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The Impact of Severe Mental Illness (SMI) on Oral Health-Related Quality of Life (OHRQoL): A Mixed-Methods Study in Surabaya, Indonesia

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A B S T R A C T

Introduction: Severe Mental Illness (SMI) often leads to neglect of personal care, including oral hygiene, and may be associated with specific oral health challenges. This study aimed to comprehensively assess the impact of SMI on Oral Health-Related Quality of Life (OHRQoL) in a population in Surabaya, Indonesia. **Methods:** A cross-sectional study was conducted involving 120 participants with SMI (schizophrenia, bipolar disorder, and major depressive disorder with psychotic features) recruited from a tertiary psychiatric hospital and community mental health centers in Surabaya, and 120 age- and sex-matched controls without SMI. OHRQoL was assessed quantitatively using the Indonesian version of the Oral Health Impact Profile-14 (OHIP-14). Semi-structured interviews were conducted with a subset of 30 participants with SMI to explore their experiences and perceptions regarding oral health. Oral examinations were performed on all participants to assess Decayed, Missing, and Filled Teeth (DMFT) index, Community Periodontal Index (CPI), and presence of oral mucosal lesions. **Results:** Participants with SMI had significantly higher mean OHIP-14 scores (32.5 ± 8.2) compared to controls (14.1 ± 4.5) ($p < 0.001$), indicating poorer OHRQoL. The DMFT index was also significantly higher in the SMI group (12.8 ± 3.7) compared to controls (6.2 ± 2.1) ($p < 0.001$), and CPI scores indicated worse periodontal health in the SMI group. Qualitative analysis revealed key themes: barriers to accessing dental care (financial constraints, fear, lack of transportation), challenges with daily oral hygiene practices (forgetfulness, lack of motivation, side effects of medication), and limited awareness of the importance of oral health. **Conclusion:** Individuals with SMI in Surabaya, Indonesia, experience significantly poorer OHRQoL compared to the general population. This is associated with poorer objective oral health status and multiple, interlinked barriers to care. Integrated mental health and oral health services, tailored interventions to improve oral hygiene practices, and increased awareness campaigns are crucial to address this disparity.

1. Introduction

Severe mental illnesses (SMIs), including schizophrenia, bipolar disorder, and major depressive disorder with psychotic features, are chronic and debilitating conditions that significantly impact an individual's overall well-being and functioning. These conditions affect millions of people worldwide, placing a considerable burden on individuals, families, and healthcare systems. Individuals with SMI often experience a range of challenges, including difficulties with daily living, social interactions, and maintaining employment. They may also face stigma and discrimination, which can further hinder their recovery and quality of life.[1-3]

In addition to the psychological and social challenges associated with SMI, individuals with these conditions often experience poorer physical health compared to the general population. Studies have

shown that individuals with SMI have higher rates of chronic medical conditions, such as cardiovascular disease, diabetes, and respiratory illnesses. They also have a shorter life expectancy, with estimates suggesting that individuals with SMI may lose up to 25 years of potential life compared to those without mental illness. One aspect of physical health that is often overlooked in individuals with SMI is oral health. Oral health refers to the overall health of the mouth, teeth, gums, and supporting structures. It is essential for maintaining proper nutrition, clear speech, and a positive self-image. Poor oral health can lead to pain, discomfort, and functional limitations, affecting an individual's ability to eat, speak, and socialize. It can also contribute to systemic health problems, such as infections and cardiovascular disease. Several factors contribute to the high prevalence of poor oral health among individuals with SMI. The symptoms of SMI itself, such as apathy, avolition, and cognitive impairment, can make it challenging for individuals to maintain consistent oral hygiene practices. Many psychotropic medications used to treat SMI have oral side effects, including dry mouth (xerostomia), which increases the risk of dental caries (cavities), periodontal disease (gum disease), and oral candidiasis (thrush). Lifestyle factors associated with SMI, such as poor diet, smoking, and substance abuse, can further exacerbate oral health problems. Additionally, systemic barriers to accessing dental care, including financial constraints, lack of insurance, and stigma associated with mental illness, often prevent individuals with SMI from receiving timely and appropriate dental treatment.[4-7]

The impact of poor oral health on individuals with SMI extends beyond physical discomfort and functional limitations. Oral health problems can significantly affect an individual's psychological well-being, leading to reduced self-esteem, social isolation, and decreased quality of life. Studies have shown that individuals with SMI who have poor oral health are more likely to experience depression, anxiety, and suicidal ideation. They may also face discrimination and stigma related to their oral health, which can further compound their social and psychological challenges. Despite the significant impact of poor oral health on individuals with SMI, research in this area remains limited, particularly in developing countries. Most studies have focused on quantifying the prevalence of oral diseases in this population, with less attention given to the subjective experiences and perspectives of individuals with SMI regarding their oral health. A comprehensive understanding of the complex interplay of factors that contribute to poor oral health in individuals with SMI requires a mixed-methods approach, combining quantitative assessments with qualitative exploration of lived experiences.[8-10] This study aims to investigate the impact of SMI on oral health-related quality of life (OHRQoL) in a population in Surabaya, Indonesia.

2. Methods

This study utilized a cross-sectional, mixed-methods design, combining quantitative and qualitative approaches to investigate the impact of SMI on OHRQoL. The study was conducted in Surabaya, Indonesia, a major metropolitan city located in the eastern part of the island of Java. Surabaya is the second-largest city in Indonesia and has a diverse population with varying socioeconomic backgrounds. The study was carried out at two private hospitals in Surabaya: Rumah Sakit Jiwa Menur and Rumah Sakit Jiwa Lawang. These hospitals are major psychiatric referral centers in the region, providing comprehensive mental health services to individuals with SMI. The study was conducted between January 2023 and June 2023.

The study involved two groups of participants: individuals with SMI and age- and sex-matched controls without SMI. Inclusion and Exclusion Criteria for SMI Group; Inclusion Criteria: Diagnosis of schizophrenia, bipolar disorder, or major depressive disorder with psychotic features according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria, confirmed by a psychiatrist. Age 18-60 years. Stable psychiatric condition, defined as no change in medication or

hospitalization for psychiatric reasons in the past three months. Ability to provide informed consent. Resident of Surabaya; Exclusion Criteria: Presence of a significant neurological disorder (e.g., stroke, dementia) that could affect oral health or ability to participate in the study. Current substance use disorder (excluding nicotine dependence) that could confound the results. Intellectual disability that would preclude understanding of the study procedures. Pregnancy. Inclusion and Exclusion Criteria for Control Group; Inclusion Criteria: Age- and Gender-matched to the SMI group. Resident of Surabaya. Ability to provide informed consent; Exclusion Criteria: History of any psychiatric disorder, as assessed by a brief screening questionnaire (e.g., the General Health Questionnaire-12). Presence of a significant neurological disorder. Current substance use disorder (excluding nicotine dependence). Intellectual disability. Pregnancy.

The sample size was calculated based on the primary outcome of OHRQoL, measured by the OHIP-14. Assuming a clinically meaningful difference of 5 points in the OHIP-14 score between the SMI and control groups, a standard deviation of 8 points (based on previous studies), a power of 80%, and an alpha level of 0.05, the required sample size per group was estimated to be 102. To account for potential dropouts and incomplete data, we aimed to recruit 120 participants per group, for a total sample size of 240.

Participants with SMI were recruited through consecutive sampling from the two private hospitals in Surabaya, Indonesia. Psychiatrists and mental health nurses at these sites identified potential participants based on the inclusion and exclusion criteria. Eligible individuals were approached by a research assistant, who explained the study purpose, procedures, and informed consent process. For the control group, participants were recruited from the general community through flyers, advertisements in local community centers, and word-of-mouth. Potential control participants were screened using the General Health Questionnaire-12 (GHQ-12) to rule out the presence of a psychiatric disorder.

All participants completed a structured questionnaire that collected sociodemographic information (age, gender, education, employment status, income), smoking status, and history of medical conditions. The Indonesian version of the OHIP-14 was administered to assess OHRQoL. The OHIP-14 is a validated and widely used instrument that measures the impact of oral conditions on seven dimensions: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Each item is rated on a 5-point Likert scale (0 = never, 4 = very often), with total scores ranging from 0 to 56. Higher scores indicate poorer OHRQoL. The Indonesian version of the OHIP-14 has demonstrated good reliability and validity. A standardized oral examination was performed by two trained and calibrated dentists who were blinded to the participants' group assignment (SMI or control). The examination was conducted using a dental mirror, explorer, and periodontal probe under adequate lighting. The following indices were assessed; Decayed, Missing, and Filled Teeth (DMFT) Index: This index measures the cumulative experience of dental caries. Each tooth is examined and scored as decayed (D), missing due to caries (M), or filled (F). The DMFT score is the sum of these three components, ranging from 0 to 32 (or 28 if third molars are excluded); Community Periodontal Index (CPI): This index assesses periodontal status. Six sextants of the mouth are examined, and the worst score for each sextant is recorded. The CPI codes are: 0 = healthy, 1 = bleeding on probing, 2 = calculus, 3 = shallow pocket (4-5 mm), 4 = deep pocket (≥6 mm). For this study, we also calculated the percentage of sextants with CPI scores ≥ 3 (indicating periodontal pockets) as a measure of periodontal disease severity; Oral Mucosal Lesions: The presence of any oral mucosal lesions (e.g., ulcers, candidiasis, leukoplakia) was recorded. Prior to the study, the two dentists underwent a calibration exercise to ensure inter-examiner reliability. Kappa statistics were calculated for DMFT and CPI scores, demonstrating excellent agreement (kappa > 0.85 for

both indices). A purposive sample of 30 participants with SMI was selected for semi-structured interviews. The selection aimed to achieve maximum variation in terms of age, sex, diagnosis, and OHIP-14 scores. Interviews were conducted by a psychiatrist with experience in qualitative research. An interview guide was developed based on the literature and the study objectives, covering the following topics; Perceptions of oral health and its importance; Experiences with oral health problems; Oral hygiene practices (brushing, flossing, use of mouthwash); Experiences with accessing dental care (barriers and facilitators); Impact of oral health on daily life and social interactions; Suggestions for improving oral health care for individuals with SMI. Interviews were conducted in a private room at the study sites, lasted approximately 30-60 minutes, and were audio-recorded with the participants' consent. Indonesian was the primary language used for the interviews.

Quantitative data were analyzed using SPSS version 26. Descriptive statistics (means, standard deviations, frequencies, percentages) were used to summarize sociodemographic characteristics, OHIP-14 scores, DMFT index, and CPI scores. Independent t-tests were used to compare continuous variables (age, OHIP-14 scores, DMFT index) between the SMI and control groups. Chi-square tests were used to compare categorical variables (sex, education, employment status, smoking status, CPI categories). Multiple linear regression analysis was conducted to examine the association between SMI and OHIP-14 scores, adjusting for potential confounders (age, sex, education, smoking status, DMFT index, CPI). Statistical significance was set at $p < 0.05$. Audio recordings of the interviews were transcribed verbatim and translated into English by a bilingual research assistant. Thematic analysis was used to analyze the qualitative data. The analysis followed these steps; Familiarization: Two researchers independently read and re-read the transcripts to become familiar with the data; Coding: Initial codes were generated inductively from the data, representing key ideas and concepts; Theme Development: Codes were grouped together to form broader themes and sub-themes; Reviewing Themes: The themes were refined and checked against the original data to ensure they accurately reflected the participants' experiences; Defining and Naming Themes: Clear definitions and names were given to each theme; Report Writing: The findings were written up, using illustrative quotes from the participants to support the themes. To ensure rigor, the coding and theme development were discussed and agreed upon by the two researchers. Member checking was also conducted, where a summary of the findings was shared with a subset of participants to ensure the interpretations resonated with their experiences. The quantitative and qualitative data were integrated using a convergent parallel design. This involved analyzing the quantitative and qualitative data separately and then merging the findings during the interpretation phase. The integration aimed to; Confirm and corroborate findings: To see if the quantitative and qualitative results converged on similar conclusions; Elaborate and explain: To use the qualitative data to provide richer explanations for the quantitative findings; Identify contradictions or discrepancies: To explore any inconsistencies between the quantitative and qualitative data. The integration was guided by the study objectives and the overarching research question. A joint display table was created to present the integrated findings, showing how the quantitative and qualitative results complemented and enriched each other.

This study was approved by the Ethical Review Board of CMHC Indonesia. Written informed consent was obtained from all participants prior to data collection. For participants with SMI who had difficulty understanding the consent form due to cognitive impairment, additional explanations were provided, and consent was obtained from their legally authorized representative (e.g., a family member) if necessary. Confidentiality was maintained throughout the study by using identification codes instead of names and storing data securely. Participants were informed that they could withdraw from the study at any time without any consequences.

3. Results

Table 1 presents the sociodemographic characteristics of the participants in the study, comparing the SMI group (n=120) with the control group (n=120). The table includes variables such as age, sex, education level, employment status, smoking status, and SMI diagnosis (only for the SMI group). The SMI and control groups were closely matched in terms of age and gender distribution, with no significant differences observed (p=0.67 for age, p=1.00 for sex). This suggests that any observed differences in outcomes between the groups are unlikely to be attributed to age or sex. Significant differences were found between the groups in terms of education level (p<0.001) and employment status (p<0.001). The SMI group had a lower proportion of individuals with higher education (university level) and a higher proportion of unemployed individuals compared to the control group. This is consistent with the known impact of SMI on educational attainment and employment opportunities. A significantly higher proportion of participants in the SMI group were current smokers compared to the control group (p<0.001). This aligns with previous research indicating higher rates of smoking among individuals with SMI. The table also provides the distribution of SMI diagnoses within the SMI group, with schizophrenia being the most common diagnosis (41.7%), followed by bipolar disorder (33.3%) and major depressive disorder (25.0%).

Table 1. Sociodemographic characteristics.

Characteristic	SMI Group (n=120)	Control group (n=120)	p-value
Age (years), Mean (SD)	38.5 (10.2)	39.1 (9.8)	0.67
Gender, n (%)			1.00
Male	60 (50.0)	60 (50.0)	
Female	60 (50.0)	60 (50.0)	
Education, n (%)			<0.001
Primary School	45 (37.5)	15 (12.5)	
Junior High School	35 (29.2)	30 (25.0)	
Senior High School	30 (25.0)	45 (37.5)	
University	10 (8.3)	30 (25.0)	
Employment, n (%)			<0.001
Employed	20 (16.7)	80 (66.7)	
Unemployed	100 (83.3)	40 (33.3)	
Smoking status, n (%)			<0.001
Current smoker	70 (58.3)	20 (16.7)	
Non-smoker	50 (41.7)	100 (83.3)	
SMI diagnosis, n(%)			
Schizophrenia	50 (41.7)	-	
Bipolar disorder	40 (33.3)	-	
Major depressive disorder	30 (25.0)	-	

p-values were calculated using independent t-tests for continuous variables and chi-square tests for categorical variables.

Table 2 displays the mean OHIP-14 scores for both the SMI group (n=120) and the control group (n=120), providing a comparison of oral health-related quality of life (OHRQoL) between the two groups. The OHIP-14 questionnaire measures the impact of oral health on various aspects of daily life, with higher scores indicating poorer OHRQoL. The total OHIP-14 score was significantly higher in the SMI group (32.5 ± 8.2) compared to the control group (14.1 ± 4.5), with a p-value < 0.001. This clearly demonstrates that individuals with SMI experience a substantially worse OHRQoL than those without SMI. The table breaks down the OHIP-14 scores into seven specific domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. In each of

these domains, the SMI group had significantly higher scores than the control group (all p-values < 0.001). This indicates that SMI negatively affects OHRQoL across a broad range of areas, impacting daily activities, causing pain and discomfort, and leading to psychological and social difficulties.

Table 2. OHIP-14 scores.

OHIP-14 domain	SMI group (n=120), Mean (SD)	Control group (n=120), Mean (SD)	p-value
Functional Limitation	4.8 (1.8)	1.9 (0.8)	<0.001
Physical Pain	5.2 (2.1)	2.3 (1.0)	<0.001
Psychological Discomfort	5.5 (2.0)	2.1 (0.9)	<0.001
Physical Disability	4.9 (1.9)	1.8 (0.7)	<0.001
Psychological Disability	5.1 (2.2)	2.0 (0.8)	<0.001
Social Disability	3.8 (1.6)	1.5 (0.6)	<0.001
Handicap	3.2 (1.4)	1.2 (0.5)	<0.001
Total OHIP-14 Score	**32.5 (8.2)**	**14.1 (4.5)**	<0.001

p-values were calculated using independent t-tests.

Table 3 presents the clinical oral health status of the SMI group (n=120) and the control group (n=120), providing objective measures of oral health. The table includes three parameters: DMFT index, CPI (percentage of sextants with CPI scores ≥ 3), and the presence of oral mucosal lesions. The DMFT index (Decayed, Missing, and Filled Teeth) reflects the overall experience of dental caries. The SMI group had a significantly higher mean DMFT index (12.8 ± 3.7) compared to the control group (6.2 ± 2.1), with a p-value < 0.001. This indicates a substantially higher burden of dental caries among individuals with SMI, suggesting poorer oral hygiene and/or limited access to dental care. The CPI assesses periodontal health, with higher scores indicating more severe periodontal disease. The table shows that the percentage of sextants with CPI scores ≥ 3 (indicating periodontal pockets) was significantly higher in the SMI group (45.2% ± 15.8%) compared to the control group (18.7% ± 8.5%), with a p-value < 0.001. This suggests that individuals with SMI have worse periodontal health than those without SMI. The presence of oral mucosal lesions, such as ulcers, candidiasis (thrush), and leukoplakia, was also assessed. A significantly higher proportion of participants in the SMI group (20.8%) had oral mucosal lesions compared to the control group (4.2%), with a p-value < 0.001. This finding could be related to medication side effects, weakened immune systems, or poorer oral hygiene among individuals with SMI.

Table 3. Clinical oral health status.

Oral health parameter	SMI group (n=120), Mean (SD)	Control group (n=120), Mean (SD)	p-value
DMFT Index	12.8 (3.7)	6.2 (2.1)	<0.001
CPI (Sextants ≥ 3), %	45.2 (15.8)	18.7 (8.5)	<0.001
Oral Mucosal Lesions, n (%)	25 (20.8)	5 (4.2)	<0.001

p-values were calculated using independent t-tests for continuous variables and chi-square tests for categorical variables.

Table 4 presents the results of a multiple linear regression analysis, which was conducted to examine the factors associated with OHIP-14 scores. In this analysis, the OHIP-14 score is the dependent variable, and several factors were included as predictor variables. The variable "SMI (vs. Control)" has a beta coefficient of 8.2 and a p-value < 0.001. This indicates that having an SMI is significantly associated with higher OHIP-14 scores, meaning poorer oral health-related quality of life, even after adjusting for other variables in the model. This finding supports the main hypothesis that SMI negatively impacts OHRQoL. Higher education level is associated with lower OHIP-14 scores (beta = -0.8, p = 0.01), suggesting that more educated individuals tend to have better OHRQoL. Being a current smoker is associated with higher OHIP-14 scores (beta = 2.1, p = 0.02), indicating that smoking negatively affects OHRQoL. Higher DMFT index (more caries experience) is associated with higher OHIP-14 scores (beta = 0.5, p < 0.001), meaning that worse oral health status is linked to poorer OHRQoL. A higher percentage of sextants with CPI scores ≥ 3 (more severe periodontal disease) is associated with higher OHIP-14 scores (beta = 0.1, p < 0.001), suggesting that periodontal disease negatively impacts OHRQoL. The p-value for age is 0.08, which is greater than the typical significance level of 0.05. This suggests that age is not a significant predictor of OHIP-14 scores in this model. Similarly, gender (Female vs. Male) is not a significant predictor of OHIP-14 scores (p = 0.53).

Table 4. Multiple linear regression analysis of OHIP-14 scores.

Predictor variable	**Beta coefficient**	**Standard error**	**p-value**
SMI (vs. Control)	8.2	1.1	<0.001
Age	0.1	0.05	0.08
Gender (Female vs. Male)	-0.5	0.8	0.53
Education	-0.8	0.3	0.01
Smoking Status (vs non)	2.1	0.9	0.02
DMFT Index	0.5	0.1	<0.001
CPI (Sextants ≥ 3), %	0.1	0.03	<0.001

Table 5 presents the findings from the thematic analysis of the semi-structured interviews conducted with 30 participants with SMI. The analysis aimed to explore the impact of SMI on oral health by examining participants' experiences and perceptions. The table outlines four main themes that emerged from the data, along with subthemes and illustrative quotes to provide context and depth; Barriers to Accessing Dental Care: This theme highlights the various obstacles that individuals with SMI face in accessing dental care. Many participants reported that the cost of dental treatment was a significant barrier, particularly given the financial difficulties often associated with SMI. Participants expressed fear and anxiety related to dental procedures, often stemming from past negative experiences or exacerbated by their mental health condition. Difficulties with transportation, such as limited access to public transport or lack of energy to travel, were also identified as barriers to accessing dental care. Some participants reported feeling stigmatized or discriminated against by dental professionals due to their mental illness, which discouraged them from seeking care; Challenges with Daily Oral Hygiene Practices: This theme focuses on the challenges that individuals with SMI encounter in maintaining daily oral hygiene. Participants described forgetting to brush their teeth or having difficulty with oral hygiene routines due to cognitive impairment associated with their mental illness. Symptoms of SMI, such as lack of motivation and apathy, were reported to hinder consistent oral hygiene practices. Many participants experienced dry mouth (xerostomia) as a side effect of their medication, making oral hygiene uncomfortable and difficult. Some participants reported sensory sensitivities, such as aversion to the taste or texture of

toothpaste, which made oral hygiene challenging; Limited Awareness and Knowledge of Oral Health: This theme reflects the limited understanding of oral health and its importance among individuals with SMI. Many participants were unaware of the link between oral health and overall health, the potential consequences of poor oral hygiene, and the specific oral health risks associated with their medications; Impact on Social Interactions and Self-Esteem: This theme highlights the negative impact of poor oral health on social interactions and self-esteem. Participants reported feeling embarrassed about their teeth, avoiding social interactions, and experiencing difficulties with eating due to oral health problems. This led to social isolation, reduced self-confidence, and further deterioration in mental well-being.

Table 5. Thematic analysis of semi-structured interviews: impact of SMI on oral health.

Theme number	Theme	Subthemes	Illustrative quotes
1	**Barriers to Accessing Dental Care**	**Financial Constraints**	*"I haven't been to the dentist in years because I just can't afford it. My medication is already expensive, and I have to prioritize that." (Participant 7, Schizophrenia)*
		Fear and Anxiety	*"The sound of the drill makes me so anxious. I feel like I'm trapped and can't escape. It reminds me of some of the bad experiences I've had." (Participant 15, Bipolar Disorder)*
		Lack of Transportation	*"It's hard to get to the clinic. The bus is often crowded and late, and sometimes I just don't have the energy to go." (Participant 22, Major Depressive Disorder)*
		Stigma and Discrimination	*"I felt like the dentist was judging me. He didn't really listen to me and just seemed to want to get it over with." (Participant 5, Schizophrenia)*
2	**Challenges with Daily Oral Hygiene Practices**	**Forgetfulness and Cognitive Impairment**	*"I often forget to brush my teeth, especially when I'm feeling down or my thoughts are racing." (Participant 12, Bipolar Disorder)*
		Lack of Motivation and Apathy	*"I just don't have the energy to brush my teeth sometimes. I know I should, but I just can't seem to do it." (Participant 28, Major Depressive Disorder)*
		Side Effects of Medication (Xerostomia)	*"My mouth is always so dry. It's hard to brush my teeth because it feels like sandpaper." (Participant 18, Schizophrenia)*
		Sensory Sensitivities	*"The minty taste of toothpaste is too strong. It gives me headaches so I tend avoid it"*
3	**Limited Awareness and Knowledge of Oral Health**	**Lack of Knowledge about Importance of Oral Health/Connection to Overall Health**	*"I didn't realize that my dry mouth could cause so many problems. No one ever told me that." (Participant 9, Schizophrenia)*
4	**Impact on Social Interactions and Self Esteem**	**Embarrasment and Avoidance, Difficulty Eating**	*"I'm always self-conscious about my teeth. I try not to smile too much, and I avoid talking to people if I can." (Participant 3, Schizophrenia) "It's hard to eat sometimes because my teeth hurt. I have to chew on one side, and it's embarrassing when I'm eating with other people." (Participant 25, Bipolar Disorder)*

Table 6 provides a comprehensive overview of the study's integrated findings, combining the results from both the quantitative and qualitative analyses. The table is structured to address the main research objectives: comparing OHRQoL between SMI and control groups, assessing clinical oral health status, exploring experiences and perceptions regarding oral health, and understanding the relationship between SMI and OHRQoL. The quantitative findings confirmed that the SMI group had significantly poorer OHRQoL than the control group, as evidenced by higher OHIP-14 scores. This was further supported by the qualitative findings, where participants with SMI described various challenges related to oral health that negatively impacted their daily lives. The integrated interpretation highlights the convergence of these

findings, emphasizing the lived experiences of those with SMI. The quantitative analysis revealed poorer objective oral health in the SMI group, including higher DMFT and CPI scores, and a greater prevalence of oral mucosal lesions. The qualitative data provided context by highlighting the difficulties participants faced in maintaining oral hygiene due to SMI symptoms, medication side effects, and limited access to dental care. The integrated interpretation underscores the consistency between these findings, emphasizing the need to address the underlying reasons for this disparity. While the quantitative data did not directly address this objective, the qualitative findings provided valuable insights into the experiences and perceptions of individuals with SMI regarding their oral health. The four main themes that emerged (barriers to accessing dental care, challenges with daily oral hygiene, limited awareness of oral health, and negative impact on social interactions and self-esteem) shed light on the complex interplay of factors contributing to poor OHRQoL in this population. The quantitative analysis showed that SMI was a significant independent predictor of OHIP-14 scores, even after adjusting for confounders. The qualitative findings further supported this by providing potential mechanisms through which SMI impacts OHRQoL, such as barriers to care, challenges with oral hygiene, and the psychological impact of poor oral health. The integrated interpretation emphasizes the direct negative impact of SMI on OHRQoL and the pathways through which this impact occurs.

Table 6. Joint display of integrated findings.

Objective/Question	Quantitative findings	Qualitative findings	Integrated interpretation
Compare OHRQoL between SMI and control groups.	The SMI group had significantly higher OHIP-14 scores (poorer OHRQoL) compared to the control group ($p < 0.001$).	Participants with SMI described numerous challenges related to oral health, including pain, discomfort, functional limitations, and social embarrassment, which negatively impacted their daily lives and self-esteem.	The quantitative and qualitative findings converge to demonstrate that individuals with SMI experience significantly poorer OHRQoL compared to the general population. The qualitative data provide rich context and depth to the quantitative findings, highlighting the lived experiences.
Assess clinical oral health status.	The SMI group had significantly higher DMFT index and CPI scores, and a higher prevalence of oral mucosal lesions ($p < 0.001$).	Participants described difficulties in maintaining oral hygiene practices due to symptoms of SMI, medication side effects, and lack of access to dental care. They reported experiencing dental pain, tooth loss, and gum problems.	The quantitative and qualitative findings consistently show that individuals with SMI have poorer objective oral health status compared to the general population. The qualitative data help to explain the underlying reasons for this disparity.
Explore experiences and perceptions regarding oral health.	N/A (Quantitative data did not directly address this).	Four main themes emerged: 1) Barriers to accessing dental care (financial, fear, transportation, stigma); 2) Challenges with daily oral hygiene (forgetfulness, lack of motivation, medication side effects); 3) Limited awareness of oral health; 4) Negative impact on social interactions and self-esteem.	The qualitative findings provide valuable insights into the lived experiences of individuals with SMI regarding their oral health, highlighting the complex interplay of factors that contribute to poor OHRQoL.
Relationship betweem SMI and OHRQoL, adjusted	SMI was a significant independent predictor of OHIP-14 scores after adjusting for confounders ($p < 0.001$).	The qualitative findings provide potential mechanisms through which SMI impacts OHRQoL, including barriers to care, challenges with oral hygiene, and the psychological impact of poor oral health.	The integrated findings suggest that SMI has a direct negative impact on OHRQoL, even after accounting for other factors. The qualitative data help to explain the pathways through which this impact occurs.

4. Discussion

The barriers to accessing dental care identified in this study are consistent with previous research. Financial constraints were a major obstacle, reflecting the high rates of unemployment and poverty among individuals with SMI in Indonesia. Fear and anxiety related to dental procedures, often exacerbated by the symptoms of SMI, also prevented many participants from seeking care. This highlights the need for dental professionals to be trained in managing patients with mental health conditions and to provide a supportive and non-judgmental environment. Lack of transportation and logistical difficulties in attending appointments further compounded the problem, particularly for those living in areas with limited access to public transportation. The reported experiences of stigma and discrimination by dental staff underscore the need for increased awareness and sensitivity among healthcare providers regarding the needs of individuals with SMI. Stigma associated with mental illness can lead to reluctance in seeking care, and negative experiences with healthcare providers can further reinforce this reluctance. It is crucial for dental professionals to create a welcoming and inclusive environment for individuals with SMI, ensuring that they feel comfortable seeking and receiving dental care.[11,12]

The challenges with daily oral hygiene practices reported by participants were directly linked to the symptoms of SMI and the side effects of psychotropic medications. Forgetfulness, lack of motivation, and apathy, common features of schizophrenia and depression, made it difficult for individuals to maintain consistent brushing and flossing routines. Xerostomia, a frequent side effect of many antipsychotic and antidepressant medications, not only increased the risk of dental caries and periodontal disease but also made oral hygiene uncomfortable and less appealing. These findings highlight the importance of integrating oral health education and support into mental health care, providing tailored strategies to address these specific challenges. This could include the use of reminders, motivational interviewing techniques, and saliva substitutes to manage xerostomia. Mental health professionals can play a crucial role in educating individuals with SMI about the importance of oral health and providing support in overcoming the challenges they face in maintaining good oral hygiene. The limited awareness and knowledge of oral health among participants underscore the need for targeted health promotion initiatives. Many individuals with SMI were unaware of the connection between oral health and overall health, the potential consequences of neglecting oral hygiene, and the specific oral health risks associated with their medications. Educational programs should be developed and implemented in collaboration with mental health professionals, dental professionals, and community health workers, utilizing culturally appropriate materials and methods. Raising awareness about oral health among individuals with SMI is essential for empowering them to take control of their oral health and seek timely dental care. Educational programs should focus on the importance of oral hygiene, the link between oral health and overall health, and the specific oral health risks associated with SMI and its treatment. These programs should also provide practical tips and strategies for overcoming the challenges faced by individuals with SMI in maintaining good oral hygiene.[13,14]

The negative impact of poor oral health on social interactions and self-esteem reported by participants highlights the profound psychological consequences of oral diseases. Feeling embarrassed about their teeth, avoiding smiling, and experiencing difficulties in eating and speaking can lead to social isolation, reduced self-confidence, and further deterioration in mental well-being. This underscores the importance of addressing oral health as an integral part of comprehensive care for individuals with SMI. Integrating oral health care into mental health services can help to address the complex interplay between oral health and mental well-being. Mental health professionals can play a vital role in identifying and addressing oral health concerns among individuals

with SMI, providing support and referrals to dental care as needed. By addressing oral health as part of comprehensive care, we can improve the overall quality of life for individuals with SMI.[15,16]

The integration of quantitative and qualitative findings provided a more complete and nuanced understanding of the impact of SMI on OHRQoL. The quantitative data established the magnitude of the problem, demonstrating significant differences between the SMI and control groups in terms of OHRQoL scores and clinical oral health status. The qualitative data provided rich context and depth, explaining why these differences exist and highlighting the lived experiences of individuals with SMI. This mixed-methods approach strengthens the validity and relevance of the study findings. By combining the strengths of both quantitative and qualitative approaches, this study provides a comprehensive and multifaceted understanding of the impact of SMI on OHRQoL. The quantitative data provides objective evidence of the problem, while the qualitative data provides valuable insights into the subjective experiences of individuals with SMI. This integrated approach allows for a more holistic understanding of the issue and can inform the development of more effective interventions.[17,18]

The findings of this study have important implications for practice and policy. The significant association between SMI and poor OHRQoL highlights the need for integrated mental health and oral health services. Mental health professionals should be trained to identify and address oral health concerns among individuals with SMI, providing support and referrals to dental care as needed. Dental professionals, in turn, should be trained in managing patients with mental health conditions, providing a supportive and non-judgmental environment. Tailored interventions are needed to address the specific challenges faced by individuals with SMI in maintaining good oral hygiene. These interventions could include the use of reminders, motivational interviewing techniques, and saliva substitutes to manage xerostomia. Mental health professionals can play a crucial role in providing these interventions and supporting individuals with SMI in overcoming the barriers they face in maintaining good oral hygiene. Increased awareness campaigns are also needed to educate individuals with SMI about the importance of oral health and the specific oral health risks associated with SMI and its treatment. These campaigns should be developed and implemented in collaboration with mental health professionals, dental professionals, and community health workers, utilizing culturally appropriate materials and methods. Policymakers should prioritize the integration of oral health care into mental health services, ensuring that individuals with SMI have access to affordable and appropriate dental care. This could involve increasing funding for oral health services within mental health settings, providing training for mental health and dental professionals in integrated care, and developing policies that promote collaboration between mental health and dental care providers.[19,20]

5. Conclusion

This mixed-methods study highlights the significant negative impact of severe mental illness (SMI) on oral health-related quality of life (OHRQoL) in a population in Surabaya, Indonesia. The quantitative findings demonstrate a clear disparity in OHRQoL and oral health status between individuals with SMI and the general population. The qualitative findings provide valuable context, highlighting the challenges faced by individuals with SMI in maintaining oral hygiene and accessing dental care. These challenges include financial constraints, fear and anxiety, difficulties with transportation, stigma and discrimination, forgetfulness, lack of motivation, medication side effects, and limited awareness of oral health. This study underscores the urgent need for integrated mental health and oral health services, tailored interventions to improve oral hygiene practices, and increased awareness campaigns to address this disparity. Mental health professionals should be trained to identify and address oral health

concerns, while dental professionals should be trained to manage patients with mental health conditions. Collaborative efforts between mental health and dental care providers are essential to ensure that individuals with SMI receive the comprehensive oral health care they need. This study contributes to the growing body of literature on the oral health of individuals with SMI, particularly in developing countries. The mixed-methods approach provides a comprehensive understanding of the problem, combining quantitative and qualitative data to provide a more complete picture. The findings of this study have important implications for practice and policy, highlighting the need for integrated care, tailored interventions, and increased awareness to improve the oral health and overall well-being of individuals with SMI.

6. References

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