

ORIGINAL ARTICLE

Oral health-related quality-of-life and mental health in individuals with chronic obstructive pulmonary disease (COPD)

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Abstract

Objectives. To investigate the association between oral health, oral health-related quality-of-life (OHRQoL) and mental health-related quality-of-life (QoL) in persons with chronic obstructive pulmonary disease (COPD) with respect to demographic, social and clinical oral health variables. **Materials and methods.** One hundred participants were included in a cross-sectional study at a hospital in Norway. Data were collected via the Oral Health Impact Profile (OHIP-14), the SF-36v2 Health Survey Mental Component (MCS), other self-reported factors, an interview and a clinical examination. Multiple regression analyses were performed. The Regional Committee for Medical and Health Research Ethics approved the study. **Results.** Higher education ($p < 0.01$), being a smoker ($p < 0.05$) and experience of oral health problems ($p < 0.001$) were significantly associated with oral health-related quality-of-life (OHRQoL). Furthermore, those with feelings of dry mouth ($p < 0.05$) and impaired OHRQoL ($p < 0.001$) experienced more mental health problems. **Conclusions.** This study demonstrated that oral health and personal factors are related to mental health-related QoL and OHRQoL in individuals with COPD. This finding shows the need to focus on oral care.

Key Words: COPD, mental health, oral health, oral health impact profile, oral health-related quality-of-life, Sf-36v2 survey

Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive condition that causes breathing difficulties. The term covers conditions such as chronic asthma, chronic bronchitis and emphysema [1–3]. It is the 4th most common cause of death in the US. COPD is associated with frequent hospitalizations and reduced life expectancy among the millions of sufferers worldwide [2,3]. Symptoms include shortness of breath, wheezing, a sensation of tightness in the chest and coughing that produces large amounts of mucus. The main cause of COPD is cigarette smoking. Although most individuals with this diagnosis are smokers or former smokers, long-term exposure to other irritants, such as chemical fumes, dust and air pollution, may also contribute to COPD. The condition develops slowly and many are diagnosed when middle-aged or older. Symptoms

increase over time, gradually limiting activities of daily life, such as cooking, cleaning, walking and personal care [1–3]. Oral health in COPD patients is important. Scannapieco et al. [4] addressed a potential link between periodontal disease and COPD. Leuckfeld et al. [5] found a high prevalence of periodontitis in COPD patients. Azarpazhooh et al. [6] concluded that there is good evidence that improved oral hygiene reduces respiratory diseases among high-risk elderly people.

The concept of quality-of-life (QoL) as psychological well-being is based on human subjective experience [7]. ‘Quality of life is a concept that expresses a subjective experience’, ‘it is a multidimensional concept: quality of life is about the physical, mental, social and existential aspects of life’, ‘it is about values and meaning in life’ ([7], p. 402). There are research reports on the association between COPD and QoL [8,9]. Individuals with COPD may experience

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reduced QoL in relation to impaired lung function [9]. Many researchers report severe depression and anxiety in COPD patients [8,10-13]. The importance of modifying the individual's diet to maintain the desired weight has been highlighted [14] and more frequent meals are recommended. This may have implications for oral health. Certain medications that are regularly used by people with COPD may increase oral health problems. For instance, inhalation medications containing anti-cholinergics may cause dry mouth [15] and corticosteroids may cause candidiasis in the oral cavity [15,16]. They may also affect bone mineral density [17]. Depression is common among COPD patients, especially in females [18], and anti-depressants are usually prescribed for these conditions [19]. Such drugs are also known to cause dry mouth problems [15].

In a population of elderly people, it was found that oral health may affect oral health-related quality-of-life (OHRQoL) and that OHRQoL was significantly correlated with the mental component of general health-related quality-of-life (HRQoL) [20].

To the best of our knowledge, we have found no studies focusing on the relationship between oral health and mental health in COPD patients.

In this context, it seemed relevant to explore oral health, OHRQoL and mental components of HRQoL in groups of patients with chronic diseases. As COPD patients seem to be at high risk for oral diseases and oral conditions may influence lung disease, we consider them a group of special interest.

The primary aim of this study was to explore how oral health-related quality-of-life (OHRQoL) is related to mental health-related QoL, controlling for socio-demographic variables (i.e. age, gender,

living status, education level, smoking) and clinical oral health-related issues (i.e. problems with oral health, regularity of dental visits, dry mouth and dental status) in a population of COPD patients.

Materials and methods

Participants

Individuals with COPD registered at an outpatient unit at Lovisenberg Diakonale Hospital (LDS) in Oslo, completed questionnaires, participated in a clinical examination and took part in an interview.

The inclusion criteria for the participants were (I) diagnosis of COPD (any stage) recorded in the medical record, (II) ability to understand, speak and read Norwegian, (III) availability on the telephone and (IV) being outpatients at LDS.

There were no restrictions in terms of age, sex or ethnic background. Participants were selected from an outpatient list with a total of 593 COPD patients registered during the previous 3 years at LDS. Participants were consecutively invited from a randomized list until 100 patients were enrolled.

Invitation to participate was made by telephone and subsequently confirmed in writing. Participants were informed of the study's aim and procedures. Approximately 120 selected individuals were unable to attend. Thus, the response rate was 45%. A flow chart is presented in Figure 1.

Questionnaire booklet

The questionnaire booklet consisted of standardized measures of oral health-related QoL (OHIP) and

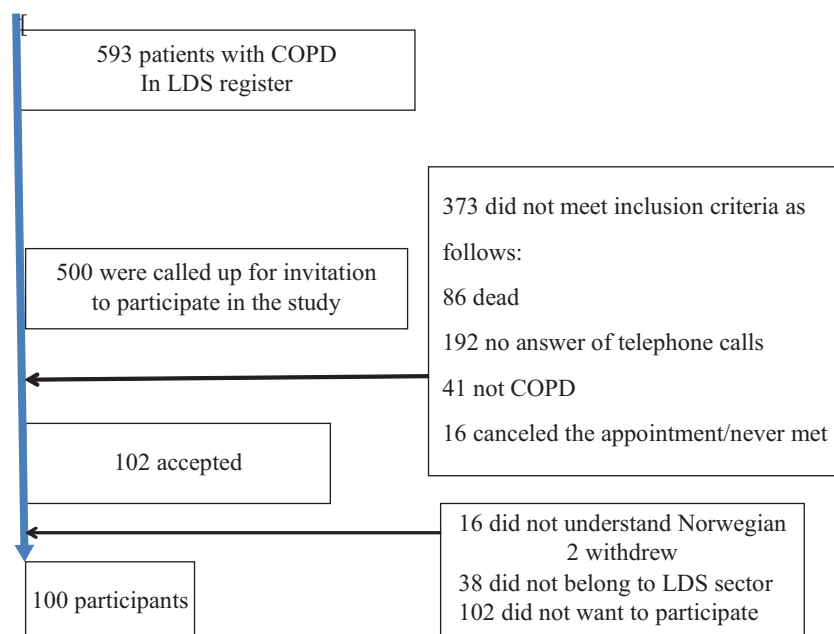


Figure 1. Flowchart of participants with COPD.

mental health-related QoL (SF-36). The questionnaire booklet was pilot tested before use. All participants filled out the questionnaires on paper upon arrival in the dental clinic and the questionnaires were checked for incomplete answers by the first author. The data were recorded in SPSS by the first author and recordings were systematically rechecked.

Measures

- *Socio-demographic data* consisted of: age, sex, living situation (living alone/with someone), education (secondary school or less/vocational, college or university) and present smoking status (smoker/non-smoker).
- *Subjective evaluations of oral health* were reported by responding to the question 'Do you feel dry or moist in the mouth' from the Xerostomia Inventory [21] and oral health problems were reported by answering 'Do you have problems with your teeth?' (No/yes, pain, chewing problems or aesthetic concerns). Past dental history was addressed by answering 'When was your last dental appointment?' (Less/more than a year ago) and 'Do you attend dental appointments regularly?' (Yes/no).
- *Health-related quality-of-life (HRQoL)* was measured using the SF-36v2 (licensed version) [22]. It comprises 36 questions divided into eight categories, covering physical function, physical role limitations, emotional role limitations, vitality, social functioning, bodily pain, mental health and general health. The eight categories can be grouped in two domains: physical health and mental health. Only the mental health domain was used in this study, in order to explore how participants viewed their mental health and emotional issues during the preceding 4 weeks. The mental health summary scores are mainly based on mental health components: vitality, social functioning, emotional and role limitations [22]. Summary scores for self-reported mental health were calculated by standard procedures. A high score indicates better health. The reliability of the SF-36 is well-documented in several countries including Norway [23].
- *Oral health-related quality-of-life (OHRQoL)* was investigated using the Norwegian version of the Oral Health Impact Profile (OHIP-14) questionnaire [24–26]. The OHIP-14 is a self-reported assessment of the impact of oral health on daily life. It is a modification of an earlier questionnaire, which had 49 items [26]. The items in the OHIP questionnaire are introduced as follows: 'During the past year, have you experienced the following problems/situations or discomfort due to your teeth, dentures or other conditions in the mouth?' Response options to each of the 14 items are: 0 = never, 1 = rarely, 2 = sometimes, 3 = quite often,

4 = often. Response option 5 = does not apply. The OHIP-14 has internal consistency, good construct, high stability and discriminant validity [26]. The total score of the OHIP-14 is summed up in a score from 0–56. A high score indicates poor OHRQoL. In this study, the Cronbach's alpha was 0.93 for the sum score.

Observed oral health variables

The oral health variables registered were: (1) Salivary flow measured with standard procedures. That is, participants were advised to avoid eating, drinking, using mouthwash or smoking 1 h before the consultation. Unstimulated saliva was collected for 15 min and stimulated for 5 min while chewing paraffin wax. (2) Present natural teeth, including root remnants, were registered in the oral examination.

Data analysis

Data were analysed using the SPSS software package (Statistical Package for Social Sciences version SPSS Statistics 18).

Descriptive analysis and stepwise multivariate regression analyses in three and four steps were performed. The results are presented with a 95% confidence interval (CI). *P*-values < 0.05 were considered statistically significant. Assumptions of normality and linearity were tested for each variable.

Ethical considerations

The study was carried out in the period of November 2009–May 2010. The Regional Committee for Medical and Health Research Ethics approved the study (S-093 19A - 6.209.1162). Participants signed a written consent form confirming their willingness to be included in the project. They were informed that they were free to withdraw from the study at any time.

Results

Demographic and descriptive characteristics

Fifty-six males and 44 females took part in the study. The mean age was 65.9 years with a range from 38–97. The majority (77%) had taken further education following secondary school, 53% lived alone and 39% were present smokers; only five individuals had never smoked (Table I).

Oral health-related variables are described in Table II.

Table I. Demographic characteristics, total $n = 100$.

	n (%)
Age, mean (SD)	65.9 (10.1)
Gender	
Male	56 (5)
Female	44 (4)
Living situation	
Living alone	53 (5)
Living with someone	47 (4)
Education	
Secondary school	22 (2)
Vocational/college/university (higher education)	77 (7)
Missing	1 (1)
Smoking history	
Non-smoker	60 (6)
Smoker	39 (3)
Missing	1 (1)

Oral health-related QoL

The mean sum score of OHRQoL (OHIP-14 sum) was 5.20 (SD = 7.7), with a range from 0–38 and with an 89% response rate.

Table II. Clinical variables, total $n = 100$.

	$n/\%$
Number of teeth present	
<20 teeth	44
≥20 teeth	56
Feeling of dry mouth	
Dry mouth	61
Moist mouth	38
Unstimulated saliva secretion measures	
Hyposalivation (<0.10)	16
Normal secretion	84
Stimulated saliva secretion measures	
Hyposalivation (<0.70)	9
Normal secretion	90
Oral health problems	
None	60
Oral health problems (pain, chewing difficulties or aesthetics)	39
Previous dental appointment	
<1 year ago	72
>1 year ago	20
Attends regular dental visits	
No	32
Yes	68

Table III. Summary of hierarchical regression analysis for variables OHIP-14.

Variables	B	SE B	β
<i>Step 1</i>			
Age	−0.26	0.08	−0.34**
Gender (male/female)	−0.70	0.16	−0.05
<i>Step 2</i>			
Age	−0.19	0.08	−0.26*
Gender (male/female)	−0.31	0.16	−0.02
Living status (living alone/living with someone)	−0.76	0.16	−0.05
Education (secondary/higher education)	0.39	0.18	0.22*
Smoking (non-smoker/smoker)	0.43	0.15	0.29**
<i>Step 3</i>			
Age	−0.14	0.07	−0.18
Gender (male/female)	0.05	0.14	0.00
Living status (living alone/living with someone)	−0.02	0.14	−0.00
Education (secondary/higher education)	0.45	0.16	0.25**
Smoking (non-smoker/smoker)	0.30	0.14	0.21*
Oral health problems (pain, chewing difficulties or aesthetics) (no problem/problem)	0.68	0.14	0.43***
Regular dental visits (no/yes)	−0.21	0.16	−0.13
Dry mouth (dry/moist)	−0.41	0.14	−0.03
Teeth present (0–19/20–28 teeth)	−0.96	0.16	−0.06

Note: Step 1 $R^2 = 0.10$, Step 2 $R^2 = 0.20$, Step 3 $R^2 = 0.39$.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table III presents a multiple regression analysis with OHRQoL as the dependent variable and independent variables entered in three steps: Step 1: Age and gender. Step 2: Living alone/living with someone, education and smoking. Step 3: Clinical status: oral health problems (pain, chewing difficulties, aesthetics), regularity of dental visits, feeling of dry mouth and number of teeth present.

The main result with a 39% explaining variance at step 3 shows that having a high level of education (st. beta = 0.25, $p < 0.01$), being a smoker (st. beta = 0.21, $p < 0.05$) and experiencing oral health problems (st. beta = 0.43, $p < 0.001$) are significantly related to a poorer OHRQoL.

For further information, see Table IV.

Mental health-related QoL

The mean sum score for mental health QoL (SF-36 mental dimension) was 46.1 (SD = 15.2), range = 8–73 and response rate = 99%.

Table IV presents a stepwise multivariate regression analysis with mental health QoL as the dependent variable and independent variables entered in four

Table IV. Summary of hierarchical regression analysis for variables predicting SF-36 MSC.

Variables	B	SE B	β
<i>Step 1</i>			
Age	0.38	0.15	0.26*
Gender (male/female)	-0.42	0.31	-0.14
<i>Step 2</i>			
Age	0.29	0.15	0.20
Gender (male/female)	-0.32	0.31	-0.11
Living status (living alone/living with someone)	0.65	0.31	0.22*
Education (secondary/higher education)	0.34	0.35	0.10
Smoking (non-smoker/smoker)	-0.77	0.30	-0.27**
<i>Step 3</i>			
Age	0.30	0.17	0.21
Gender (male/female)	-0.33	0.31	-0.11
Living status (living alone/living with someone)	0.52	0.32	0.18
Education (secondary/higher education)	0.19	0.36	0.31
Smoking (non-smoker/smoker)	-0.56	0.31	-0.20
Oral health problems (pain, chewing difficulties or aesthetic) (no problem/problem)	-0.26	0.33	-0.09
Regular dental visits (no/yes)	-0.20	0.36	-0.06
Dry mouth (dry/moist)	0.64	0.32	0.21*
Teeth present (0–19/20–28 teeth)	0.43	0.35	0.14
<i>Step 4</i>			
Age	0.17	0.16	0.12
Gender (male/female)	-0.34	0.29	-0.12
Living status (living alone/living with someone)	0.54	0.30	0.18
Education (secondary/higher education)	0.52	0.35	0.15
Smoking (non-smoker/smoker)	-0.32	0.30	-0.11
Oral health problems (pain, chewing difficulties or aesthetics) (no problem/problem)	0.38	0.35	0.12
Regular dental visits (no/yes)	-0.38	0.33	-0.12
Dry mouth (dry/moist)	0.59	0.30	0.20*
Teeth present (0–19/20–28 teeth)	0.35	0.32	0.12
OHIP-14	-0.90	0.24	-0.47**

Note: Step 1 $R^2 = 0.06$, Step 2 $R^2 = 0.15$, Step 3 $R^2 = 0.16$, Step 4 $R^2 = 0.29$.

* $p < 0.05$, ** $p < 0.001$.

steps: Step 1: Age and gender. Step 2: Living alone/living with someone, education and smoking history. Step 3: Clinical status: oral health problems (no problem/problem), regularity of dental visits, feeling

of dry mouth, number of teeth present. Step 4: OHIP-14 sum score.

The main result at step 4 shows an explaining variance of 29%. Dry mouth (st. beta = 0.20, $p < 0.05$) and low OHRQoL (st. beta = -0.47, $p < 0.001$) are significantly related to more mental health problems.

Discussion

Our main results showed that COPD patients who were smokers had higher levels of education and more oral health problems experienced impaired oral health-related QoL. Furthermore, those with dry mouth and impaired oral health-related QoL experienced more mental health problems.

Compared to a Norwegian representative sample, our participants had poorer OHRQoL (mean = 5.2 vs 4.1 among 50–69-year-olds and 3.0 among persons older than 70 years in the general population) [27]. Consequently, we may conclude that our sample of COPD patients had substantial oral health problems. As COPD patients seem to be especially vulnerable to oral diseases [4–6], this finding indicates the need to focus on oral care.

In the equation where OHRQoL was the dependent variable, we found no association with dry mouth. However, persons with a feeling of dry mouth had a lower score of mental health QoL, indicating lower mental health. (This may be a result of medication for breathing difficulties or depression, where dry mouth is a frequent side-effect.) People with COPD are often prescribed anti-cholinergics as well as anti-anxiety medications to reduce their breathlessness [2,3]. These medications may contribute to dry mouth. Patients in poor health are at risk of dehydration and this may lead to dry mouth as well [28]. It is also possible that anxiety and fear affect salivary flow via the autonomic sympathetic innervation system. However, relatively few of the participants in our study presented with objective hyposalivation. As the saliva secretion measurements were performed at different times of day and as salivation levels may vary considerably over time, it is possible that the subjective experience of dry mouth is a more valid measure than secretion measurements.

This addresses the complexity of proper preventive care for COPD patients. Dry mouth is a risk factor for oral diseases and it should be addressed without conflicting with proper medication in such patients.

The present study did not demonstrate any association between the number of teeth present and mental health QoL or OHRQoL. This result is not in accord with earlier studies [26,29,30]. Our study group included many elderly participants who most likely have a higher level of acceptance for tooth

loss because, in their youth, it was more common to lose teeth early than it is today.

The younger age groups reported poorer OHRQoL and poorer mental health QoL in this study. In representative samples of the general Norwegian population, Holst and Dahl [27] confirmed that oral HRQoL was higher among older than younger people. They suggested that aesthetic ideals highlighted in the media have a higher influence on younger than on older age groups. This may also be true in our sample of COPD participants.

There was no association between gender and the other variables in the present study. Those with higher levels of education reported lower OHRQoL. The stepwise multiple regression analysis demonstrated that years of education persisted when the clinical variables were added to the analysis. This finding is in contrast to earlier reports where a representative sample of Norwegian individuals with fewer years of education reported more problems [27]. Our analysis also showed that smoking was significant at both the second step entering socio-demographic variables and the third step entering oral clinical variables in the equation where oral health was the dependent variable. This result indicates that smoking, together with high education and low age, explains 20% of the variance. However, when entering the oral health problems variable, the variance increased to 39%, indicating that oral health problems may be the variable that explains most of the association with OHRQoL.

One aim of this study was to investigate a possible association between OHRQoL and mental health-related QoL. After entering oral health in the equation where mental health was the dependent variable, it was shown that poor OHRQoL was the most important factor to predict poor mental health-related QoL. This result is in accord with those of other studies. An example is HIV patients, where oral health has a strong relationship with both mental health and physical health [31]. We are not aware of any publications showing an association between OHRQoL and mental health-related QoL in COPD. Our analysis shows that it is important to be aware that oral health problems in COPD patients may be a contributing factor to poor mental health-related QoL.

Limitations

The present study has several limitations. First, the response rate was low and many of the persons selected for invitation to the study were either dead or unreachable. The study offered a free dental examination and, together with the relatively high number (32%) of participants who did not attend regular dental appointments, this may reflect that many people with COPD feel too ill to attend. Anxiety

may also have hindered participants from attending the scheduled appointment. The range of symptoms for people with COPD is broad and it is likely that the participants represent the healthier end of the COPD spectrum. The relatively low number of participants may cause type I or type II errors. As this was a cross-sectional study, causal relationships between variables cannot be excluded. However, the study has several strengths. One researcher carried out all the clinical examinations and interviews with the participants, standardized and validated instruments were used and questionnaires and interviews covered similar issues to establish consistency of information.

Conclusions

This sample of COPD patients has substantial oral health problems. The results indicate that oral health problems are related to OHRQoL and that OHRQoL is related to mental health-related QoL in individuals with COPD. Access to oral health services is, therefore, important in the management of COPD so that impaired oral health does not become an additional burden for sufferers. There is a need to focus on oral healthcare for this group of patients.

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