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RESEARCH

# Unraveling the signs and symptoms of oral conditions that affect daily life activities and oral health-related quality of life

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## Abstract

**Objectives** Since oral conditions negatively affect oral health-related quality of life (OHRQoL), this study evaluated which oral clinical condition, signs, and symptoms are associated with the impact on OHRQoL, its domains, and specific daily life activities among adults.

**Materials and methods** Data from a probabilistic sample of adults (35–44 years old) was used. The Oral Impacts on Daily Performance (OIDP) was used to evaluate OHRQoL, its domains (physical, psychological, and social), and nine daily life activities. Signs and symptoms of oral diseases (dental caries, periodontal disease, need for dental prothesis, and tooth loss) and oral self-perception were considered. Descriptive, bivariate, and multi-level analyses were conducted.

**Results** A total of 5,834 adults were included, of which 52.9% had some negative impact of oral conditions on OHRQoL. Difficulty in eating was the most affected daily life activity. For multiple models, dental caries lesions (cavities), filled teeth with caries, gingival bleeding, periodontal pocket, dental pain, need for upper or lower dental prosthesis, and oral health self-perception were associated ($p < 0.05$) with overall OHRQoL or at least one of its domains. The impact on daily life activities of each individual was associated with at least one oral condition. Dental caries lesions (cavity) and dental pain were associated ($p < 0.05$) with the impact on most daily life activities evaluated.

**Conclusions** Different signs and symptoms of prevalent oral diseases are associated with the impact on specific daily life activities among adults, which may compromise the OHRQoL.

**Clinical relevance** Knowledge of how signs, symptoms, and oral conditions affect OHRQoL and daily life activities can provide essential information for clinicians to establish proper disease management and preventive strategies focusing on improving patients' lives.

**Keywords** Quality of life · Oral health · Adults · Oral health-related quality of life

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## Introduction

Oral diseases are an important public health concern worldwide. More than 3.5 billion people have been affected by oral diseases, accounting for approximately half of the world's population [1]. Untreated dental caries, periodontal disease, and tooth loss have been indicated as the most prevalent oral conditions, showing a high prevalence and incidence [1], which impair the economic aspects of countries and global productivity [2]. Untreated caries in permanent teeth is considered one of the most important health conditions affecting people worldwide [3, 4]. Moreover, periodontal disease has a high burden that can lead to physical pain, psychological discomfort, and physical disability [5]. Periodontal disease

and dental caries are considered one of the main reasons for tooth loss [6], which is a critical indicator of oral health and affects oral functions and the ability to perform daily activities [7]. Their treatment and control are complex and challenging at the public level as individuals show different signs and symptoms according to the severity of the disease.

Oral health is an essential part of overall health and is influenced by an individual's perceptions, which is an important aspect of their quality of life [8]. This concept considers an individual's ability to execute normal oral functions without pain, discomfort, and disease [8]. Therefore, oral health-related quality of life (OHRQoL) has been described as a multidimensional construct representing subjective assessments of how much oral conditions affect an individual's daily life [9]. Systematic reviews have shown the negative impact of oral conditions on oral health perception and OHRQoL [10, 11]. As expected, not only the presence of oral disease lead to a negative impact on OHRQoL but mainly the clinical signs and symptoms related to the disease, such as dental pain due to caries lesions [12].

Previous studies have shown an association between the presence of oral problems and their impact on OHRQoL [13, 14]. Therefore, this topic has been widely explored in the literature, showing the impact of dental caries, periodontal disease, and tooth loss on the overall OHRQoL or its domains [7;15–19]. Since OHRQoL is multidimensional, these evaluations should consider not only the domains of OHRQoL but also identify specific daily life activities affected by oral conditions. Although some studies have evaluated the impact of oral diseases on specific daily life activities, such as untreated dental caries and reduced dentition profile [14;20], the same individual can be affected by more than one disease, and the impact is expected according to the clinical signs and symptoms of the disease and its severity. Thus, the presence of disease was not the main cause. However, previous studies have not evaluated the association of specific oral diseases and their signs and symptoms with specific daily life activities and OHRQoL among adults highly affected by oral diseases.

Therefore, this study evaluated which oral clinical condition, signs, or symptoms are associated with the impact on OHRQoL, its domains, and specific daily life activities among adults.

## Methods

### Ethical aspects

This study used the data from the São Paulo Oral Health 2015 (SBSP-15) survey (São Paulo, Brazil). The epidemiological survey was conducted according to the ethical principles of the Brazilian National Health Council Resolution and approved by the local Research Ethics Committee (46,788,215.9.0000.5418). The participants were informed about the study and signed a consent form.

### Sampling and survey design

The SBSP-15 evaluated the oral health status through interviews and clinical examinations of a representative sample of adolescents, adults, and older people from six macroregions (domains) of the state of São Paulo (Brazil), conducted according to the World Health Organization and the Brazilian national survey—SB Brazil 2010 guidelines [21, 22]. Sampling was determined by the conglomerate in two stages, with a proportional probability of the size of the municipalities' populations or conglomerates. First, 178 municipalities (primary sampling units) were randomly drawn (first stage), with 33 domains, except for the capital metropolitan region. Then, 390 census tracts (second sampling units), two sectors for 177 municipalities, and 36 sectors for the capital were drawn, allowing all households in the census tract to be visited. Individuals who were part of the selected age groups were evaluated. The exhaustion technique (until the estimated sample size was achieved) was used for each primary sampling unit.

Clinical oral examinations were conducted by trained and calibrated dentists to train the consensus technique. The minimum acceptable Kappa value was 0.65 for each examiner. In the present study, only adults (35–44 years old) who answered questions regarding OHRQoL were included.

### OHRQoL evaluation and daily life activities

OHRQoL and daily life activities were evaluated using the Oral Impacts on Daily Performance (OIDP) [23]. The nine daily activities included in the instrument were difficulty in eating, brushing discomfort, anxiety or irritability, feeling ashamed to smile or talk, difficulty in sleeping, effect on leisure, difficulty in speaking, disruption of study or work, and effect on participation in sports. Each item of the questionnaire was preceded by the question, "Some people have problems that might be caused by the teeth. Which of the following situations apply to you in the last six months?" The response options were "no" and "yes" (impact on the activity). To evaluate the overall OHRQoL, a dichotomous variable was constructed by attaching the nine items from OIDP, with the response options "no impact" (no impact reported) and "with impact" (impact reported on at least one item from OIDP). The OIDP items were then divided into physical (eating, brushing, speaking, and physical activity), psychological (smiling, sleep, and anxiety), and social (leisure and study) domains, which were evaluated separately and dichotomized in accordance with the overall impact (no/yes) [23]. The overall impact and each domain

were considered separately as dependent variables. Moreover, to evaluate the impact of oral conditions on each daily activity, each item (question) of the OIDP was considered as dependent variable.

### Oral conditions evaluation—disease, signs, and symptoms

Dental caries were extracted from the Decayed-Missing-Filled Teeth index (DMFT). From this index, the following signs related to dental caries were extracted: tooth loss due to dental caries, dental caries lesion (cavity), and filled teeth with caries (cavity). According to the WHO guidelines and the DMFT index, the need for clinical treatment was also considered for each tooth and variable dichotomized (no or yes). Periodontal disease was evaluated using the Community Periodontal Index (CPI), which considers the presence of the following signs of periodontal condition: gingival blending, calculus/plaque, and periodontal pockets (4–5 mm or ≥ 6 mm). Dental pain, a common symptom of oral diseases, was evaluated using the following question: "Have you had a dental pain in the past 6 months?" (yes, no, and I do not know/did not answer). The clinical need for dental prostheses (removable or fixed prosthetic devices) in the upper and lower arches was also considered. Oral health self-perception was considered a symptom of oral conditions and dichotomized as satisfied (very satisfied or satisfied) or unsatisfied (not satisfied/not unsatisfied, unsatisfied, or very unsatisfied).

### Socioeconomic characteristics

The socioeconomic variables considered were age, sex (male or female), and years of education.

### Statistical analysis

Because the study involved a database generated using complex cluster sampling, a correction to the sample design was applied considering the effect of clusters and assigning weights to the sampled elements. First, a descriptive analysis was conducted, including the absolute distribution and corrected relative frequency (%). In the first step of the analysis, the following variables were considered to be dependent separately: overall OHRQoL and physical, psychological, and social domains. Bivariate analysis was conducted to estimate the odds ratios (OR) considering all the independent variables mentioned above. Significance level was also estimated in the bivariate analysis, and independent variables with a significance level of $p \leq 0.20$ were selected for multiple models. A logistic regression model was used in the multiple analysis considering a level of significance $p \leq 0.05$ for the variables that remained associated with the outcomes, estimating OR and 95% confidence intervals (95% CI). All models were adjusted by socioeconomic variables (age, sex, and educational level). All independent variables (oral diseases, signs, and symptoms) associated ($p \leq 0.05$) with at least one domain of OHRQoL or the overall measure were included in the multiple models, considering each daily life activity from OIDP as the dependent variable. Pearson's correlation was used to correlate the number of oral clinical signs and symptoms and the number of daily life activities with negative impact. SPSS software (version 25.0) was used for all statistical analyses.

## Results

This study included 5,834 adults aged 35–44 years. Among them, 52.9% (2,950) showed some impact of oral conditions on the OHRQoL. Interestingly, the physical domain of the OHRQoL was most affected by oral conditions (45.4%, $n = 2{,}506$), followed by psychological domain (40.4%, $n = 2{,}242$) and social domain (17.6%, $n = 913$). Most of the participants were women (69.5%), and the average age was 39.44 (95% CI 39.3–39.5). In the bivariate analysis, all signs and symptoms of oral conditions were associated ($p < 0.20$) with the overall OHRQoL and its domains (physical, psychological, and social), showing a higher prevalence of impact on OHRQoL among individuals with oral problems (Table 1).

In the adjusted model of variables (signs and symptoms of oral conditions) associated with the impact on OHRQoL and its domains ($p \leq 0.05$), this impact was greater among individuals with dental caries lesions (cavity), filled teeth with caries, gingival blending, periodontal pocket, dental pain, need for upper or lower dental prosthesis, and oral health self-perception, being associated with at least one dependent variable (Table 2). Dental pain, need for upper dental prosthesis, and oral health self-perception were the only variables associated ($p \leq 0.05$) with the overall OHRQoL and all its domains (Table 2).

All oral conditions (signs and symptoms) associated in the previous model with overall OHRQoL or at least one of its domains were considered in the multiple models using each daily life activity as the dependent variable. Considering the impact of each daily life activity as an outcome, all activities were associated ($p \leq 0.05$) with at least one oral condition (Table 3). Interestingly, dental pain presence was the most associated oral symptom with the impact on the daily life activities, being not only associated with impact on "difficulty in speaking." Among the signs, the presence of dental caries lesions (cavity) on at least one tooth was the main condition

**Table 1** Descriptive and bivariate analyses of independent variables related to the impact of oral signs and symptoms on OHRQoL and its physical, psychological, and social domains among adults (35–44 years). $n = 5834$

| Variables | | | Overall impact (%) | | Overall | Physical | Psychological | Social |
|---|---|---|---|---|---|---|---|---|
| | *n* | % | No | Yes | OR | OR | OR | OR |
| Oral clinical problems, signs and symptoms | | | | | | | | |
| Tooth loss by dental caries | | | | | | | | |
| 0 | 940 | 16.8 | 20.5 | 13.6 | 1 | 1 | 1 | 1 |
| 1 or more | 4894 | 83.2 | 79.5 | 86.4 | 1.63# | 1.59# | 1.53# | 2.18# |
| Dental caries lesion | | | | | | | | |
| 0 | 3272 | 53.6 | 63.7 | 44.7 | 1 | 1 | 1 | 1 |
| 1 or more | 2562 | 46.4 | 36.3 | 55.3 | 2.17# | 2.12# | 2.58# | 2.95# |
| Filled teeth with caries | | | | | | | | |
| 0 | 4414 | 73.6 | 79.5 | 68.4 | 1 | 1 | 1 | 1 |
| 1 or more | 1420 | 26.4 | 20.5 | 31.6 | 1.79# | 1.69# | 1.91# | 1.77# |
| Gingival blending* | | | | | | | | |
| No | 3233 | 55.8 | 63.7 | 49.0 | 1 | 1 | 1 | 1 |
| Yes | 2424 | 44.2 | 36.3 | 51.0 | 1.82# | 1.83# | 1.86# | 1.79# |
| Calculus/plaque* | | | | | | | | |
| No | 2489 | 42.8 | 49.4 | 37.0 | 1 | 1 | 1 | 1 |
| Yes | 3168 | 57.2 | 50.6 | 63.0 | 1.66# | 1.67# | 1.73# | 1.53# |
| Periodontal pocket* | | | | | | | | |
| No | 4184 | 73.1 | 81.2 | 66.0 | 1 | 1 | 1 | 1 |
| Yes | 1473 | 26.9 | 18.8 | 34.0 | 2.22# | 2.09# | 2.22# | 1.89# |
| Dental pain* | | | | | | | | |
| No | 3962 | 67.9 | 85.5 | 52.5 | 1 | 1 | 1 | 1 |
| Yes | 1818 | 32.1 | 14.5 | 47.5 | 5.32# | 5.21# | 5.05# | 4.20# |
| Need dental clinical treatment | | | | | | | | |
| No | 2487 | 40.2 | 50.7 | 30.9 | 1 | 1 | 1 | 1 |
| Yes | 3347 | 59.8 | 49.3 | 69.1 | 2.29# | 2.17# | 2.69# | 2.91# |
| Need upper dental prosthesis* | | | | | | | | |
| No | 3957 | 65.3 | 74.3 | 57.2 | 1 | 1 | 1 | 1 |
| Yes | 1865 | 34.7 | 25.7 | 42.8 | 2.16# | 2.17# | 2.63# | 3.00# |
| Need lower dental prosthesis* | | | | | | | | |
| No | 3129 | 51.3 | 61.2 | 42.5 | 1 | 1 | 1 | 1 |
| Yes | 2691 | 48.7 | 38.8 | 57.5 | 2.14# | 2.07# | 2.45# | 2.46# |
| Oral health self-perception* | | | | | | | | |
| Satisfied | 2574 | 40.4 | 58.7 | 24.0 | 1 | 1 | 1 | 1 |
| Unsatisfied | 3210 | 59.6 | 41.3 | 76.0 | 4.49# | 4.09# | 5.27# | 5.31# |

*Loss of information. *OR*, odds ratio. #$p < 0.05$. *OIDP*, Oral Impacts on Daily Performance

associated with the impact on daily life activities, not associated only with "difficulty eating" and "feeling ashamed to smile or talk" (Table 3). Negative oral health self-perception was associated with the impact on all daily life activities, with an OR > 2.45 (OIDP5—participation in sports).

Finally, there was a positive correlation between the number of oral problems and the number of items of daily activities (Fig. 1). Therefore, adults with more oral health problems in terms of signs and symptoms have a greater impact on their daily activities, compromising OHRQoL.

## Discussion

This study identified the clinical and subjective oral conditions and their signs and symptoms that were associated with the negative impact on the OHRQoL and daily activities of Brazilian adults. Approximately 52.9% of individuals had an impact on the overall OHRQoL. The most impacted domain, regardless of oral condition, was the physical domain, followed by psychological and social factors. The presence of oral problems may lead to a range of general boundaries such as functional, psychological,

**Table 2** Multiple analyses of variables (oral signs and symptoms) associated ($p \leq 0.05$) with the impact on overall OHRQoL and its physical, psychological, and social domains among adults (35–44 years)

| Variables | Overall OR (95% CI) | Physical OR (95% CI) | Psychological OR (95% CI) | Social OR (95% CI) |
|---|---|---|---|---|
| Dental caries lesion | | | | |
| 0 | | | 1 | 1 |
| 1 or more | | | 1.41** (1.0–1.8) | 1.81** (1.2–2.5) |
| Filled teeth with caries | | | | |
| 0 | | | 1 | |
| 1 or more | | | 1.25* (1.0–1.5) | |
| Gingival blending | | | | |
| No | | | | 1 |
| Yes | | | | 1.27* (1.0–1.6) |
| Periodontal pocket | | | | |
| No | 1 | 1 | 1 | |
| Yes | 1.78*** (1.4–2.2) | 1.70*** (1.3–2.1) | 1.64*** (1.2–2.1) | |
| Dental pain | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 4.35*** (3.1–6.0) | 4.34*** (3.0–6.2) | 4.00*** (3.2–5.0) | 3.07*** (2.2–4.1) |
| Need upper dental prosthesis | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 1.28* (1.0–1.6) | 1.38** (1.1–1.7) | 1.52*** (1.2–1.8) | 2.03*** (1.4–2.8) |
| Need lower dental prosthesis | | | | |
| No | 1 | 1 | 1 | |
| Yes | 1.39** (1.1–1.7) | 1.28** (1.0–1.5) | 1.50** (1.1–1.8) | |
| Oral health self-perception | | | | |
| Satisfied | 1 | 1 | 1 | 1 |
| Unsatisfied | 3.27*** (2.7–3.8) | 2.88*** (2.4–3.4) | 3.37*** (2.7–4.1) | 3.30*** (2.3–4.7) |

All analysis was controlled/included by socioeconomic variables: age, sex, and education. *$p < 0.050$, **$p < 0.020$, ***$p < 0.001$. *OR*, odds ratio; *95% CI*, 95% confidence interval *OIDP*, Oral Impacts on Daily Performance

and social limitations, which negatively affect an individual's quality of life [24]. This negative impact on OHRQoL has been found in young adults with oral problems, such as dental caries and periodontal disease [25]. In addition, the daily activities of OIDP (difficulty eating, speaking, and sleeping, discomfort when toothbrushing, anxiety/irritability, social contacts, participation in sports, felling ashamed to smile/talk, and disruption of work/study) were compromised by the oral conditions evaluated.

Dental caries cavities are an important problem affecting OHRQoL, mainly in the psychological and social (OR 1.81) domains, speaking, and study/work activities. Dental caries cavities are directly related to dental pain [26], which may explain their impact on these activities. Considering that these clinical consequences of the disease may be correlated with discomfort and irritation, oral functions such as chewing movements can be limited. Previous evidence has shown the relationship between untreated caries and the impact on OHRQoL [27–29] and on specific daily activities, such as difficulty eating and sleeping [13]. It is also known that population health is compromised by dental conditions, and decayed teeth are associated with numbers of physically and mentally unhealthy days and days with activity limitation [30]. However, it is worth mentioning that OHRQoL can be improved by caries intervention procedures to reduce its consequences [31].

Regarding periodontal conditions, such as gingival blending and periodontal pockets, there was an association with the impact on OHRQoL and some daily activities, such as toothbrushing, speech, and smiling. Periodontal disease is associated with pain and difficulty in maintaining oral hygiene [32]. Considering the association between periodontal disease and OHRQoL, systematic reviews have suggested different results, with inconclusive findings [29] or a negative impact on OHRQoL [32]. Moreover, the impact is greater when the severity of periodontal disease increases [33]. In addition, self-reported gingival conditions and gum bleeding have been associated with psychological factors, and this knowledge is important in the development of prevention, education, and improvement of oral health hygiene strategies [34]. Interestingly, as expected, evidence has shown that periodontal therapy promotes OHRQoL,

**Table 3** Multiple analyses of variables (oral signs and symptoms) associated ($p \leq 0.05$) with each item (daily activities) of OIDP among adults (35–44 years)

| Variables | OIDP1 | OIDP2 | OIDP3 | OIDP4 | OIDP5 | OIDP6 | OIDP7 | OIDP8 | OIDP9 |
|---|---|---|---|---|---|---|---|---|---|
| Dental caries lesion | | | | | | | | | |
| 0 | | 1 | 1 | 1 | 1 | 1 | | 1 | 1 |
| 1 or more | | 1.32** | 1.47** | 1.68** | 1.53* | 2.76*** | | 1.85** | 1.73** |
| Filled teeth with caries | | | | | | | | | |
| 0 | 1 | | | | | | | | |
| 1 or more | 1.29** | | | | | | | | |
| Gingival blending | | | | | | | | | |
| No | | 1 | | | | | | | |
| Yes | | 1.35* | | | | | | | |
| Periodontal pocket | | | | | | | | | |
| No | 1 | 1 | 1 | | | 1 | 1 | | 1 |
| Yes | 1.39** | 1.35* | 1.47** | | | 1.86** | 1.83*** | | 1.61** |
| Dental pain | | | | | | | | | |
| No | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 |
| Yes | 4.7* | 3.55*** | 4.23*** | 2.91*** | 2.87*** | | 2.04*** | 3.22*** | 5.58*** |
| Need upper dental prosthesis | | | | | | | | | |
| No | 1 | | 1 | 1 | | 1 | 1 | 1 | |
| Yes | 1.36** | | 1.50** | 1.97*** | | 1.45** | 1.58** | 2.13** | |
| Need lower dental prosthesis | | | | | | | | | |
| No | | 1 | 1 | | 1 | | 1 | | 1 |
| Yes | | 1.45*** | 1.25* | | 1.63* | | 1.44** | | 1.44** |
| Oral health self-perception | | | | | | | | | |
| Satisfied | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Unsatisfied | 2.67** | 2.83*** | 3.39*** | 3.53*** | 2.45** | 3.91*** | 4.32*** | 3.14*** | 2.67*** |

All analysis was controlled/included by socioeconomic variables: age, sex, and education. *$p<0.050$, **$p<0.020$, ***$p<0.001$. *OR*, odds ratio; *95% CI*, 95% confidence interval; *OIDP*, Oral Impacts on Daily Performance; *OIDP1*, difficulty eating; *OIDP2*, discomfort when brushing; *OIDP3*, anxiety or irritability; *OIDP4*, effect on leisure; *OIDP5*, participation in sports; *OIDP6*, difficulty speaking; *OIDP7*, feeling ashamed to smile or talk; *OIDP8*, disruption of study or work; *OIDP9*, difficulty sleeping

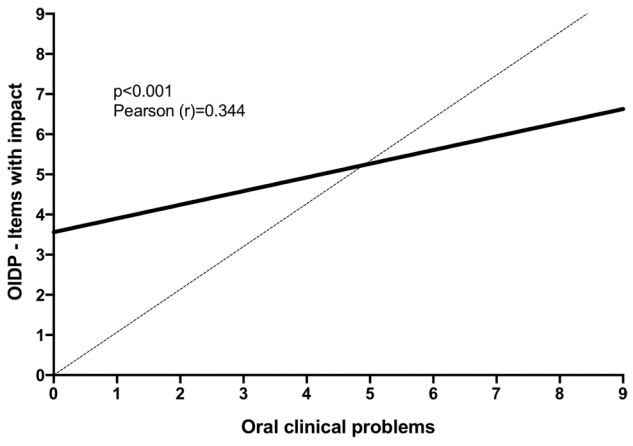


**Fig. 1** Correlation between the number of oral clinical problems (signs and symptoms) and the number of items (daily activities) from OIDP with impact

reducing psychological discomfort ("uncertainty" and "tense feeling"), psychological disability ("upset"), and physical pain ("pain in oral area" and "uncomfortable to eat") [16].

Regarding dental pain, this condition was the most associated with the OHRQoL, affecting all domains more severely than other oral conditions. This condition is associated with dental caries, periodontal disease, and the need for dental treatment among Brazilian adults [35]. A previous study also showed that dental pain is related to a negative impact on sleeping, difficulty eating, school absenteeism, difficulty paying attention in class, difficulty doing homework, staying away from recreational activities among children [36], eating and cleaning teeth among adolescents [37], and eating and feeling ashamed to smile or speak among adults and older adults [38]. Additionally, OHRQoL may be negatively impacted among those who search for a dentist

only when they feel pain [39]. In addition, adults with severe dental anxiety have a higher correlation with dental pain [40]. However, even though anxiety levels were not investigated, it is an issue that must be considered in further studies because these aspects are associated with insufficient oral health and dental care [41].

In addition, the necessity for upper and lower dental prostheses was associated with negative OHRQoL. The absence of functional dentition is one of the clinical aspects correlated with OIDP, being correlated with speaking, embarrassment to smile, and interference with an individual's ability to communicate [42]. This is also directly correlated with individual self-perception of treatment need and difficulty speaking, since most of them were unsatisfied and had a negative health belief, besides being associated with a higher dental fear and anxiety, which can hinder dental treatment [43]. These oral health problems have been shown to be correlated with physical and functional issues, interfering with chewing, speaking, and swallowing [44]. In addition, owing to tooth loss over time, these individuals may have a higher incidence of malocclusions, which, if not treated, have an impact on the physical and psychosocial domains [45].

The number of clinical problems in an individual is directly correlated with a greater impact on daily activities and the OHRQoL (Fig. 1). This emphasizes the importance of studies that evaluate these associations in each population, as they can present different oral problems that would directly impact daily activities and OHRQoL. Experimental evidence indicates that psychological approaches may improve oral behaviors and hygiene [46], which emphasizes the importance of OIDP knowledge. Evaluating the impact on daily activities is an important instrument for measuring oral health in adults and older patients [47]. Furthermore, the incorporation of subjective aspects can help the development of treatment planning for public services, approaching essential equity and impacting an individual's quality of life [48, 49]. Moreover, promoting access to dental services may directly affect health outcomes, mainly focusing on health promotion [50].

Thus, the presence of clinical and subjective oral conditions and their signs and symptoms negatively affect OHRQoL, its domains, and daily activities. Dental pain was the main factor responsible for this effect. Interestingly, specific oral problems can impair specific activities of daily living. These findings suggest that adults perceive different oral problems differently in terms of which activities are compromised.

**Author contribution** CVL and JGS analyzed the data, wrote, and critically revised the manuscript. MSN, EJMM, VSOA, and PHCM wrote the manuscript. RCF and AMEBLM wrote and critically revised the manuscript.

**Data availability** Data available on request from the authors.

## Declarations

**Ethics approval** The epidemiological survey was conducted respecting the ethical principles of the Brazilian National Health Council Resolution and was approved by the local Research Ethics Committee (46788215.9.0000.5418).

**Informed consent** The participants were informed about the study and signed a consent form.

**Competing interests** The authors declare no competing interests.

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