasons for no preventive care use: Predisposing: ethnicity – black (36.4%) and brown skin colour (42%) Enabling: location – not living in state capital (44.8%) Need: dental pain (13.6%), self-reported need for dental treatment (27.8%)
Amin and ElSalhy [28]	Canada	To explore factors affecting children's dental attendance among new immigrants	Mean (SD) age of children and mother – 62.7 (17.2) months and 34.1 (5.3) years old, respectively	Cross-sectional study	314 new immigrant child–parent pairs	Convenience sample: parents' demographics, oral health knowledge, perceptions and oral health behaviours were gathered by questionnaire and the child's caries status was determined through a clinical examination	56.3% of boys and 57.7% of girls did not visit the dentist within the year Enabling: lack of insurance and time lowered the odds to have a dentist visit by 65% and 59%, respectively Need: parents perceiving dental check-up as a painful experience were 67% less likely to have a dental visit, children's mean DMFT/dmft was 3.1 (3.5)
Onyejaka et al. [27]	Nigeria, Western Africa	To identify factors that facilitated and served as barriers to children's utilization of oral health care services in Enugu, Nigeria	8–11 years	Cross sectional study with measures collected at two different time points 12 months apart	1406 primary school pupils	Multistage stratified sampling technique: 12 months follow-up visit, closed-ended questions were used to get information from the children or their parents via phone interviews.	85.3% of children did not visit the dentist for the follow-up during the 12 months Enabling: middle (AOR: 0.50; 95% CI: 0.31–0.79) and low (AOR:0.24; 95% CI: 0.13–0.45) socio-economic strata, living with guardians/relatives (AOR: 0.08; 95% CI: 0.01–0.60) Time constraint for parents
da Costa et al. [41]	Brazil, South America	To assess clinical, behavioural and socioeconomic factors associated with non-use of dental services by schoolchildren	8–12 years	Cross-sectional school-based study	1211 children	Self-applied questionnaire answered by parents; interviews and oral health examination of children	24.3% never visited a dentist Predisposing: low maternal schooling (AdjPR: 1.46; CI: 1.17–1.82) Enabling: crowded households (AdjPR:1.55; CI: 1.23–1.97), low family income (AdjPR:1.81; CI:1.12–2.93)

(continued)

Table 3. Continued.

Author and year	Country	Objectives	Age	Study design	Sample size	Data collection	Key findings
Darmawikarta et al. [36]	Toronto, Canada	To identify sociodemographic, dietary and biological factors associated with families who do not receive dental care in early childhood and to identify risk factors associated with having cavities among children who receive early dental care	0–5 years	Cross-sectional study	2505 children	Standardized parent-completed survey	Need: oral health status – DMFT = 0, (AdjPR: 1.70; CI: 1.34–2.16) Public schools (AdjPR: 8.32; CI: 3.10–22.32) 38% children had not been to a dentist Enabling: low family income (OR: 2.73; 95% CI: 1.47–5.06) Need, enabling and predisposing: oral health status – dental cavities (older children (OR: 1.04; 95% CI: 1.03–1.05), children of low-income families (OR: 1.90; 95% CI: 1.17–3.10), and east Asian maternal ethnicity (OR: 1.91; 95% CI: 1.10–3.29) 76.32% had not visited the dentist Predisposing: low mother education: (AdjPR: 1.13; 95% CI: 1.02–1.24) Enabling: low socio-economic status Need: oral health status: 'poor' parent-perceived oral health (AdjPR: 1.70; 95% CI: 1.07–2.70), availed dental services for non-preventive reasons with dental caries (AdjPR: 2.37; 95% CI: 1.31–4.30)
Machry et al. [38]	Brazil, South America	To assess the relationships between socioeconomic and psychosocial factors and the utilization of dental health services by children aged 1–5 years	1–5 years	Cross-sectional study	478 children	Multistage sampling: structured questionnaire administered to parents and clinical examination of children	Non utilization in the last 12 months (OR: 2.40; 95% CI: 1.73–3.33) for 2–3 years, (OR: 2.43; 95% CI: 1.94–3.05) for 6–7 years Predisposing and need: ethnicity: indigenous – caries (OR: 1.90; 95% CI: 1.08–3.34) and non-utilization of dental services (OR: 1.95; 95% CI: 0.96–3.94) in 2–3-year-old Enabling and need: socio-economic position – low, parent-reported caries (OR: 3.29; 95% CI: 1.84–5.90) for 2–3 years (OR: 1.79; 95% CI: 1.46–2.20) for 6–7 years 79.3% had never had a dental appointment, 43.65% children were diagnosed with
Kilpatrick et al. [26]	Australia	Using four measures of potential inequality, this study examined patterns in oral health for Australian children at ages 2–3 and 6–7 years	2–3 and 6–7 years	Cross-sectional data from two cohorts of children in the Longitudinal Study of Australian Children (LSAC)	2–3 years (n = 4606), 6–7 years (n = 4464)	Two-stage stratified clustered design; child's primary carer face to-face interviews and self-completed questionnaires	
Goettems et al. [37]	Brazil, South America	To investigate the influence of a child's clinical condition; maternal	2–5 years	Cross-sectional study	608 mother-child dyads	Mothers answered a questionnaire and clinical examination of	(continued)

Table 3. Continued.

Author and year	Country	Objectives	Age	Study design	Sample size	Data collection	Key findings
Maserejian et al. [31]	Boston, Maine, United States	characteristics such as dental anxiety and dental visit pattern; socioeconomic conditions; and maternal perception of the child's oral health-related quality of life (OHRQoL) on a child's use of dental care services	Aged 6–10 at baseline	Prospective cohort	Rural Maine ($n = 232$) and urban Boston ($n = 266$)	Interviewer-administered questionnaires assessed demographic and personal characteristics, reasons for missed appointments were recorded during follow-up	untreated dental caries during the visit to a dentist Predisposing: low schooling level of mothers (PR: 0.65; 95% CI: 1.19–1.65) Irregular visits to a dentist by the mother (PR: 0.49; 95% CI: 0.35–0.68) At 6-month visits, the average percentage attendance was almost 20% lower and utilization lowered down until the end of the 5-year trial Urban children – predisposing: non-White race (OR: 2.65; 95% CI: 1.45–4.83); enabling: household welfare use (OR: 3.94; 95% CI: 1.66–9.39), deep debt (OR: 2.00; 95% CI: 1.00–3.99), and distance to dental clinic (OR: 3.02; 95% CI: 1.52–5.98). Rural children – predisposing: caregiver education level (OR: 3.06; 95% CI: 1.17–8.02), need: greater number of decayed tooth surfaces at baseline (need for care) (OR: 1.06; 95% CI: 1.01–1.11)
Fägerstad et al. [11]	Sweden, Western Europe	To investigate the occurrence of missed dental appointments among 16–19-year-old adolescents in a Swedish county	16–19-year-old	Adolescents (13–19 years) Retrospective case-control design	522 cases with, and 522 matched controls without, dental avoidance behaviour	Computer-based non-stratified random selection; previous missed and cancelled appointments, oral health status, dental treatment, fear or behaviour problems, and medical, psychosocial or lifestyle factors were analysed from the dental records	13.1% of the appointments were missed. Number of previous missed (OR: 1.68; 95% CI: 1.48–1.90) and cancelled dental appointments (OR: 1.08; 95% CI: 1.03–1.14) Sociodemographic load (OR: 2.84; 95% CI: 1.24–6.49) Predisposing: gender – boys (14.6%) Need: oral health problems (caries – OR: 1.38; 95% CI: 1.05–1.82, gingivitis – OR: 1.72; 95% CI: 1.30–2.30) 11.6% had not visited the dentist for more than 3 years whereas 3.4% had never visited the dentist Predisposing: gender – males, non-Caucasian ethnicity (Mulatto: PR: 1.30; 95% CI: 1.13–1.50 and Black: PR: 1.58;
Fonseca et al. [33]	Brazil, South America	To investigate the factors associated with no dental visit within the last two years by adolescents in the state of São Paulo, Brazil, by using data from the Oral Health Conditions of São Paulo state population	15–19 years	Cross-sectional epidemiological study	5558 adolescents	Conglomerate/cluster sampling in two stages with probabilities proportional to the population size (PPS), dental visits were measured, and contextual and	(continued)

Table 3. Continued.

Author and year	Country	Objectives	Age	Study design	Sample size	Data collection	Key findings
Ola et al. [29]	Nigeria, Western Africa	Project (SBSP-2015) conducted in 2015 To test the relationship between socioeconomic position (SEP), family composition, number of siblings, and birth position in the family, and the utilization of oral health services by senior secondary school pupils in Ile-Ife, Nigeria	Mean age of – 15.8 years old (SD = 1.9)	Cross-sectional	1200 pupils	Multistage, stratified sampling; self-administered questionnaire	95% CI: 1.29–1.93 Enabling: lower mean family income (PR: 1.62; 95% CI: 1.36–1.94), ≥1000 inhabitant/dental surgeons (PR: 1.27; 95% CI: 1.03–1.56) Need: Dissatisfaction with the oral health condition (PR: 1.20; 95% CI: 1.01–1.45), periodontal disease in the form of dental calculus (PR: 1.38; 95% CI: 1.16–1.53) 75.2% had not visited the dentist within last year Predisposing: Parents/guardians – single mothers (OR: 1.80; 95% CI: 1.05–3.09), without a parent (OR: 3.52; 95% CI: 1.80–1.65) Enabling: Low socio-economic position – income: 1–10,000 naira (equals to US\$ 63.31) (OR: 1.87; 95% CI: 1.17–2.97) and 10,000–19,000 naira (equals to US\$ 120.29) (OR: 1.93; 95% CI: 1.20–3.11) Dental visits – 56% had not received the dental care in the past two years and 44% availed care with toothache as the main reason Enabling and need: Location: Urban – less oral health care attendance (AOR: 0.6; 95% CI: 0.5–0.8), more dental caries (dmft >0) (AOR: 2.2; 95% CI: 1.2–3.9), seeking care because of toothache (AOR: 1.5; 95% CI: 1.1–2.0) Need: Oral health status – mean DMFT and MT – 2.9 (SD = 2.3) and 0.5 (SD = 0.9), respectively, dissatisfied with dental health and delayed treatment demand for dmft 5–14 (OR = 2.3 (1.3–4.1), 3.2 (1.5–6.8)), respectively Forgotten dental appointments during the last 5 year (OR: 6.0; 95% CI: 3.54–10.07) Predisposing: gender – male Need: High caries experience (OR: 2.1; 95% CI: 1.18–3.71)
Okullo et al. [32]	Uganda, Eastern Africa	To describe clinical and self-perceived indicators of oral health status and the use of oral health care services by social and demographic characteristics	Mean age – 5.8 years (SD = 1.6 years, range = 13–19 years)	Cross-sectional	1146 secondary school students	Systematic random sampling; structured questionnaires and dental examination	
Skaret et al. [34]	Norway, Western Europe	To explore possible explanatory factors related to high frequency of missed/cancelled dental appointments during the age group 12–18 years	12–18 years	Retrospective cohort and cross-sectional	Initial sample – 1119 and final sample – 754	Participants were mailed questionnaires at the age of 20 and their dental records were assessed between the ages of 12 and 18.	

(continued)

Table 3. Continued.

Author and year	Country	Objectives	Age	Study design	Sample size	Data collection	Key findings
Al Agili and Farisi [44]	Jeddah, Saudi Arabia, Southwest Asia	To examine the association between children's access to dental healthcare, and PEN factors	All third- and eighth-grade students (<9 to >14 years)	Both children and adolescent (0–19 years) Cross sectional study	Initial sample – 1668 and final sample – 1397	Subjects who missed or cancelled 20% or more of their dental appointments between the ages of 12 and 18 were the target group Random sample; parent questionnaire and oral examination	Not in school (OR: 3.5; 95% CI: 1.61–7.72) Negative beliefs of dentists (OR: 2.7; 95% CI: 1.43–5.21) (a) 26% never visited a dentist and (b) 31% needed dental care during last year but could not get it. Predisposing: oral health illiteracy (a) 82.3%, (b) 49.7%) Enabling: financial ((a) 22.8%, (b) 37.1%) Dentist-related ((a) 19.9%, (b) 42.1%), transportation ((a) 9.8%, (b) 20.8%) Reason for the dental visit – dental caries (38.4%) and toothache (43.8%)
Portero de la Cruz and Cebriño [35]	Spain, Western Europe	(i) To discover how frequently dental services are used and the prevalence of dental health problems in Spanish and immigrant children; (ii) to identify the type of treatment received during dental health visits; and (iii) to analyse the socioeconomic and demographic variables which influence the non-regular utilization of dental health services and the presence of dental health problems. To estimate children's preventive oral health care use and oral health and investigate associations with child, family and health care characteristics	3–14 years old	Cross-sectional study	4568 children	Trietapic sampling; children's questionnaire (0–15 years) and the household questionnaire filled in by the mother, father or guardian	Higher prevalence of non-regular utilization in 3–14-year-old Spanish and immigrant children (Spanish: 35.43%; immigrants: 51.78%) <i>Predisposing</i> : 3–6-year-olds (Spanish: 53.11%; immigrants: 45.04%) <i>Enabling</i> : Lower social class (Spanish: 47.22%, immigrants: 77.86%) <i>Need</i> : Dental health problem (Spanish: 31.10% and immigrant: 36.36%)
Lebrun-Harris et al. [30]	United States		2–17 years	Observational, cross-sectional study	46,100 children	Data from nationally representative web- and paper-based survey were analysed. Survey respondents were parents or caregivers	20.4% did not avail preventive health care visit in the past year Less likely to visit for preventive dental care and specific preventive services: <i>Predisposing</i> : Young children (aged 2–5 years) (AdjPRR: 0.78; 95% CI: 0.74–0.83) <i>Enabling</i> : Children with no health insurance (AdjPRR: 0.84; 95% CI: 0.77–0.90), and those from lower-income (AdjPRR: 0.92; 95% CI: 0.88–0.97) and lower-educated households (AdjPRR: 0.93; 95% CI: 0.86–1.01)

(continued)

Table 3. Continued.

Author and year	Country	Objectives	Age	Study design	Sample size	Data collection	Key findings
Baldani et al. [42]	Southern Brazil, South America	To assess the individual determinants of non-utilization of dental services by low-income children living in areas served by the PHC program (FHP) in a big city in Southern Brazil	The group of babies and pre-school children (0–6 years of age) and school children and adolescents (ages 7–14 years old)	Cross-sectional population-based study	350 children	Stratified multistage sampling method; questionnaire answered by parents;	Need: 12% had caries and 6% had fair or poor condition of the teeth 31% had never visited a dentist <i>Predisposing:</i> Very young – 50.5% <i>Enabling:</i> Family homes were under absent ownership – 44.4% Need: Dental visit is often associated with pain (AOR: 4.34; 95% CI: 1.84–10.23), not reported child's oral health problems (AOR: 0.25; 95% CI: 0.13–0.49), without perceived need of dental care (38.8%) Lower odds of a preventive dental visit: <i>Predisposing:</i> Young (AOR: 0.18; 95% CI: 0.17–0.19), black (OR: 0.69; 95% CI: 0.63–0.76) or multiracial relative to white (OR: 0.71; 95% CI: 0.60–0.83), parents' low education (OR: 0.79; 95% CI: 0.69–0.92), unemployed parents (OR: 0.88; 95% CI: 0.79–0.99) Enabling: lower income (OR: 0.44; 95% CI: 0.39–0.49), uninsured (OR: 0.41; 95% CI: 0.38–0.44) 31.05% had never been to dental care <i>Predisposing:</i> Parents/guardians with the lowest educational range (AOR: 1.37; 95% CI: 1.08–1.71) <i>Enabling:</i> Income – no dental care in the last 12 months those having parents/guardians with monthly income <900 euros (OR: 2.03; 95% CI: 1.57–2.61) Need: Prevalence of caries was 31.45%
Lewis et al. [45]	United States	To (1) describe the proportion of US children with > or = 1 preventive dental visit within the previous year, (2) identify factors that were associated with preventive dental care use and (3) test the hypothesis that preventive dental care use by near-poor children is associated with State Child Health Insurance Program policies for covering dental care.	0–17 years	Cross-sectional nature	102,353 children	Data from the National Survey of Children's Health were analysed. The telephonic survey was completed by a parent or guardian who had sufficient information of the health of children under the age of 18 years.	
Tapias-Ledesma et al. 2005 [43]	Spain, Western Europe	To ascertain the possible influence of sociodemographic variables on dental service utilization and oral health among Spanish children	3–15 years	Descriptive cross-sectional study	4023 interviews conducted with parents or guardian	Random sample: interviews conducted with parents or guardians	

DMFT: The Decayed, Missing, and Filled Teeth index; MT: missing teeth; OR: odds ratio; AOR: adjusted odds ratio; CI: confidence interval; PR: prevalence ratio; adjPR: adjusted prevalence rate ratios; US\$: U.S. dollar; SD: standard deviation.

Table 4. Distribution of the included articles according to the age, country grouped by income level according to the World Bank Organization [46], and study design.

Target population	Number of articles	High income (Canada, USA, Australia, Norway, Saudi Arabia, Spain, Sweden)	Upper middle income (Brazil)	Lower middle income (Nigeria)	Low income (Uganda)	Cohort	Case-control	Cross-sectional
Children (0–12 years)	10 [26–28,31,36–41]	4 [26,28,31,36]	5 [37–41]	1 [27]		1 [31]		9 [26–28,36–41]
Adolescents (13–19 years)	5 [11,29,32–34]	2 [11,34]	1 [33]	1 [29]	1 [32]		1 [11]	4 [29,32–34]
Both children and adolescents (0–19 years)	6 [30,35,42–45]	5 [30,35,43–45]	1 [42]					6 [30,35,42–45]

were more likely to utilize dental services for treatment rather than prevention [38]. Other barriers to access to dental services were place of residence [27,31,40], distance to dental clinic [31], lack of dental insurance, time, transportation and difficulty finding a dentist [28].

Among adolescents, lower family income [29,33], lack of dental insurance [33] and urban resident was associated with low probability of visiting a dentist [32].

Among children and adolescents, economic status [30,43–45], lack of dental insurance [30,45], lower social class [35], less accessibility to dental services [42,44,45] and place of residence [30,34,45] were the factors related to non-utilization of dental services.

Need factors

Subjective need factors were pain and discomfort that led to dental visit apart from preventive reasons. The objective need factors were presence of dental caries.

Among children, the prevalence of dental caries was 34% [38] to 44% [37]. Poor oral clinical status was associated with child poor dental attendance pattern [39]. Children with poor parent-perceived oral health and children with dental caries were more likely to visit the dentist for non-preventive reasons [38]. More decayed tooth surfaces at baseline were associated with less usage of dental services in future [31]. Children who self-reported the need of dental treatment and who had dental pain underused the dental check-ups and preventive care [40].

Among adolescents, dissatisfaction with the oral health condition [33], high caries experience [34], poor oral health [11] and periodontal disease [33] were associated with non-utilization of dental services.

Among children and adolescents, the prevalence of caries was 9% [35] to 45% [43]. Apart from preventive, dental caries, toothache [44] and dental pain [42] were the common reasons for having visit to a dentist.

Discussion

This integrative review sought to explore non-utilization of oral health services and identify factors related to non-utilization of oral health services among children and adolescents. The findings of this review revealed the pattern of non-utilization of dental health services among children and adolescents. The under and non-utilization of dental services were associated with predisposing, enabling and immediate treatment need factors, although there was a huge variation in the utilization.

Strengths of this review include the use of a five-stage integrative approach that allows to include both empirical and theoretical research [14]. The search strategies were developed across five major electronic databases. The original articles screening and selection phase included two independent reviewers. The PRISMA flow diagram was adopted for the inclusion of the articles. The Rayyan QCRI and Distiller-SR software further improved the systematic

approach. The modified NOS was used for quality assessment of the selected articles.

The Andersen behavioural model [25] is widely used in the healthcare domain to study the health services utilization and was employed here to highlight the factors associated with the non-utilization of oral health services in terms of predisposing factors like age or gender, enabling factors like income or health insurance and treatment need factors such as children's and adolescents' subjective and objective oral health related parameters. The thematic analysis of the studies was guided by the Andersen's behavioural model.

There are some limitations. Other factors related to non-utilization of dental services, for instance, dental phobia and behavioural (eating habits and dental hygiene, such as not brushing teeth on a regular basis) were not explored. The data extraction and the quality assessment of the articles were carried out by one author. Studies that were not published in English were excluded. The search and screening procedures excluded the paper focussing on the vulnerable groups, for instance, children with special health care needs (CSHCN). The number of emergency dental visits for the non-traumatic dental problems were not assessed. Most of the included articles in this study are cross-sectional in design; therefore, a temporal sequence is difficult to establish. The availability and accessibility of oral health services varies greatly amongst geographic places around the world. The findings of this review may not be globally applicable.

Predisposing factors such as age, gender, ethnicity and education were associated with the non-utilization of dental health services among both children and adolescents. The younger children had decreased likelihood of a preventive dental visit [30,45] and a higher probability of never had a dental visit [38]. This may be explained by the child's oral health mostly being dependent on their parents, and any lack of oral health education and awareness of parents will reflect on their child's oral health [47]. In Canada, among four ethnic groups, religion and genetics were reported to influence the oral health perception among parents and caregivers [48]. Non-biological parents were less likely to have booked dental visits for their children [49]. However, one study reported older youth in worse oral health are less likely to receive preventive dental care than the younger children [50].

Gender was associated with the non-utilization of dental health services. Being male meant lower odds of receiving dental service among children [39] and adolescents [32,33]. The gender differences may reflect parental attitudes, and cultural beliefs towards children's oral health. Also, females are more concerned with their physical appearance and, as a result, are more likely to adopt dental-health-promoting behaviours and habits [51].

The other two sociodemographic factors appearing significant were low educational attainment of the parent, and ethnicity. Parents' low education level affects utilization of dental services in both children and adolescents [43]. Higher level of education may lead to greater awareness and knowledge about preventive health services and increased utilization of health services [52]. Another study reported indirect

association of ethnicity with dental check-up visits through three variables: consistent source of dental care, dental insurance status and family income [53]. Language other than the host language is bound to have an effect, and is difficult to separate it from ethnicity, income and culture [54].

Low family income is one enabling factor that negatively affects the utilization of dental services in both children [36] and adolescents [29]. Low-income families with lack of education have a number of challenges, including a lack of awareness about preventive health care and insufficient knowledge of available resources to meet their health-care needs [55]. The same applies for lack of dental insurance coverage [56]. A recent review reported insured people utilized health services at a higher rate, depending on the type of health service [57].

The treatment need factors such as caries and pain were associated with utilization of curative but not preventive dental services. A study reported the proportion of preventive dental care decreases and curative treatment increases with increase in age [58]. Dental emergency among adolescents was cited as the reason for first access to oral health services, with adolescents being more prone to utilize dental emergency than children [59]. The hospital emergency visits for non-traumatic dental problems might burden the human resource involved in providing the health care. Further evidence needs to be collected to assess the economic impact of such visits depending on the type of health services across the globe.

In conclusion, non-utilization of dental health services tends to be higher in children than adolescents. The predisposing (age, gender, ethnicity, parent's level of education), enabling (family income, dental insurance) and treatment need factors (oral clinical status) were associated with non-utilization of dental services. More research is needed to address discrepancies based on available resources within countries, in order to increase dental use and reduce oral health inequities linked to underlying marginalization.

Author contributions

All the authors have made substantial contributions to the conception and design, extraction and interpretation of data, writing and revising this manuscript. BT and MK were involved in the conception and design of this review, SG, BT and MK were involved in selecting the articles required for the study, SG did the data extraction, SG and BT were involved in the quality assessment. SG, BT and MK were involved in the writing process and BT and MK were involved in critically revising this review paper. All authors gave approval for the final manuscript for publication.

Disclosure statement

The authors declare there is no conflict of interest.

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Data availability statement

Data sharing not applicable to this review as no datasets were generated or analysed during the current study.

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