

The Impact of Sex Differences and Oral Health Behaviors on Oral Health-related Quality of Life among Patients with Schizophrenia in Taiwan: A Cross-sectional Study

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Abstract

Objective: Oral health denotes general well-being, meaning that the person can perform functions such as eating, talking, and keeping smile. Those functions can impact on oral health-related quality of life (OHRQoL) with differences between sexes. In this study, we intended to examine sex differences and oral health behaviors in OHRQoL among institutionalized patients with schizophrenia. **Methods:** We recruited 150 institutionalized patients (99 men and 51 women) with schizophrenia in a nursing home. We measured OHRQoL with the 36-item Short-Form Health Survey (SF-36) questionnaire, and oral health by oral cleaning habits, oral health problems, and oral health care. **Results:** The mean values of the SF-36 physical component summary (PCS) score and mental component summary (MCS) score were 62.4 and 49.9, respectively, which were lower in women than those in men. Cooperativeness was a protective factor, but toothache and bleeding gums were risk factors in PCS. The standard cleaning method and cooperativeness were protective factors, but toothache, bleeding gums, and swollen gums were risk factors in MCS. **Conclusion:** Our study finding showed that women tended to report poorer physical and OHRQoL than men even after controlling oral health behaviors and problems. Toothache and bleeding gums were risk factors for poor OHRQoL. The findings provide useful information for health-care resource planning in patients with schizophrenia.

Key words: 36-item Short-Form Health Survey, oral health, the SF-36 mental component summary, the SF-36 physical component summary
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Introduction

Health-related quality of life (QoL) is defined as individuals' perception of their position in life in the context of value systems and the culture in which they are related to their personal goals, expectations, and standards [1]. Furthermore, health-related QoL conceptually is being focused on subjective perceptions about one's ability to do important activities that are influenced by one's health status [2].

Oral health, rarely life-threatening, is nevertheless a major public health problem with high prevalence, and it affects an individual's QoL. Oral health has been defined as the state

of the mouth and the associated structures. An individual with good oral health can avoid diseases in the future, can masticate food sufficiently, maintain a socially acceptable appearance, and continue in their desired social rôle [3, 4]. Based on a conceptual model to explain the pathways, oral health and QoL are linked inseparably [5]. Clinical practice of dentistry, dental research, and dental education are identified as obvious factors influencing oral health-related

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QoL (OHRQoL) [6]. Studies have associated periodontal disease with low OHRQoL [7-10]. The relationship between oral and general health (GH) is complicated, especially in patients with schizophrenia. Oral health status is important from the physical and the psychological viewpoints because it influences appearance, speech, sense of taste, ability to chew to eat and to socialize, self-image, as well as social well-being [5, 11, 12]. Oral diseases affect a patient's QoL through social and psychological impacts, such as low self-esteem and self-confidence [13-15]. An individual's dental condition can be better expressed through its impact on their QoL than using clinical indices [16]. Therefore, clinicians should monitor oral health and strategize dental health-care programs, institutional priorities, and policies for enhancing OHRQoL.

Oral health is related to mental illness, social and medical support, as well as the health care system [17]. Institutionalized older patients have been reported to have poor oral health [18]. Patients with schizophrenia are at a greater risk of developing missing teeth, tooth decay, and periodontal diseases [13]. Poor lifestyle and unhealthy behaviors (e.g., diet with high sugar, use of drugs, tobacco and alcohol usage, as well as inadequate oral hygiene), along with social-demographic factors (such as low education, low income, or poor support), explain the poor oral health in this population [19, 20]. Interventions such as oral health assessments using standard checklists designed for non-dental personnel, assistance with oral hygiene, management of iatrogenic dry mouth, and early dental referral have been suggested [13]. OHRQoL is a subjective measure that can be confounded by the patients' cognitive function. In previous studies, patients with schizophrenia show a wide variation between subjective perception and objective evaluation of dental status [21]. Clinicians usually observe pain, which may be hindered in patients with schizophrenia [22]. Patients with schizophrenia are at risk of poor oral health, but the relation of oral health behaviors and OHRQoL is not clear. Therefore, to determining oral health factors that are the most closely related to QoL in patients with schizophrenia is essential.

Over the years, several studies have found a sex difference in QoL [23]. Women tend to report lower health-related QoL scores than men, although woman may, in fact, be healthier [24, 25]. Therefore, we must consider sex difference when determining the association between oral health and QoL.

To the best of our knowledge, no specific questionnaire exists for evaluating OHRQoL in patients with schizophrenia. Previous studies have been based on expert opinions or on questionnaire that have not been validated among ethnic Chinese groups [20, 26]. Furthermore, most studies have depended on examination by a dentist or on face-to-face interviews, neither of which are nor cost-effective, especially in the nursing home setting [20]. Important limitations exist in recognizing poor oral health and the treatment requirements of institutional patients [27, 28]. Because of the special status of this group with poor oral conditions and more complicated treatments, additional information is required on factors influencing health-related OHRQoL of institutionalized patients with schizophrenia.

In this study, we hypothesized that the OHRQoL would be related between oral health and sex in institutionalized patients with schizophrenia. To achieve this objective, we recruited patients with schizophrenia from a southern Taiwan nursing home, and evaluated the impact of oral health behaviors, oral problems, and general issues such as age, sex, and social status on OHRQoL. Carrying out a cross-sectional study and using multiple regression models, we intended to document the oral health behaviors, and to explore the potential inter-relationships among oral health, sex and OHRQoL.

Methods

Study population

Participants were recruited between January 2015 and February 2015 from the Kaohsiung Municipal Kai-Syuan Psychiatric Hospital affiliated Da-Liao Lily Psychiatric Nursing Home in Taiwan. The inclusion criteria were patients with schizophrenia with ages between 18 and 65 years. Written informed consents were obtained from all participants before the assessment. Individuals received a face-to-face interview. We excluded those showing any cognitive deficits (e.g., intellectual disability, neurocognitive disorder, intoxication, dementia due to withdrawal from substance use, or withdrawal from substance use) that could have prevented them from understanding the study purpose or completing the copies of questionnaire.

The study was approved by the institutional review board of Kaohsiung Municipal Kai-Syuan Psychiatric Hospital (IRB protocol number = KSPH-2014-36 and date of approval = December 31, 2014), with the stipulation of obtaining informed consent from all study participants.

Measures

Thirty-six item Short-form Health Survey

The self-administered 36-item SF-36 is to assess HRQoL in the preceding month. The questionnaire items are assessed on 3-6-point Likert-like scales. SF-36 is an internationally known instrument to assess the construct of HRQoL. It was translated into Chinese for the Taiwanese population in 1996, and it has shown good psychometric properties [29]. SF-36 measures several domains of HRQoL, including physical functioning, rôle limitations due to physical health problems, bodily pain (BP), GH perceptions, vitality, social functioning (SF), rôle limitations due to emotional problems (RE), and mental health (MH). Moreover, the instrument allows users to compute two summary scores for HRQoL-physical component summary (PCS) and mental component summary (MCS). A score was calculated for each domain and was transformed to obtain a value ranging from 0 to 100 [30]. A relatively high total score indicates better OHRQoL than a relatively low total score. The internal reliability (Cronbach's α) of SF-36 in the present study was 0.75.

Oral health questionnaire

We designed a copy of oral health questionnaire because we were unaware of established copy of questionnaire to examine

the oral health of psychiatric patients. The questionnaire was self-administered, covering oral cleaning habits, oral health problems, and oral healthcare. The content of the questionnaire was reviewed and modified by a senior psychiatrist and a dentist for expert validity. The participants were asked seven questions about oral cleaning habits. Those questions included self-cleaning, method, frequency, toothbrush exchange, and learning. In addition, participants were asked four questions about self-perception of oral health problems and conditions. Those included gingival bleeding, toothache, swollen gums, and halitosis. Another set of questions was to assess the use of oral health care measures. Participants were asked to indicate dental visit experiences over the last three years, type of dental treatment, co-cooperativeness, and intervals between visits. Treatments included tooth extraction, filling, periodical inspection, endodontic therapy, scaling, and gum treatment. Responses were coded as “yes” and “no.”

Study procedures

Research assistants explained the procedures and methods of completing research questionnaire to the participants individually. The participants were allowed to ask questions if they had problems while completing the copy of the questionnaire, and the research assistants helped revolve their problems.

Statistical analysis

We did descriptive analysis of sociodemographic variables and SF-36 scores with *t*-test and Chi-square test. To preliminarily examine the associations between participants' oral health and OHRQoL, we conducted correlation analyses.

We used linear regression models to compare the PCS or MCS of oral health parameters. We did sequential multiple linear regression analyses to examine whether the differences in PCS or MCS between men and women could be explained by the distribution of oral health parameters. Model 1 included sex and other demographic characteristics (age, education, marital status, onset, course, hospitalization, and smoking status). We then constructed model 2 with sex, demographic characteristics, and oral health parameters as the independent variables.

Statistical analyses were computed using Statistical Package for Social Science version 20.0 software (SPSS Inc., Chicago, Illinois, USA). The differences between the groups were considered significant if $p < 0.05$.

Results

Totally, we enrolled 150 individuals with schizophrenia and obtained valid responses pertaining to personal history and to the SF-36 and the copy of oral health questionnaire. As shown in Table 1, no significant difference existed between men and women in age (both slightly above 55 years old), education (around 8–9 years), marital status (mostly not married), onset (slightly above 25 years old), course (around 32 years), hospitalization (around 7 times), and smoking status (around one quarter).

Table 1. Comparisons of demographic data between men and women

Characteristics	Men (<i>n</i> = 99) <i>n</i> (%)	Women (<i>n</i> = 51) <i>n</i> (%)
Age (years), mean ± SD	55.3 ± 7.2	57.1 ± 9.0
Education (years), mean ± SD	9.1 ± 3.9	8.3 ± 3.6
Marital status		
Married	10 (10.1)	9 (17.6)
Others	89 (89.9)	42 (82.4)
Onset(years), mean ± SD	25.1 ± 10.4	26.9 ± 12.6
Course(years), mean ± SD	32.1 ± 13.0	34.4 ± 18.3
Hospitalization (times), mean ± SD	6.7 ± 13.7	9.3 ± 18.7
Smoking	32 (32.3)	11 (21.6)

All comparison items were not significantly different between men and women using χ^2 or *t*-test when appropriate (*n* = 150). SD, standard deviation

Table 2 compares the oral health characteristics between men and women. Around 90% of the participants reported self-cleaning with toothbrush and toothpaste. Learning of oral cleaning was prevalent in both sexes. The cleaning frequency was about 1.5 times per day. More than 95% of the participants visited a dentist in the last three years, and the reasons mainly included toothache (60%), followed by swollen gums (4.7%), and bleeding gums (2.7%). In the type of dental treatment, the participants visited a dentist mostly for periodical inspection (68.0%), followed by scaling (50.7%), and filling (30.7%). Men significantly reported better co-operativeness (84.8% vs. 66.7%, $p = 0.01$) but significantly lower prevalence of swollen gums (2.0% vs. 9.8%, $p < 0.05$) than women.

Table 3 compares the SF-36 scores between men and women. Men showed significantly higher values of PCS and MCS than women (64.6 vs. 58.0, $p < 0.001$; 51.1 vs. 47.5, $p < 0.05$, respectively). Considering the different domains of SF-36, men were scored significantly higher than women in physical function (88.7 vs. 67.3, $p < 0.001$), BP (87.4 vs. 76.9, $p < 0.01$), SF (82.4 vs. 73.0, $p < 0.05$), emotional rôle (82.5 vs. 69.3, $p < 0.05$), and MH (54.7 vs. 49.1, $p < 0.05$).

Tables 4 and 5 summarize the results obtained using our multiple regression models. In Model 1, where we included sex and demographic data as independent variables, we found that men reported significantly higher PCS and MCS scores than women ($\beta = 0.269$, $p < 0.01$; $\beta = 0.170$, $p < 0.05$), respectively. Married persons reported significantly higher PCS and MCS than single people ($\beta = 0.204$, $p < 0.05$; $\beta = 0.232$, $p < 0.05$, respectively). Patients' sex and demographic characteristics explained 12.4% of the variance in PCS and explained 7.9% of the variance in MCS. In the final regression model, 52.6% of the variance in PCS and 45.7% of the variance in MCS were explained. In oral health parameters, co-operativeness was a protective factor, whereas toothache and bleeding gums were risk factors in PCS. The use of the standard cleaning method and co-operativeness were protective factors, and toothache, bleeding gums, and swollen gums were risk factors in MCS.

Discussion

Table 2. Comparisons of oral health characteristics between men and women

Characteristics	Men	Women
	(<i>n</i> = 99) <i>n</i> (%)	(<i>n</i> = 51) <i>n</i> (%)
Self-cleaning	89 (89.9)	43 (84.3)
Cleaning with toothbrush	98 (99.0)	50 (98.0)
Cleaning frequency per day (times), mean ± SD	1.6 ± 0.7	1.5 ± 0.8
Standard cleaning method	53 (53.5)	33 (64.7)
Cleaning with toothpaste	97 (98.0)	49 (96.1)
Periodical toothbrush exchange	81 (81.8)	40 (80.0)
Learning of oral cleaning	80 (80.8)	37 (72.5)
Dental visit in last three years	96 (98.0)	47 (95.9)
Reason of dental visit		
Toothache	62 (62.6)	28 (54.9)
Bleeding gums	4 (4.0)	0 (0)
Swollen gums*	2 (2.0)	5 (9.8)
Halitosis	1 (1.0)	0 (0)
Cooperativeness*	84 (84.8)	34 (66.7)
Treatment		
Extraction	12 (12.1)	2 (3.9)
Filling	33 (33.0)	13 (25.5)
Periodical inspection	64 (64.6)	38 (74.5)
Endodontic therapy	0 (0)	0 (0)
Scaling	51 (51.5)	25 (49.0)
Gum treatment	10 (10.1)	2 (3.9)
Intervals between visit (months), mean ± SD	7.4 ± 3.7	6.1 ± 4.8

**p* < 0.05 using χ^2 or *t*-test when appropriate (*n* = 150).
SD, standard deviation

Table 3. Comparisons of 36 item Short-form Health Survey scores between men and women

Scores	Mean ± SD	
	Men (<i>n</i> = 99)	Women (<i>n</i> = 51)
Physical functioning***	88.7 ± 17.9	67.3 ± 30.6
Role physical	79.5 ± 38.9	68.1 ± 39.7
Bodily pain**	87.4 ± 19.1	76.9 ± 25.3
General health	69.6 ± 21.2	65.7 ± 24.0
Vitality	71.6 ± 17.5	66.6 ± 24.4
Social functioning*	82.4 ± 17.7	73.0 ± 28.1
Role emotional*	82.5 ± 36.7	69.3 ± 39.4
Mental health*	54.7 ± 12.6	49.1 ± 19.7
Physical health composite score***	64.6 ± 9.1	58.0 ± 13.6
Mental health composite score*	51.1 ± 7.9	47.5 ± 12.3

p* < 0.05; *p* < 0.01; ****p* < 0.001 using *t*-test (*n* = 150).
SD, standard deviation; SF-36, 36 item short-form health survey

Sex remained a significant factor regardless of whether other parameters were adjusted for, suggesting that the differences could not be fully explained using demographic characteristics or oral health parameters.

In this study, we examined oral health parameters and their impacts on the OHRQoL of patients with schizophrenia in a nursing home in Taiwan. Male sex and co-operativeness were protective factors, whereas toothache and bleeding gums were risk factors in physical and MH. The standard cleaning method was a protective factor for MH but not for physical health. As shown in Table 3, men reported significantly higher PCS (*p* < 0.001) and MCS (*p* < 0.05) than women. Moreover, the results of our regression analysis showed that the differences existed in PCS (Table 4) and MCS (Table 5) between men and women cannot be fully explained using oral health and that sex plays a rôle.

The mean age of our study group (Table 1) was about 56 years. Poor oral health is a reported risk factor among older adults. A previous study reported that 68% of the institutionalized older adults have no natural teeth, and 22% have neither natural nor artificial teeth [12]. Dental loss could be the cause and consequence of poor oral health. Poor oral health behaviors, such as not brushing teeth and non-standard cleaning methods, can cause dental loss. Poor oral conditions, such as bleeding gums when brushing, toothache, and swollen gums, prevented patients from brushing teeth, leading to poorer oral health. Therefore, the inclusion of age in the regression model is important when considering the effects of other factors on OHRQoL.

The prevalence of dental problems was greater than 60% in our study (Table 2). This finding has been due to several causes. First, patients with schizophrenia frequently do not recognize their disease and health status owing to poor cognitive function [31]. Second, the side effects of psychiatric medications, (such as hyposalivation [32], hypersalivation with clozapine [33], and extrapyramidal side effects such as dystonia- and dyskinesia-related posture change), which prevent effective brushing of teeth [34] were reported to be related to poor oral health. Periodontal disease was associated with the metabolic side effects of second-generation antipsychotic drug [35, 36]. Moreover, patients with schizophrenia show negative symptoms, causing neglected self-care and maintenance of good oral hygiene [37]. Therefore, they neglect their oral health problems or are unaware of dental treatment needs [38]. Interventions such as oral health assessments using standard checklists designed for non-dental personnel, assistance with oral hygiene, management of iatrogenic dry mouth, and early dental referral have been suggested [13].

We examined the oral cleaning habits, oral health problems, and oral healthcare among the study participants. It is important for us to learn which factor has the strongest influence on patients' OHRQoL to implement better resource planning and prioritization. For example, toothache and bleeding gums are the oral health problems associated with poor physical health, whereas toothache, bleeding gums, and swollen gums were associated with poor MH. Toothache, bleeding, and swollen gums are relatively vague terms because they can be caused

Table 4. Relationships between related factors and scores of physical component summary: multiple regression models

Independent variables	β (Model 1)	β (Model 2)
Men versus women	0.269**	0.273***
Age	-0.133	-0.063
Education	0.033	-0.058
Marital status	0.204*	0.074
Onset	-0.024	-0.022
Course	-0.087	-0.142
Hospitalization	0.079	0.91
Smoking	<0.001	-0.006
Oral health		
Self-cleaning		0.038
Cleaning frequency		0.054
Standard cleaning method		0.070
Periodical toothbrush exchanging		0.056
Learning of cleaning method		0.055
Toothache		-0.299***
Bleeding gums		-0.231**
Swollen gums		-0.108
Halitosis		-0.106
Co-operativeness		0.220*
Scaling		0.059
Intervals between visits		0.078
<i>F</i>	2.296	6.441
<i>R</i> ²	0.124	0.526
<i>Adj R</i> ²	0.070	0.445

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Model 1 included sex and other demographic characteristics parameters as the independent variables.

Model 2 included sex, other demographic characteristics, and oral health parameters as the independent variables

by dental caries or periodontal diseases, and they have been reported to negatively impact on OHRQoL [39].

Moreover, we investigated patients' attitudes toward dental visits. Co-operativeness was considered as the patients' behavior during dental treatment. Patients with schizophrenia may not act against a dental visit, but could resist heavily the treatment process. Cognitive impairment and excess negative symptoms can strongly influence their awareness and expression of pain [22]. Therefore, psychoeducation about co-operativeness during dental treatment is important in improving physical and MH.

Sex, an unmodifiable factor, was shown to have a clinically meaningful impact on physical and MH (Table 2). Women are more vulnerable to poor QoL than men, both physically and mentally. In a recent nationally representative study on health-related QoL conducted in the United States, women have been reported lower scores than men across different age groups with various instruments [40]. In our multivariable analysis, we found a difference in physical and MH between men and women, regardless of which other factors were adjusted for in the model (Tables 4 and 5). Previous studies suggested that women have lower pain tolerance, are more

Table 5. Relationships between related factors and scores of mental component summary: multiple regression models

Independent variables	β (Model 1)	β (Model 2)
Men versus women	0.170	0.155*
Age	-0.047	0.006
Education	-0.052	-0.094
Marital status	0.232*	0.103
Onset	-0.058	-0.048
Course	-0.096	-0.098
Hospitalization	0.089	0.045
Smoking	-0.028	-0.012
Oral health		
Self-cleaning		-0.066
Cleaning frequency		0.109
Standard cleaning method		0.179*
Periodical toothbrush exchanging		0.013
Learning of cleaning method		0.033
Toothache		-0.270***
Bleeding gums		-0.161*
Swollen gums		-0.192*
Halitosis		-0.085
Co-operativeness		0.196*
Treatment		
Scaling		0.101
Toothache		-0.004
Intervals between visits		0.046
<i>F</i>	1.387	4.890
<i>R</i> ²	0.079	0.457
<i>Adj R</i> ²	0.022	0.364

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Model 1 included sex and other demographic characteristics parameters as the independent variables.

Model 2 included sex, other demographic characteristics, and oral health parameters as the independent variables

willing to consult physicians, and give higher pain ratings than men [24, 25, 41]. Another suggestion is that the distributions of chronic conditions in women and men are different [24, 25].

Study limitations

The readers are warned against over-interpret the study results because our study has six study limitations:

- The participants were recruited at on-site visits. Those who were not interested in participating in the study may not have been included.
- The data were drawn from copies of self-reported questionnaire, which might have resulted in shared method variance. We did not obtain collateral information from medical staff or family to double check for participants' levels or severities of dental problems and oral health behaviors.
- Other risks and protective factors related to OHRQoL might exist. They include comorbid physical diseases and psychiatric disorders, but we did not examine them in this

study. We did not evaluate the medication used and report of side effect. History and severity of schizophrenia and related cognitive function impairment were also not evaluated in our study. The multiple regression analysis suggested that sex, co-operativeness, toothache, and bleeding gums explain 52.6% of the variability in PCS, whereas sex, standard cleaning method, and cooperativeness were protective factors in MCS, and toothache, bleeding gums, swollen gums explain 45.7% of the variability in MCS. For example, factors such as participants' psychiatric diagnosis, substance use disorder (esp., betel nut use disorder), physical illness, dentures, social expectations, personality and functional status warrant further investigation [23, 42].

- Our self-reported questionnaire to collect the status of oral health was not validated or compared with dentists' examination.
- Our study is a cross-sectional analysis. We could not differentiate properly between whether a person had low OHRQoL because of his/her poor oral health and whether a person with low OHRQoL was more likely to develop poor oral health.
- The oral health questionnaire was only reviewed and modified by a senior psychiatrist and a dentist for expert validity. However, it was not validated through comparing with other oral health questionnaire. Future studies with a longitudinal design would be valuable to further evaluate this issue when elucidating the causal relationship of oral health and OHRQoL.

Summary

In this cross-section study, we investigated the effects of the oral health of institutionalized patients with schizophrenia in Taiwan on their OHRQoL. The study showed a difference in OHRQoL between men and women. Those findings add to the current literature on sex differences in OHRQoL, providing useful information for decision makers to plan and prioritize health care resource for oral health in patients with schizophrenia in Taiwan and other countries. Further prospective studies considering physical illness are needed to confirm our findings.

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Conflicts of Interest

The authors declare no potential conflicts of interest in publishing this report.

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