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A scoping review of factors that affect unmet dental service needs among people living with HIV/AIDS

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Abstract

Background There was an inequality in utilizing oral and dental healthcare utilization. Although people living with HIV need more oral and dental services they receive less and they have many unmet needs about their teeth health. Therefore, the present study aimed to find the factors related to unmet dental service needs (UDSN) among people living with HIV/AIDS (PLWHA) through a scoping review study.

Methods This scoping review was done based on the Arksey and O'Malley framework. PubMed, Scopus, Web of Science, Embase, and Proquest were searched for finding the relevant studies. After searching the mentioned databases, 10,431 papers were retrieved. All papers were screened and finally, 20 papers were included for synthesis.

Results The results showed UDSN ranged between 17–90.4% which in most studies was reported more than 50%. Reported related factors were classified into demographic, access, Health Conditions Exacerbating Dental Needs (HCEDN), health care provider, and patient status categories. The results also show that there is a high prevalence of HCEDN among PLWHA, such as untreated dental caries, dry mouth, enamel hypoplasia, and ulcers.

Discussion The results provide valuable information for improving access and UDSN among PLWHA. The results suggest the need for further research to explore the causal relationships between these factors and unmet need of dental service, and to evaluate the effectiveness of interventions that aim to overcome the barriers and enhance the facilitators of unmet dental service need among this population.

Keywords Oral health, Dental care, Dental service, Unmet need, Utilization, Health care, HIV, AIDS

Introduction

Oral health is one of the major health issues across the globe [1]. According to the global burden of diseases, more than 3.5 billion people are suffering from unmet dental service need (UDSN) [2]. Since oral health is highly connected with overall well-being [3], the health systems are trying to make it more accessible and utilizable for the population, however, there are several unresolvable limitations, especially in low and middle-income countries [4]. Regardless of advancements in oral healthcare, inequality in accessing and utilizing oral and dental care is becoming one of the major public health problems within and between countries [1, 4–7].

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All efforts to reduce inequality in dental and oral healthcare utilization should be focused on decreasing UDSN, especially in low socio-economic contexts [8, 9]. There is much evidence that many people are not utilizing health services, especially people with special needs such as people living with HIV (PLWHA) [10]. While they need more social support and access to a higher level of healthcare, they receive lower. This is referred to as inverse care law which indicates that people who need health care more are less utilizing it [11, 12]. This law could be attributable to many health conditions such as living with HIV.

While the number of PLWHA is increasing in low-income settings such as sub-Saharan countries [13], their need for oral and dental health services is rising. On the other hand, many factors hinder them from receiving healthcare such as stigma against them [14–16]. Therefore, it could be concluded that PLWHA are utilizing oral healthcare lower than others, while their conditions make them more susceptible to oral and dental issues [17].

Methods

This study is a type of scoping review that follows the methodological framework of the Arksey and O'Malley framework [18]. Therefore, the research question was answered based on five following stages:

1 Identifying the Research Question: in this stage, the research question was identified as What are the factors that affect UDSN by PLWHA?
2 Identifying the relevant studies: in this stage, five databases including PubMed, Scopus, Web of Science, Embase, and Proquest were searched for the relevant studies. Additionally, reference lists of the included studies were checked to find other possible studies. For searching the databases, we divide the search query into three segments including HIV OR synonyms, need OR synonyms, and oral health OR synonyms. Then, using AND truncation, we retrieved the papers that had all these three words. Table 1 shows the search strategy.
3 Study selection: we select studies based on following inclusion and exclusion criteria.

Inclusion criteria: Studies that were published in English, after 2000, had the keywords in title and abstract, and indexed in PubMed, Scopus, ISI Web of Science, Embase, Proquest databases were include in the study.

Exclusion Criteria: Studies were excluded if they were not original, were not peer-reviewed articles, and did not focus on UDSN by PLWHA.

4 Charting the Data: Charting the data was done using a data extraction form which includes author, study year, country, study type, data gathering method and tools, study sample, and results. The filled form for all 20 included studies is available in the Appendix.

Table 1 The search strategy for UDSN by PLWHA

Databases	PubMed, Scopus, ISI Web of Science, Embase, Proquest
Limits	Language (full-text in English) and date (published after 2000)
Date	Indexed before June 25, 2023
Strategy	#1 AND #2 AND #3 in title and abstract
#1	oral OR dent* OR teeth OR tooth
#2	need OR demand OR utilize*
#3	HIV OR AIDS OR "Human Immunodeficiency Virus" OR "Acquired Immunodeficiency Syndrome"

In our study, we employed a rigorous coding process to identify and categorize themes within the selected articles. Each article was independently reviewed by three researchers to ensure a comprehensive analysis. When discrepancies arose in the categorization of themes, the following steps were taken to resolve them:

Discussion: The reviewers engaged in detailed discussions to understand each other's perspectives and rationales behind their coding decisions. This collaborative approach often led to a consensus.
Third-Party Review: In cases where consensus could not be reached, a third-party expert was consulted. This expert, who was not involved in the initial coding, provided an unbiased opinion to help resolve the disagreement.
Reference to Coding Manual: Throughout the process, the team referred to a detailed coding manual that outlined specific guidelines and criteria for theme categorization. This manual was instrumental in maintaining consistency and clarity in the coding process.

By implementing these strategies, we ensured that the themes identified in the articles were accurately and consistently categorized, thereby enhancing the reliability and validity of our study.

5 Collating, Summarizing, and Reporting the Results: At the final stage, extracted factors that affect UDSN by the PLWHA were categorized using thematic analysis. Themes were created through an iterative process involving initial open coding, followed by axial coding to identify relationships between codes, and finally selective coding to refine and define the themes.

Result

After searching the mentioned databases, 10,431 papers were retrieved. From this number, 4,094 papers were duplicates. After removing duplicates, 5,475 papers were

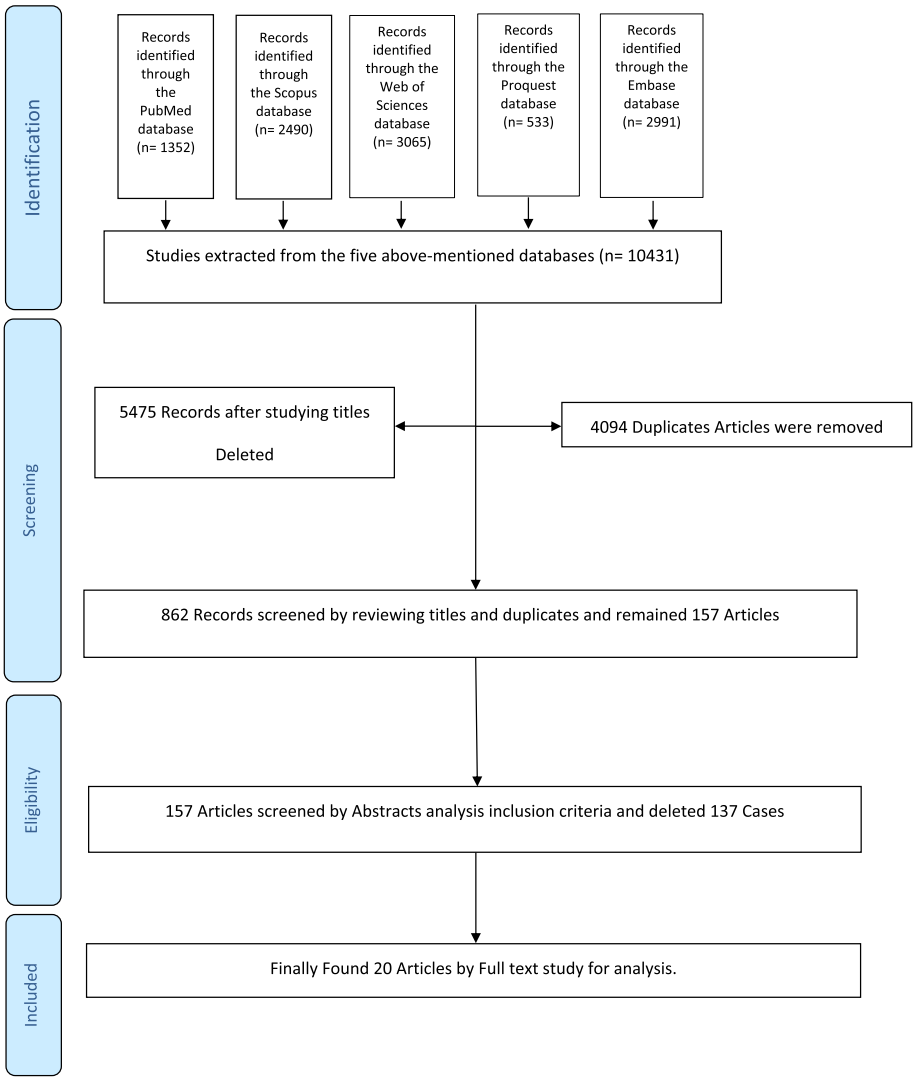

Fig. 1 PRISMA flow diagram for the scoping review process

remained. These papers were screened at several stages to reach the final papers to be included in the study. In the first stage, papers were screened based on title by two authors separately (SD and MS) with over 86% agreement. In the cases of disagreement, the third researcher's (PB) decision was considered as the final decision for inclusion or exclusion. After this stage, 862 papers were remained and screened based on the abstract. Finally, 137 full texts were checked and 20 papers were included for final analysis based on exclusion criteria. Screening at all stages was done as the first stage. The PRISMA flowchart for the screening process is shown in Fig. 1.

The result of this scoping review is based on the analysis of 20 studies that met the inclusion and exclusion criteria. The studies described various causes related to the use of oral and dental treatment services.

The results showed the factors that affect the UDSN among PLWHA in different countries and settings. The tables are based on various types of studies, such as cross-sectional, observational study, cohorts, qualitative, and randomized controlled trial, which used different data-gathering tools, such as questionnaires, interviews, focus groups, and clinical examinations. The sample sizes ranged from 28 to 2864, and the participants had different demographic, socio-economic, and health characteristics. The summary of the studies is in the Appendix. Also, the percentages of UDSN were reported in some studies.

The analysis of the 20 studies revealed a diverse range of findings regarding oral health needs and UDSN among

various populations. The studies were conducted across different countries, including Kenya, the United States, South Africa, Switzerland, and the United Kingdom, and involved a total sample size ranging from 28 to 2864 participants.

Demographic factors

The age of participants varied widely, with some studies focusing on children (e.g., [19]: 6 to ≤12 years) and others on adults (e.g., [20]: 35–49 years). The gender distribution also varied, with some studies having a higher proportion of males (e.g., [21]: 92% male) and others of females (e.g., [22]: 100% female). Educational attainment ranged from primary education (e.g., [19]: 40.9% primary) to higher education levels (e.g., [23]: 41% less than high school). Marital status was reported in several studies, with a notable proportion of participants being married (e.g., [22]: 59% married). Ethnic and racial backgrounds were diverse, with significant representation of African American and Black participants in studies conducted in the United States (e.g., [20]: 78.1% Black).

Access

Income levels varied, with many participants reporting low income (e.g., [24]: 49.5% earning ≤$5,000 annually). Employment status was also diverse, with a significant number of participants being unemployed or in informal employment (e.g., [25]: 64.8% unemployed). The percentage of participants with insurance coverage varied, with some studies reporting high levels of uninsured individuals (e.g., free 2005: 58% Medicaid with dental coverage and no private insurance).

Unmet Dental Service Needs (UDSN)

The prevalence of UDSN was high across several studies. For instance, Mohamed [26] reported a 90.4% unmet treatment need among children in South Africa, while Santella [20] found that 59.4% of participants in the United States did not receive necessary dental care. Common oral health problems included untreated dental caries, dry mouth, enamel hypoplasia, and ulcers. These issues were prevalent among PLWHA, as highlighted in multiple studies.

Oral and dental issues

The results indicate that there are many barriers and facilitators of UDSN among PLWHA. The most common barriers include low income, lack of insurance, unemployment, transportation difficulties, waiting time, cumbersome procedures, lack of dental providers, dental anxiety and fear, problem-focused care-seeking behavior, negative experiences with dental providers, HIV stigma, lack of knowledge, psychological issues, smoking, alcohol use, history of jail, stimulant or opioid use, and food insecurity. The most common facilitators include higher education, stable housing, having a regular source of dental care, having an HIV primary care doctor, having a dental case manager or social worker, and receiving help in getting dental care. The findings indicate a significant occurrence of oral and dental issues in PLWHA [19, 26].

Factors were classified in Table 2 (Demographic, Access, Health Conditions Exacerbating Dental Needs (HCEDN), Patient experience about health care provider behavior, and patients' status).

Overall, the findings underscore the significant oral health disparities and UDSN among various populations, particularly those with low socioeconomic status and limited access to healthcare services.

Discussion

The aim of this study was to examine the factors that influence UDSN among PLWHA. The results showed that demographics, access, HCEDN, Patient experience about health care provider behavior, and patient characteristics were associated with the use or non-use of dental services. These findings have implications for improving the oral health and quality of life of this vulnerable population.

The results also show that there is a high prevalence of UDSN among PLWHA, such as untreated dental caries, dry mouth, enamel hypoplasia, and ulcers, which affect their oral health-related quality of life. However, the utilization of dental services, and many people have UDSN. The results also reveal some differences in UDSN by age, gender, race/ethnicity, marital status, living situation, region of residence, and immigration status.

The results indicated that age was a significant predictor of UDSN, with older people being less likely to receive dental care than younger people. This is consistent with previous studies that found that older PLWHA face more barriers to accessing dental services, such as lack of insurance, transportation, and social support. Moreover, older people may have more comorbidities and medications that affect their oral health and increase their need for dental care [41].

Gender was another demographic factor that influenced UDSN, with men being more likely to use dental services than women [19–30, 32–36]. The reasons for the gender disparity in UDSN are not clear but may be related to differences in oral health knowledge, attitudes, beliefs, and behaviors between men and women [42, 43].

Marital status, education level, race/ethnicity, living situation, region of residence, and immigration status

Table 2 Classification of factors affecting UDSN by PLWHA

No	Component	Reference	Reference evidence
Demographic			
1	Age	[19, 20, 22–25, 27–35]	In general, most of the people in the studies were middle-aged and it seems that age has a direct relationship with not receiving services (decreasing utilization with aging).
2	Gender	[19–30, 32–36]	Men had utilization more than females
3	Marital Status	[19, 22, 27, 31]	Married patients had utilization more than single ones.
4	Education level	[19, 20, 22–25, 27–29, 31–36]	Higher educated had more utilization than others, especially primary education.
5	Race/Ethnic	[19–21, 23–25, 27, 29–36]	Whites had utilization more than other groups.
6	living in temporary situations	[24, 28, 36, 37]	A stable situation had more utilization than a temporary.
7	Region of residence	[28, 35]	South region had less than other utilization (Less privileged areas in Switzerland and the United States)
8	Being resident or immigrant	[28, 29]	Immigrant utilizes dental care less than residents.
Access			
1	Income	[20–22, 24, 25, 27, 28, 31–40]	The lowest income had less utilization than other.
2	Insurance	[20–23, 25, 28, 32–36]	Insured patients had more utilization than other
3	Employment status	[20, 22, 24, 25, 27, 29, 31, 32, 35, 36]	Unemployed patients had less utilization than other.
4	Transportation	[21–23, 27, 37, 40]	People who had Private transport utilized more than other.
5	Cumbersome Administrative Procedures	[23, 30, 40]	Utilization decreases with an increase in procedure.
6	Long waits at the dental office	[23, 30, 40]	utilization decreases with an increase in waiting time.
7	Available/lack of dental service (distance or facility)	[20–22, 25, 27, 30–32, 34, 36–40]	Patients utilize public sector providers more than private sector services. The people who lived near dental care providers utilized more than those in far distance.
Health Conditions Exacerbating Dental Needs(HCEDN)			
1	Most need care services (oral & dental)	[19, 21, 26, 27, 29, 31, 32, 36]	Dental & oral problems (Such as dry mouth, enamel hypoplasia, and ulcers affecting oral health and quality of life) were most or top problems needed in these studies. The rate of HCEDN shows that utilization was low.
Patient experience about health care provider behavior			
1	Negative service experience	[23, 27, 30–32]	Negative experiences decrease utilization.
2	Painful experiences	[20, 23, 27, 28, 30–32, 38–40]	Utilization decreases if the patient had painful experiences.
3	Privacy and confidentiality	[23, 27, 30–32, 39, 40]	Patients utilize less dental care if service providers do not consider their privacy and confidentiality.
4	Lack of trust in the service provider	[23, 27, 30–32, 39, 40]	Trust in service providers increases utilization.
5	Discrimination by the provider	[23, 27, 30–32, 40]	Discrimination by the provider is one of the barriers to utilization.
Patient-related factors			
1	Fear of HIV stigma	[21, 23, 34, 37–39]	Fear of HIV stigma decreases utilization.
2	lack of knowledge	[28, 32, 37, 40]	Patients with low knowledge utilize dental care less than others.
3	psychological (low motivation, anxiety & …)	[23, 25, 29, 31, 37]	Decrease of utilization.
4	Smoke	[20, 29, 34, 38]	At least 40% were smokers (Decrease in utilization).
5	Alcohol	[20, 29, 34]	Alcohol users report an unmet need for dental care/services, with heavy drinkers experiencing a greater unmet need compared to moderate drinkers, indicating a decrease in utilization.
6	History of jail	[20, 36]	At least 40% were in jail (Decrease of utilization).
7	Stimulant, opioids Use	[20, 25, 34]	Mean 80% user/ user report self-treatment (Decrease of utilization).
8	Food Insecure	[20, 36]	Make less utilization.
9	Has HIV primary care doctor	[20]	Positive relation with utilization
10	Having an assigned case manager or social worker (Dental Case Manager)	[23, 30]	Facility (Make more utilization).
11	Dental Care Source & Medical background	[23, 30, 32]	Patients who have a consistent dental care source and a well-documented medical history are more likely to receive comprehensive care.
12	Problem-focused care-seeking behavior	[23, 31]	Patients who visit a provider only when they have a specific problem (problem-focused care-seeking behavior) tend to use dental services less frequently compared to those who seek regular preventive care.

were also associated with UDSN. Married people, higher educated people, white people, people living in stable situations, people living in regions other than the South, and residents were more likely to use dental services than their counterparts. These findings suggest that social, economic, and cultural factors play a role in determining access and UDSN among PLWHA. Previous studies have also reported similar associations between these factors and UDSN [24, 44].

Access factors, such as income, insurance, employment status, and transportation, were also important predictors of UDSN. People with lower income, without insurance, unemployed, and private transportation were less likely to use dental services than people with higher income, with insurance, employed, and with public transportation. These findings confirm that financial and structural barriers restrict access and contribute to UDSN among PLWHA. [45–47]. Therefore, interventions that reduce the cost of dental care, expand the coverage of dental insurance, increase the availability of dental providers, and facilitate transportation to dental clinics are needed to improve the oral health of this population[4, 48, 49].

HCEDN were also associated with UDSN. People who had more of them were more likely to use dental services than people who had fewer or no HCEDN. This finding indicates that PLWHA tend to seek dental care only when they have a problem, rather than for preventive or routine purposes [50]. This problem-focused care-seeking behavior may result in delayed diagnosis and treatment of oral and dental conditions, which may worsen the oral health and general health outcomes of this population[51, 52]. Therefore, interventions that promote preventive oral health behaviors, such as regular tooth brushing, flossing, and dental check-ups, are needed to prevent and manage HCEDN among PLWHA [53–55].

Healthcare provider factors, such as the behavior, attitude, and availability of dental providers, were also related to UDSN. People who had negative experiences with dental providers, such as long waits, cumbersome procedures, inappropriate or refused treatment, painful procedures, confidentiality issues, mistrust, or discrimination, were less likely to use dental services than people who had positive experiences with dental providers. These findings suggest that the quality and satisfaction of dental care affect the UDSN among PLWHA [56, 57]. Therefore, interventions that improve the communication, empathy, and competence of dental providers, as well as the accessibility, affordability, and acceptability of dental services, are needed to enhance the dental care experience and utilization of this population [58–61].

Patient factors, such as HIV stigma, lack of knowledge, psychological factors, smoking, alcohol use, history of jail, stimulant or opioid use, food insecurity, having an HIV primary care doctor, having a dental case manager or social worker, and having a dental care source and history, were also associated with UDSN. People who feared HIV stigma lacked oral health knowledge, had low motivation, anxiety, or depression, smoked, used alcohol, had a history of jail, used stimulants or opioids, or were food insecure were less likely to use dental services than people who did not have these factors. On the other hand, people who had an HIV primary care doctor, a dental case manager or social worker, or a dental care source and history were more likely to use dental services than people who did not have these factors. These findings indicate that personal, behavioral, and psychosocial factors influence UDSN among PLWHA [62, 63]. Therefore, interventions that address these factors, such as reducing HIV stigma, increasing oral health knowledge, enhancing motivation and self-efficacy, providing psychological support, encouraging smoking and alcohol cessation, offering harm reduction services, ensuring food security, facilitating the coordination and continuity of care, and providing case management and social work services, are needed to improve the oral health and quality of life of this population[64–67]. Therefore, it is recommended that future research emphasize the types of treatment and health services of people to determine the barriers and facilitators of benefiting these people from all types of oral and dental health services.

The limitations of this study include the heterogeneity of the studies included in the review, the potential publication bias, and the lack of information on some factors that may affect the UDSN, such as oral health status, oral health-related quality of life, and patient preferences. Future research should evaluate the effectiveness of interventions to improve access and the UDSN among this population.

While several studies related to the UDSN of PLWHA, this study tried to find and categorize the related factors reported in previous studies. These factors vary from demographic to disease-related. The results could be used by oral health policymakers to decrease inequality in oral healthcare utilization.

Conclusion

This study identified several factors that influence the UDSN among PLWHA. These factors include demographics, access, HCEDN, healthcare providers, and patient characteristics. The findings of this study have implications for improving the oral health and quality of life of this population, by informing the development and implementation of interventions that address the barriers and facilitators to UDSN among PLWHA.

Appendix

The summary of included studies regarding UDSN by PLWHA

Study	Type of Study	Total Sample	Country	Age n(%)	Sex n(%)	Education n(%)	Marital status n(%)
Wang 2023 [19]	cross-sectional analysis was nested in a longitudinal cohort study	71	Kenya	Children 6 to ≤ 12 48 (67.6%)	Male 37 (52.1%)	Primary 29 (40.9%)	-
Masiga 2022 [22]	cross-sectional explorative mixed methods study	221	Kenya	34–41 91 (41%)	Female 221(100%)	Primary 95 (43%)	Married 130 (59%)
Santella 2021 [20]	observational study	Total participants: 801 Participants assessed for dental care utilization: 657	United state	35–49 177 (45.4%)	Female 132 (39.6%)	Less than high school 164 (42.1%)	-
Dasgupta 2021 [21] (*n* = 340)	observational study	340	United States	-	Male 92%	-	-
Mohamed 2020 [26]	cross-sectional survey	66	South Africa	Child 2–12 y	Male 38 (57.6%)	-	-
Turton 2015 [27]	observational study	Total participants: 435 Participants with oral health problems: 347 (79.8%) Participants who received care: 288 (83% of those with oral health problems)	South Africa	20–29 years 435(100%)	Female 435(100%)	-	-
Parish 2015 [23]	randomized controlled trial	44	United State	mean age was 47 years (30–67 y)	27 (61%) males	education, 18 (41%) had less than a high school education	-
Krause 2013 [37]	cross-sectional study	220	United State	35_44 73 (33%) 45_54 68 (31%)	Female 115 (52%)	Less than high school graduate 66 (30%) High school graduate 74 (33%)	Never married 100 (45%)
Darling 2013 [28]	cross-sectional	50	Switzerland	29.7 mean	Female 45 (90%)	Obligatory schooling 28 (56%)	-
Singer 2012 [29]	cross-sectional study	444	United State	45–54 208 (47.1%)	Male 264 (59.5%)	High school graduate 164 (36.9%) High school graduate or general diploma 163 (36.7%)	-
Pereyra 2011 [24]	cross-sectional study	593	United State	35 to < 45 230 (38.8%) 45 to < 55 217 (36.6%)	Male 420 (70.8%)	High school graduate 227 (38.3%)	-
Lemay 2010 [30]	cross-sectional study	160	United State	45–54 32(45.1%)	Male 57(80.3%)	-	-
Nazir 2005 [31]	observational study	81	United Kingdom	mean age of 40.5	Male 79(76%)	General Certificate of Secondary Education 38%	single (63%)
Freed 2005 [32]	descriptive study	2466	United States	35–49 1388 (55%)	Female 1748 (77%)	12–15 years education 1391 (55%)	-
Menke 2003 [25]	comparative study using data from prospective cohort studies	1771	United States	Age < 45 years 74.9%	Male (100%)	Education < 12 years 46.9%	-
Kenagy 2003 [36]	longitudinal interview study	161	United States	-	Males comprised 60.9%	some high school" (32.5%)	-
Dobalian 2003 [33]	longitudinal study	2864	United States	38.8 mean	Male 1580 (70.7%)	AA/some college 646 (28.9%)	-
Metsch 2002 [34]	observational study	1479	United States	37.3 mean	Male (846) 57.2%)	>High school graduate/GED 60.8% (*n* = 899)	-
Heslin 2001 [35]	Cross-sectional study	2864	United States	35–49 years (*n* = 1,587)	Male (2,013)	AA/some college (*n* = 808) HH diploma (*n* = 804)	-
Duran 2000 [40]	Cross-sectional study	28	United States	25–35 50%(14)	Male 79% (22)	High School 48%(13)	-

Study	Ethnic/Race n(%)	Income n(%)	Employment n(%)	Percentage of having Insurance n(%)	Dental Insurance n(%)	Region n(%)	Dental unmet need n(%)
Wang 2023 [19]	-	-	-	-	-	-	47 (66.2%)
Masiga 2022 [22]	-	= < 10,000 KES 93 (42%)	Informal 108 (49%)	71 (32%)	-	-	-
Santella 2021 [20]	Black 303 (78.1%)	Less20,000 $ annual 247 (90.5%)	Disabled 192 (49.2%)	241 (62.1%)	-	Southern 248 (63.6%)	(59.4%) No received care
Dasgupta 2021 [21] (*n* = 340)	non-Hispanic/Latino White 57%	-	-	204 (60%)	-	-	38%
Mohamed 2020 [26]	-	-	-	-	-	-	Unmet treatment need (90.4%)
Turton 2015 [27]	-	-	-	-	-	-	13.56 (59%)
Parish 2015 [23]	27 (61%) Blacks	-	-	-	-	-	-
Krause 2013 [37]	African-American 191 (87%)	$5000_$9,999 63 (29%)	-	117 (57%)	-	-	(56.6%)
Darling 2013 [28]	-	-	-	-	-	-	Perceived needs 7(17%)
Singer 2012 [29]	Non-Hispanic black or African American 271 (61.2%)	-	-	-	-	-	56%
Pereyra 2011 [24]	Black 338 (57.0%)	<=$5,000 291 (49.5%)	No 456 (76.9%)	-	-	-	493 (83.1%)
Lemay 2010 [30]	Non-Hispanic 59 (83.0%) White 57 (80.3%)	-	-	-	-	-	-
Nazir 2005 [31]	84% White British	greater than £30,000 per annum 16%	Unemployed 46%				25%
Freed 2005 [32]	White 1249 (49%)	-	Not employed 1507(60%)	858 (29%)	Medicaid with dental coverage& No private insurance (58%)	South 784(36%)	75%
Menke 2003 [25]	860 (48.6%) were white	Monthly family income <$750 54.3%	Unemployed 64.8%	857(48.4%)	-	-	-
Kenagy 2003 [36]	African American (82.6%).	(81.3%) less $10,000 per year (63.8% less $5,000)	Not employed (83.2%)	64(40.6%)	-	-	28%
Dobalian 2003 [33]	White 1217 (54.5%)	$25,001+ 642 (28.7%)	-	1193 (53.4%)	-	-	-
Metsch 2002 [34]	African American 37.6% (556)	$5,000 + 40.1% (593)	Yes 52.6% (777)	-	-	-	76.3%
Heslin 2001 [35]	White (1,397)	>$25,000 (778)	Unemployed (1,845)	596 (20.81)	Medicaid / dental 596	South (913)	18.9% *Unmet dental need 32,900*
Duran 2000 [40]	-	1–500 56%(14)	Retired / Disabled 56%(15)	35% (9)	-	-	Dental Care needs 46%(13) Not received 82% (23)

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Authors' contributions
PB raised the research idea and helped in finding keywords, searching terms, and screening. SD and MS searched databases, screened the papers, and drafted the primary version of the manuscript collaboratively. MS extracts data from papers. All authors analyze and chart the findings. All authors reviewed the final version of the manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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