


Oral health self-care behaviours in serious mental illness: A systematic review and meta-analysis

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Abstract

Aim: To understand the relationship between serious mental illness and oral health self-care behaviours using meta-analytic methods and a narrative synthesis of available literature.

Method: The review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines [PROSPERO reference: CRD42020176779]. Search terms pertaining to serious mental illness and oral health were entered into EMBASE, PsycINFO, Medline and CINAHL. Eligible studies included a sample of people with a serious mental illness and a quantitative measure of an oral health self-care behaviour (eg dental visits, toothbrushing). The Effective Public Health Practice Project tool was utilised to appraise the quality of the literature. Studies in the meta-analysis contained a non-clinical or general population comparator sample.

Results: People with a serious mental illness were significantly less likely to visit the dentist (OR 0.46, 95% CI 0.32–0.65, $p > 0.001$) or brush their teeth (OR 0.19, 95% CI 0.08–0.42, $p < 0.001$) when compared to non-clinical comparator samples. Few studies explored other oral health self-care behaviours (eg flossing and mouth washing), but uptake was generally low in people with a serious mental illness. The study quality of included studies was variable.

Conclusions: The research showed a reduced uptake of oral health self-care behaviours in people with a serious mental illness. Suboptimal oral health can negatively impact on physical, social and psychological functioning. Further research is needed to understand the reasons for low rates of oral health self-care behaviours in this population.

KEY WORDS

bipolar disorders, dental care, oral health, psychotic disorders

Summations

- People with a serious mental illness were less likely to visit the dentist.
- They were also less likely to brush their teeth.
- There was limited evidence around the use of dental floss and mouthwash

Limitations

- The quality of the available literature was variable.
- Few studies explored the use of dental floss and mouthwash.
- Research typically did not distinguish between routine and emergency dental visits.

1 | INTRODUCTION

There is evidence that people with a serious mental illness (SMI; ie psychosis, bipolar disorder) experience worse oral health outcomes than the general population.¹ For example, past research has indicated that people with SMI are 2.8 to 3.4 times as likely to be edentulous (complete loss of all teeth) and have significantly higher rates of decayed, missing or filled teeth (DMFT) or surfaces (DMFS) in comparison with the general population.²⁻⁴ Suboptimal oral health can have a detrimental impact on physical and psychological functioning.⁵ The oral cavity plays a crucial role in the overall well-being of a person and damage thereof can cause considerable suffering by affecting basic and essential functions like eating and speaking.⁶ Severe caries (tooth decay) leads to pain, discomfort, disfigurement, acute and chronic infections, and eating and sleeping disruption as well as a higher risk of hospitalisation, high treatment costs and lost workdays.⁷ Research suggests that there is a link between poor oral health and chronic disease, such as diabetes and cardiovascular diseases.^{8,9} The ability to smile can also be affected,⁵ which can impact on self-esteem¹⁰ and the ability to socialise with others.⁶

The reasons for poor oral health outcomes in people with SMI are likely complex and may include higher rates of drug misuse,¹¹ smoking¹² and medication side effects (eg xerostomia).¹³ Poor oral health in this population may also be due to reduced levels of oral health self-care behaviours (eg dental care, toothbrushing). Some, but not all, studies have suggested that people with a SMI are less likely to attend routine dental visits and, when they do, are more likely to have teeth extracted rather than filled.²⁻⁴ This could explain the high rate of edentulous in this population. An increased focus on preventative practices has improved oral health outcomes in the general population.¹⁴ Further research is needed to understand levels of oral health behaviours in people with SMI, which could inform future prevention and intervention strategies, leading to better outcomes. It may help to understand oral health inequalities in people with SMI.

1.1 | Aims of the study

The aim of this review was to better understand utilisation of oral health self-care behaviours in people with SMI. It used meta-analytic methods to synthesise the size and consistency of differences in oral health self-care behaviours between people with a SMI and non-clinical comparator samples. It also aimed

to narratively review studies without a non-clinical comparator sample to better summarise the existing literature.

2 | MATERIAL AND METHODS

This review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-analyses standards with a protocol published on PROSPERO [CRD42020176779].

2.1 | Eligibility criteria

The inclusion criteria were as follows: (i) case-control, cohort, cross-sectional, longitudinal and epidemiological design study; (ii) publication in an English language peer-reviewed academic journal; and (iii) a quantitative measure of an oral health self-care behaviour. We defined oral health self-care behaviours as actions that individuals take to improve or preserve good oral health.¹⁴ This included owning a toothbrush, dental care attendance and frequency of toothbrushing.

Studies were required to include a sample of at least 75% of people diagnosed with a SMI in accordance with the Diagnostic and Statistical Manual (DSM-III or later) or International Classification of Disease (ICD-9 or ICD-10) criteria. SMI is a contentious, but widely used term often including a range of diagnoses such as personality disorders, major depression disorder and dementia.^{2,3} However, for the purpose of this review, SMI was defined as the collective term for people with a diagnosis of a psychotic or a bipolar spectrum disorder to maintain consistency with the UK-based National Institute for Health and Care Excellence (NICE) guidance and the majority of past literature.¹⁵ Specific diagnostic criteria included schizophrenia, schizophreniform, schizoaffective disorder, delusional disorder, bipolar I and bipolar II. Participants who met the operational criteria for an early intervention service for first episode psychosis were included to allow for diagnostic uncertainty in younger age groups. For the purpose of the meta-analysis, eligible studies were required to include valid comparator group (eg general population sample, non-clinical comparator).

2.2 | Screening procedure

Systematic searches were conducted in Medline, EMBASE, PsycINFO and CINAHL to identify peer-reviewed articles

published between January 1980 and April 2020. Search terms were entered in blocks relating to serious mental illness (severe mental or serious mental or chronic mental or schizo* or psychoti* or psychos* or hallucinat* or paranoi* or bipolar or mania or manic) and oral health (oral health or oral hygiene or tooth* or teeth* or dent*). The search terms were developed based on the authors' clinical experience and relevant past reviews.^{2-4,16} In cases where papers were unavailable or the data were insufficient to confirm eligibility or generate an effect size, information was requested from the primary or corresponding author. The first author (ET) screened the reference lists of eligible articles, citing articles and relevant reviews.^{2-4,16} Ten per cent (805 studies) of titles and abstracts were double rated by another author (TV), with high levels of agreement ($k = 0.84$). At least two of the authors screened each of the full articles to confirm eligibility with discrepancy resolved through consensus.

2.3 | Data extraction

Relevant study information (eg study design, sample size and type of sample) was extracted by the first author (ET). For the meta-analysis, outcome data were independently extracted by two authors (ET and JPC) to calculate an effect size ($ICC = 0.95$, $p > 0.001$). If multiple time points were presented (eg dental visit within one year and dental visit within two years), the lower timescale analysis was selected to ensure consistency. When possible, we extracted analyses that controlled for covariates (eg adjusted odds ratios).

2.4 | Quality assessment

An adapted version of the Effective Public Health Practice Project (EPHPP) tool¹⁷ was used to evaluate the overall quality of the included articles due to its suitability for assessing public health-focused quantitative studies. The EPHPP has demonstrated good construct and content validity and interrater reliability.¹⁸ Consistent with previous review papers,^{19,20} the tool was adapted to account for the observational design of eligible studies. Domains that were not considered relevant (design; blinding; intervention integrity; withdrawals and drop-outs) to the included studies were omitted. The design domain pertained to randomisation procedures for intervention evaluations and was therefore not relevant to the reviewed literature and excluded.

The adapted version of the EPHPP consisted of four domains: selection bias, confounders, data collection methods and analyses. Each domain was rated as strong, moderate or weak, and from this, a global rating was derived based for each domain. In the original EPHPP, analyses ratings were not used to calculate the global rating. However, consistent

with previous adaptations,²¹ a decision was made to include analyses scores in the overall global rating as appropriateness of analysis was deemed to be integral to the quality of the study. Articles were rated by two authors (ET and TV; 79% agreement), and, in cases of discrepancy, consensus was reached with input from a third author.

2.5 | Statistical analysis

2.5.1 | Meta-analysis

We used comprehensive meta-analysis (CMA, v3)²² to generate effect sizes and conduct analysis for all outcomes with $K > 3$. Study effect sizes were transformed into odds ratios and a random effects model was utilised as statistical heterogeneity was expected across studies.²³ Heterogeneity was explored through the use of the Q test and I^2 statistic and a sensitivity analysis was conducted to assess whether any individual study had greater influence over the overall effect size.

2.5.2 | Narrative synthesis

In order to appraise the wider literature in this area, all studies without a comparator group were narratively synthesised using the synthesis without meta-analysis (SWiM)²⁴ guidelines. Outcomes were grouped according to oral health self-care behaviours and the corresponding literature was tabulated using the population, intervention, comparator and study type (PICOS) framework to summarise the literature and explore clinical heterogeneity. A weighted average was calculated for key outcomes, using all available data, even those without a clinical comparator.

3 | RESULTS

The PRISMA flowchart (Figure 1) displays the screening process. Thirty-three studies²⁵⁻⁵⁷ were eligible for inclusion. The total sample comprised of 446,932 people with a SMI and 6,284,176 controls. Further information was provided by seven authors^{26,29,35,38,44,48,57} to either confirm eligibility or produce an effect size. Table 1 displays the descriptive information on the included studies.

3.1 | Quality appraisal

Findings from the quality assessment are summarised in Table 2. Six studies obtained strong scores, seven moderate and 20 weak. Limitations predominantly related to data collection

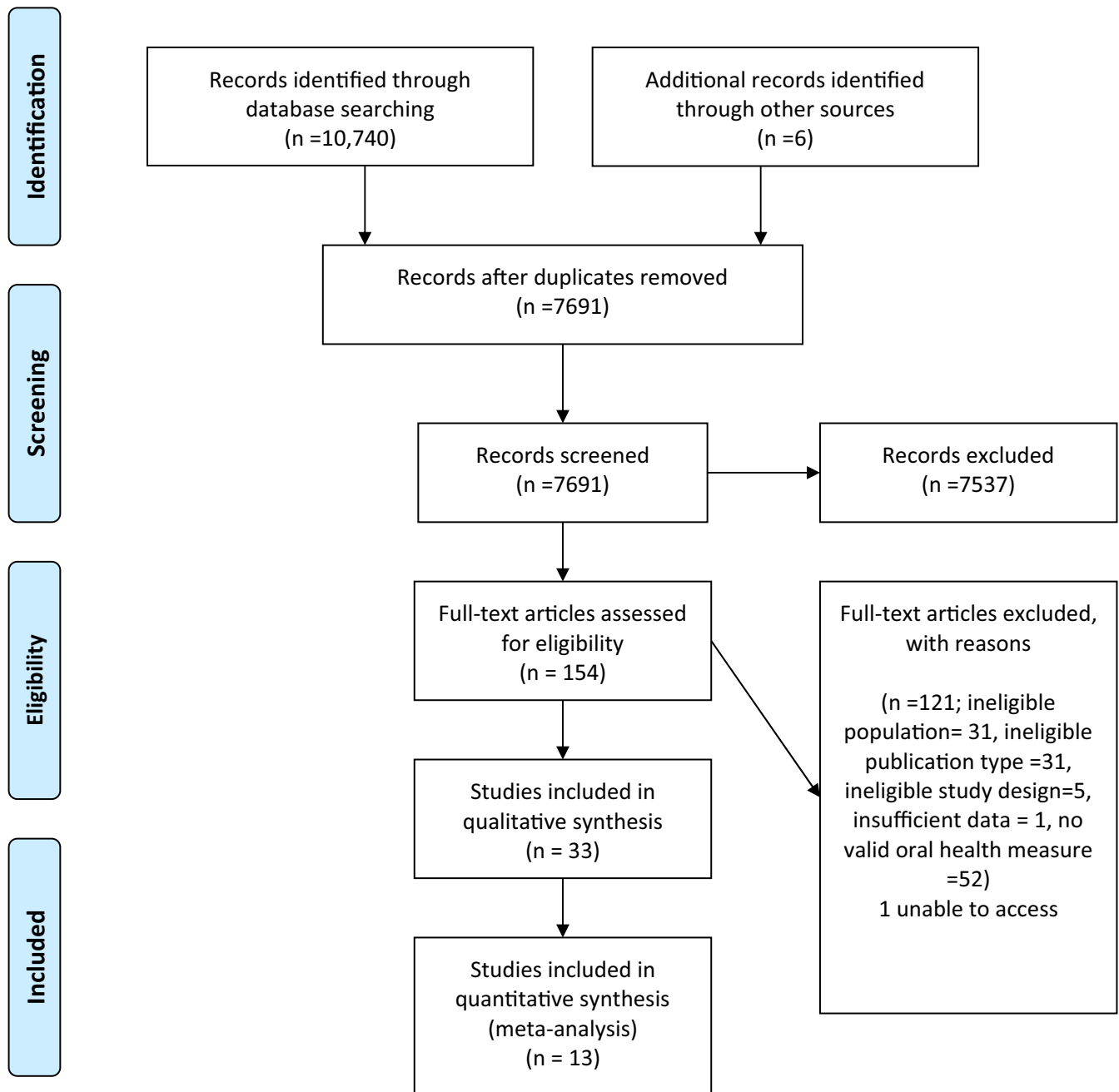


FIGURE 1 PRISMA Flow Diagram of article screening

as the outcome measures were typically not validated and had poor reliability. Studies tended to have a broader focus than oral health self-care behaviours. Therefore, the analysis in this area tended to be basic (eg percentages) and did not account for confounders, leading to higher rates of weak ratings.

3.2 | Dental service use

Twenty-three studies reported data on dental visiting behaviour. These studies were of mixed quality. However, more than half of the studies entered into the meta-analysis were

of strong quality. Studies were conducted in Europe (52%, $K = 12$), North America (26%, $K = 6$), Asia (13%, $K = 13$), South America (4%, $K = 1$) and Australasia (5%, $K = 1$). Sixteen studies focused on people with a psychotic disorder, one on bipolar disorder and six on mixed SMI samples. A weighted average of data from eight^{28,33,40,41,43,45,52,57} cross-sectional and case-control studies indicated that 34% of participants with SMI had visited the dentist in the previous year. One epidemiological study⁴⁷ indicated that 43% of participants had visited the dentist within one year.

Two studies had higher rates of dental attendance compared to the rest of the literature, potentially explained by their

samples of people with early psychosis²⁵ (80% within 2 years) and bipolar disorder²⁹ (85% within 2 years). Data were split into diagnostic groups (psychotic disorders and bipolar disorder) in one study,³⁷ which looked at dental attendance across a five-year period. Although levels of attendance were high across both groups, they were greater in bipolar disorder (79% compared to 68%). One small-scale cross-sectional study⁵⁷ explored the impact of a partnership between mental health and dental services and found that 90% of individuals with a SMI had attended the dentist within one year. Baseline data were not provided to explore the difference between outcomes before and after the integration of services.

3.3 | Dental service use meta-analysis

Nine studies^{29,30,33,36,41,43,47,52,55} of mostly strong quality explored dental service usage in comparison to a non-clinical comparator and were analysed using random effects meta-analysis (Figure 2). One study²⁵ was omitted from this analysis as the measure of dental service use was not consistent across the case sample and non-clinical comparator. The analysis (Figure 2) showed an overall OR of 0.46 (95% CI 0.32–0.65, $p > 0.001$), indicating that individuals with a SMI were significantly less likely to access dental services in comparison with non-clinical controls. Separate analyses were conducted to explore differences between case-control and epidemiological studies. Although statistically there was no significant difference in the strength of effect sizes between the two types of study ($Q(1) = 0.70$, $p = 0.400$), the five case-control studies (OR 0.32, 95% CI 0.08–1.29, $p = 0.109$) indicated no significant difference in dental service usage between SMI and non-clinical controls, whereas the four epidemiological studies (OR 0.60, 95% CI 0.38–0.96, $p = 0.003$) did show a significant difference between these populations.

The Q test and I^2 statistic were used to explore statistical heterogeneity. Results indicated high levels of statistical heterogeneity across studies ($Q(8) = 2097.61$, $p < 0.001$, $I^2 = 99.62$), suggesting that the strength of the relationship between SMI and dental service use was highly variable. A sensitivity analysis, which removed each study in turn to explore the impact on the overall effect size, indicated that one study⁴³ exerted some influence over the overall effect size (OR 0.65, 95% CI 0.46–0.93, $p = 0.019$).

3.4 | Oral hygiene

3.4.1 | Toothbrushing frequency

Twenty-one studies provided data on toothbrushing frequency. An even proportion of studies were conducted in Europe and Asia (43%, $K = 9$), and the remaining studies were conducted

in North America (9%, $K = 2$) and Australasia (4%, $K = 1$). Fifteen studies were conducted in people with a psychotic disorder only (75%, $K = 15$), whereas six (25%, $K = 6$) studies were conducted in mixed SMI samples. A weighted average of 10 studies^{25,26,39,40,43,51–54,56} indicated that only 39% of people with a SMI brushed their teeth twice a day.

The results and measures used to assess toothbrushing frequency were greatly variable. Results indicated that toothbrushing habits were often reduced in inpatient samples of people diagnosed with schizophrenia. Two studies^{38,56} found that the uptake of toothbrushing behaviours was low in 50% of participants. Similarly, in one study, “habitual brushing” (undefined) was recorded in only 22% of participants.²⁷ In mixed SMI inpatient samples,^{43,46,54} participants were more likely to clean their teeth. Studies of better quality^{38,56} were more likely to report reduced toothbrushing behaviours.

3.4.2 | Toothbrushing frequency meta-analysis

Five case-control studies^{25,39,43,52,56} of predominantly weak quality included a non-clinical comparator group and were entered into a random effects meta-analysis (Figure 3) to produce an overall effect size. Outcomes for two studies were dichotomised to generate an effect size.^{43,56} The overall effect size (OR 0.19, 95% CI 0.08–0.42, $p < 0.001$) suggested that people with a SMI were significantly less likely to brush their teeth than controls.

The Q test and I^2 statistic ($Q(4) = 23.13$, $p < 0.001$) indicated high levels of heterogeneity. 82% of the variance was due to statistical heterogeneity. A sensitivity analysis was conducted to identify outliers. The results indicated that two studies^{25,39} exerted some influence over the overall effect size. When one study²⁵ was removed, the effect size reduced to OR 0.07, CI 0.01–0.55, $p = 0.012$. A similar effect was observed when the other study³⁹ was removed (OR 0.06 CI 0.01–0.44, $p = 0.005$). However, the effects of neither study were great enough to impact overall statistical significance.

3.4.3 | Toothbrush ownership and maintenance

Two studies of weak quality reported on toothbrush ownership^{25,44} and found similar levels in people with a SMI (70% and 66%). Results from three studies^{26,27,43} of weak to moderate quality indicated variable levels of toothbrush maintenance in people with a SMI. One study⁴³ suggested that only 1.8% of people with SMI changed their toothbrush every three months, but this was higher at 33% in a second study.²⁶ A key difference between these two studies was that the former⁴³ recruited an inpatient sample and the latter²⁶ (which indicated a much higher rate of upkeep) included an outpatient sample. A third

TABLE 1 Descriptive information on included studies

Study ID	Study design	Population Diagnosis	Status	Country
Adams 2017	Clustered RCT, baseline data	First episode psychosis	Outpatient	UK
Agarwal, 2019	RCT, Baseline data	Schizophrenia	Outpatient	India
Corridore, 2017	Cross-sectional	Schizophrenia, schizoaffective, borderline personality disorder	Therapeutic community	Italy
Cunha 2017	Case-control	Bipolar disorder	Outpatient	Brazil
Denis, 2017	Cross-sectional	Schizophrenia	Inpatient and outpatient	France
Denis, 2019	Cross-sectional	Schizophrenia	Inpatient and outpatient	France
Denis 2020	Epidemiological	Schizophrenia	Inpatient and outpatient	France
Dickerson, 2003	Case-control	Schizophrenia, schizoaffective disorder	Outpatient	United States
Djordjevic, 2019	Case-control	Schizophrenia	Inpatient	Serbia
Eltas, 2013	Cross-sectional	Schizophrenia	Outpatient	Turkey
Eskelinen, 2017	Cross-sectional	Schizophrenia, schizoaffective disorder, other schizophrenia spectrum disorder	Outpatient	Finland
Gandre, 2020	Epidemiological	Psychotic and bipolar disorder	Outpatient and inpatient	France
Gurbuz, 2011	Cross-sectional	Schizophrenia	Inpatient	Turkey
Hede, 1992	Case-control	Schizophrenia, reactive psychosis, manic depression	Outpatient	Denmark
Hsieh, 2011	Pre-test post-test design, baseline data	Schizophrenia	Inpatient	Taiwan
Janhardanan, 2011	Case-control	Schizophrenia	Outpatient	United States
Jovanovic, 2010	Case-control	Schizophrenia, NOS psychosis, schizoaffective disorder, persistent psychotic disorder, bipolar disorder	Inpatient	Serbia
Lynch, 2005	Cross-sectional	Schizophrenia, other	Inpatient	Northern Ireland
McCreadie, 2004	Case-control	Schizophrenia	Outpatient	Scotland
Nayak, 2020	Cross-sectional	Schizophrenia, mania	Outpatient	India
Ngo, 2018	Cross-sectional	Schizophrenia, Intellectual Disability, other	Inpatient	Singapore
Nielson, 2011	Epidemiological	Schizophrenia	Inpatient and outpatient	Denmark
Pelletier, 2015	Cross-sectional	Schizophrenia, schizotypal disorder, delusional disorder	Outpatient	Canada
Patrick, 1996	Cross-sectional	Schizophrenia	Outpatient	United States
Salsberry, 2005	Cross-sectional	Schizophrenia, schizophreniform, schizoaffective disorder, delusional disorder, ICD-9 – Paranoid disorders	Outpatient	United States
Singh, 2017	Cross-sectional	Schizophrenia	Outpatient	India
Singh, 2019	Cross-sectional	Schizophrenia	Outpatient	India

Sample size	Comparator Type	Outcome
Case: 1248 Control: 17849	Adult Dental Health Survey (ADHS)	Dental service use, toothbrush frequency, technique and ownership
111	N/A	Toothbrushing frequency, technique, maintenance of toothbrush, aid for cleaning tongue and mode for cleaning teeth
67	N/A	Dental service usage and toothbrushing frequency
Case: 176 Control: 176	Existing study datasets	Dental service use
90	N/A	Dental service usage and toothbrushing frequency
109	N/A	Dental service usage and toothbrushing frequency
Case: 2,213 Control: 578,006	General population database	Dental service usage (scaling)
Case: 100 Control: 2705	National health and nutrition survey	Dental service usage
Case: 190 Control: 190	Community sample of patients with localised or generalised chronic periodontitis	Toothbrush frequency and technique
53	N/A	Toothbrush frequency
275		Dental service use
Case: 413,437 Control: 1,240,311	French national health data system	Dental service use
330		Toothbrushing frequency
Case: 84 Control: 2548	General population survey	Dental service use and toothbrushing frequency
100	N/A	Toothbrush frequency and maintenance of toothbrush
Case: 198 Control: 113	Community comparison group	Dental service usage
Case: 186 Control: 186	Community comparison group	Dental service use, toothbrush frequency, technique and maintenance of toothbrush
65	N/A	Toothbrush ownership
Case: 93 Control: 28,471	General population survey	Dental service usage, toothbrushing frequency, flossing, mouthwash use
250	N/A	Toothbrush frequency
191		Toothbrushing frequency
Case: 21,417 Control: 3,790,446	National health insurance database	Dental service use
146		Toothbrushing frequency
353	N/A	Dental service use
230		Dental service use
71		Dental service use, toothbrushing frequency, mode and material for cleaning teeth
156		Dental service use, toothbrushing frequency, mode and material for cleaning teeth

(Continues)

TABLE 1 (Continued)

Study ID	Study design	Population Diagnosis	Status	Country
Stiefel, 1990	Case-control	Schizophrenia, bipolar disorder, other non-organic, personality disorder	Outpatient	United States
Tani, 2012	Cross-sectional	Schizophrenia, schizoaffective disorder, delusional disorder, acute and transient psychotic disorder	Inpatient	Japan
Teng, 2016	Epidemiological	Schizophrenia, delusional disorders	Inpatient and outpatient	Taiwan
Tredget, 2019	Cross-sectional	Schizophrenia	Outpatient	Wales
Wieland, 2010	Cross-sectional	Schizophrenia, schizoaffective disorder, bipolar disorder, schizotypal personality disorder	Outpatient	Australia
Xiong, 2010	Cross-sectional	Bipolar, psychotic disorder	Outpatient	United States

study of weak quality²⁷ found that 25% of subjects “maintained their hygiene tools” over an unspecified timescale.

3.4.4 | Toothbrush technique

Three studies of moderate to weak quality investigated toothbrushing technique^{26,43,56} and found between 72.6% and 98.2% of people with a SMI used the incorrect brushing technique. Agarwal and colleagues²⁶ defined the correct technique as sulcular (also known as bass), which has been found to be more effective.⁵⁸ The other studies did not define the correct toothbrushing technique and are therefore difficult to interpret.

3.4.5 | Materials used for oral health self-care behaviours

Two studies^{26,50} of weak and moderate quality explored the uptake of oral hygiene tools in people with a SMI. Both were conducted in India with participants diagnosed with schizophrenia. Results indicated that 21.6% of participants used a tongue cleaning aid.²⁶ One study⁵⁰ highlighted that 34% of the sample used their finger to clean their teeth.

3.4.6 | Flossing frequency

In three studies^{45,52,57} of weak quality, uptake of flossing behaviour ranged from 11% to 20%. One study⁵² found that flossing behaviour was 50% lower in a sample with SMI compared to non-clinical controls. No studies investigated flossing technique.

3.4.7 | Mouthwash

Three studies^{40,45,57} of weak quality explored the uptake of mouthwash in people with a SMI. In one study,⁴⁰ 4.7% of

participants reported that their oral care routine solely consisted of using mouthwash. One study⁴⁵ found that 23% of individuals with SMI used mouthwash as part of their oral care routine, which was similar to a non-clinical comparator group. A further study⁵⁷ found that 35% of people with a SMI used mouthwash, but there was no non-clinical comparator group.

4 | DISCUSSION

This is the first meta-analysis to comprehensively explore the uptake of oral health behaviours in people with SMI. We systematically reviewed 33 studies comprised of 446,932 people with a SMI and 6,284,176 controls. Findings indicated that people with SMI are significantly less likely to access dental services and frequently brush their teeth when compared to the general population. There is also some tentative evidence to suggest that other behaviours such as flossing, mouth washing, and ownership and maintenance of materials for oral health self-care behaviours are low in individuals with a SMI.

Recent research has suggested that people with a SMI are more likely to experience suboptimal oral health in comparison with the general population.²⁻⁴ This review builds on existing literature by finding that oral health self-care behaviours are significantly reduced in people with a SMI. Results indicate that between 34 and 43% of people with a SMI visit the dentist at least annually. This is stark contrast to past research indicating that approximately 61% of the general population visit the dentist at least once per year.⁵⁹ Similarly, the finding that 39% of individuals with a SMI clean their teeth twice a day is much lower than what is typically recorded for the general population.⁶⁰ More research is needed to ascertain the difference between SMI and the general population when key confounders (eg socio-economic status, access to dental care) are considered. Two of the included studies^{36,55} controlled for income and access to dental care and found similarly low

Sample size	Comparator Type	Outcome
Case: 37 Control: 29	Community comparison group	Dental service use, toothbrushing frequency and flossing.
523	N/A	Toothbrushing frequency
Case: 4298 Control: 623,175	National insurance research database	Dental service use
106	N/A	Dental service usage, toothbrush frequency and mouthwash use
20		Dental service use, toothbrushing frequency, flossing and mouthwash use
170	N/A	Dental service usage

rates of dental service utilisation in SMI. Research in non-clinical samples has indicated an association between dental behaviours and outcomes.⁶¹ However, further research is required to establish whether the uptake of oral health self-care behaviours mediates the relationship between SMI and oral health outcomes.

Overall, the quality of the literature was variable with a high number of studies receiving a weak rating on the EPHPP tool. Outcomes of interest were seldom the focal point of included studies. Therefore, outcome measures were often unvalidated and analyses typically neglected to include key confounders (eg severity of illness, socio-economic status, access to dental care). It is also noteworthy that some studies used survey data as the comparator group and did not employ matching criteria. Although the quality of the available literature was variable, we were able to extract descriptive data from the majority of identified studies.

In the available literature, mental health diagnoses were often retrieved from the medical notes, and in some cases, the method of confirming diagnoses was unstated. Further information was required from some authors to ascertain the diagnostic system used. Future studies should address this issue by ensuring that diagnoses are determined through more rigorous processes. Maintenance behaviours and dental attendance were poorly defined in the majority of studies. Most failed to distinguish between routine and emergency care. This is important given that people with a SMI may be more likely to utilise emergency care in crisis and less likely to attend routine dental visits.³⁰ Future research should carefully define dental visiting to provide a better understanding of pathways to care.

The literature predominantly focused on individuals with a psychotic disorder. However, one study²⁹ explored dental visiting behaviours in people with a diagnosis of bipolar disorder only, where there were high rates of dental attendance similar to the control group. High rates of dental attendance were also found across a longer time period in a study that separately assessed dental attendance in bipolar disorder and

psychotic disorders.³⁷ It is possible therefore that dental visiting behaviours may not be as disrupted in people with bipolar disorder. No studies looked at toothbrushing in bipolar disorder, which poses as an important area for future research.

Only a limited number of studies could be statistically analysed using meta-analytic methods as the majority did not include a non-clinical comparator. Consequently, post hoc analyses were not conducted to assess selection and publication bias.^{62,63} Substantial levels of heterogeneity reduce confidence in the size of the effects produced. The observed heterogeneity may have been due to differences in methods and quality across the included studies. Study design had an impact on the dental visiting results. Statistically, there was no difference between case-control and epidemiological findings. However, when analysed separately, epidemiological studies indicated a significant difference between dental visiting in people with a SMI compared to controls, whereas case-control studies did not.

We restricted our inclusion criteria to peer-reviewed papers published in the English language which may have introduced bias. Studies with significant findings may be more likely to be published, which could skew the results.⁶⁴ Accessing English language publications may also reduce diversity across study samples. Requests for further information to confirm diagnoses or generate an effect size were sent to multiple authors and responses were only received by seven authors, which limited the ability to include some studies.

The disparity between the physical health of people with a SMI and the general population has been well documented.^{65,66} Growing evidence suggests disparities exist in oral health.^{2-4,67} The reasons for this are likely to be multifactorial and may include medication,^{68,69} systemic issues^{70,71} and personal capability.⁷² Literature indicates that education alone does not improve oral health outcomes in this client group, despite guidance published by the British Society of Disability and Oral Health (BSDH).⁷¹ One study²⁵ adapted and evaluated the checklist from BSDH guidelines and found no significant

TABLE 2 Quality assessment

Study ID	Selection Bias	Confounders	Data collection	Analysis	Global rating
Adams 2017	Moderate	Weak	Weak	Moderate	Weak
Agarwal, 2019	Moderate	Moderate	Weak	Strong	Moderate
Corridore, 2017	Weak	Weak	Weak	Moderate	Weak
Cunha 2017	Moderate	Moderate	Weak	Strong	Moderate
Denis, 2017	Moderate	Strong	Weak	Strong	Moderate
Denis, 2019	Weak	Strong	Weak	Strong	Weak
Denis 2020	Strong	Strong	Strong	Strong	Strong
Dickerson, 2003	Moderate	Strong	Moderate	Strong	Strong
Djordjevic, 2019	Moderate	Moderate	Weak	Strong	Moderate
Eltas, 2013	Moderate	Weak	Weak	Moderate	Weak
Eskelinen, 2017	Moderate	Weak	Weak	Strong	Weak
Gandre, 2020	Strong	Strong	Strong	Strong	Strong
Gurbuz, 2011	Moderate	Moderate	Weak	Moderate	Moderate
Hede, 1992	Moderate	Weak	Weak	Weak	Weak
Hsieh, 2011	Weak	Weak	Weak	Weak	Weak
Janhardanan, 2011	Moderate	Strong	Weak	Moderate	Moderate
Jovanovic, 2010	Moderate	Weak	Weak	Strong	Weak
Lynch, 2005	Weak	Weak	Weak	Weak	Weak
McCreadie, 2004	Moderate	Weak	Weak	Weak	Weak
Nayak, 2020	Weak	Weak	Weak	Moderate	Weak
Ngo, 2018	Strong	Weak	Weak	Moderate	Weak
Nielson, 2011	Strong	Moderate	Strong	Strong	Strong
Patrick, 1996	Weak	Weak	Weak	Moderate	Weak
Pelletier, 2015	Weak	Weak	Weak	Weak	Weak
Salsberry, 2005	Strong	Strong	Strong	Moderate	Strong
Singh, 2017	Moderate	Weak	Weak	Strong	Weak
Singh, 2019	Moderate	Weak	Weak	Strong	Weak
Stiefel, 1990	Moderate	Weak	Weak	Moderate	Weak
Tani, 2012	Moderate	Weak	Weak	Strong	Weak
Teng, 2016	Strong	Strong	Strong	Strong	Strong
Tredget, 2019	Moderate	Weak	Weak	Weak	Weak
Wieland, 2010	Weak	Weak	Weak	Weak	Weak
Xiong, 2010	Moderate	Strong	Weak	Moderate	Moderate

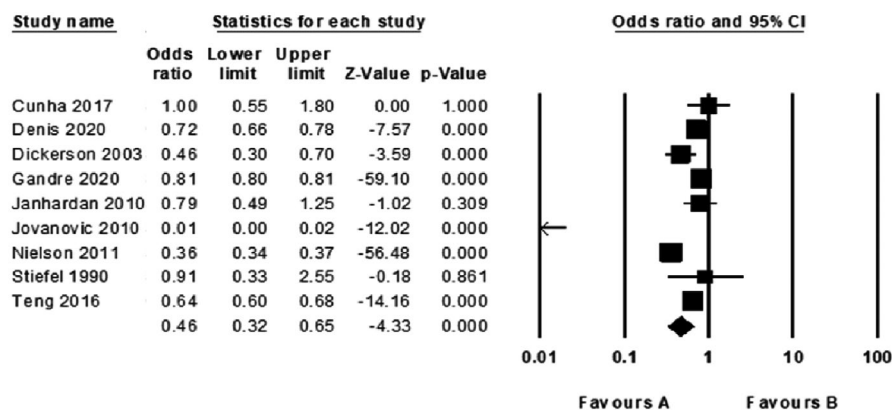
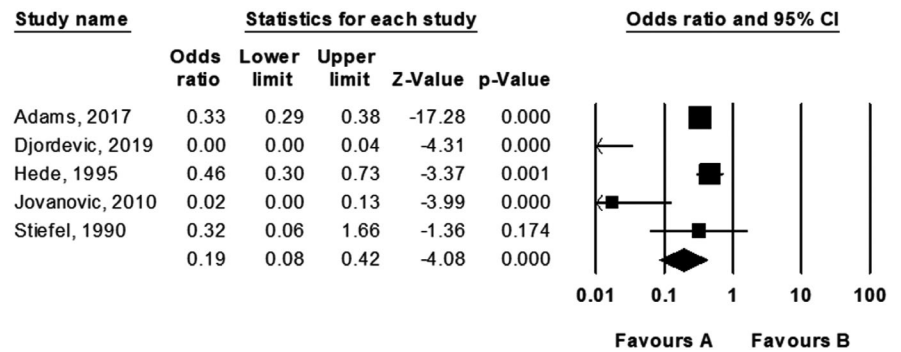


FIGURE 2 Forest plot with individual effect sizes for studies comparing access to dental services in people with severe mental illness to non-clinical comparator samples

FIGURE 3 Forest plot with individual effect sizes for studies comparing rates of toothbrushing in people with severe mental illness to non-clinical comparator samples



improvements between the intervention and control group. Similarly, a Cochrane review¹⁰ suggests that education alone does not improve oral health outcomes in people with a SMI. National guidelines in the UK and Australia^{73,74} have indicated a need for increased oral health support for people with complex and early psychosis promoting assessment, monitoring and additional support to maintain oral health. This review indicates that such guidelines should be adopted more broadly to include all people who experience psychosis. However, further research is needed to better understand what factors impact on oral health self-care behaviours to ensure that intervention and support is targeted accordingly.

5 | CONCLUSION

In conclusion, findings from this review indicate that oral health self-care behaviours are reduced in people with an SMI. Further research is needed to explore which factors affect the uptake of behaviours and how mental health difficulties are a risk factor for poor oral health outcomes. The recent Lancet Commission⁶⁵ called for better integration of mental and physical care. The results from this review indicate that this should also encompass dental care to meet the wide-ranging and complex needs of this client group, and to ensure effective early screening, monitoring and intervention in oral health.

ACKNOWLEDGMENTS

We would like to thank Deepali Agarwal, Saana Eskelinen, Fernando Oliveira Costa, Ozlem Gürbüz, Jean-François Pelletier, Daniel Siskind and Ruth Freeman for providing additional data.

CONFLICT OF INTEREST

None of the authors have any conflicts of interest arising from this research.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1111/acps.13308>.

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How to cite this article: Turner E, Berry K, Aggarwal VR, Quinlivan L, Villanueva T, Palmier-Claus J. Oral health self-care behaviours in serious mental illness: A systematic review and meta-analysis. *Acta Psychiatr Scand.* 2022;145:29–41. <https://doi.org/10.1111/acps.13308>