Original Article

Assessment and comparison of clinical dental status and its impact on oral health-related quality of life among rural and urban adults of Udaipur, India: A cross-sectional study

Abstract

Background: Dental diseases negatively influence people's oral health-related quality of life (OHRQoL) and thus their perceived need for dental care. QoL is increasingly acknowledged as a valid, appropriate and significant indicator of service need and intervention outcomes in contemporary public health research and practice.
Objectives: (1) To assess the psychometric properties of oral health impact profile-14 (OHIP-14) scale among rural and urban OHIP of Udaipur population. (2) To assess and compare clinical dental status (dental caries, periodontal disease and prosthetic status) and its impacts on OHRQoL rural and urban population of Udaipur.
Materials and Methods: A cross-sectional descriptive survey was conducted among rural (600) and urban (600) population of Udaipur that have age ranges between 20 and 79 years, chosen from outpatient department of Pacific Dental College and Hospital. The OHIP-14 was tested for validity and reliability. Chi-square, Student's *t*-test, analysis of variance and multiple logistic regression analysis were employed for statistical analysis.
Results: The Cronbach's alpha of the scale was found to be 0.85 among the rural population and 0.89 among the urban population. Prevalence of periodontal disease (community periodontal index and loss of attachment) was found greater among the rural population than the urban population. Urban population showed significantly greater proportion of subjects with prosthesis (including partial, fixed and total) as compared to the rural population. Among study population, OHIP-14 was significantly ($P \leq 0.05$) associated with age, gender, presence of decayed teeth (DT), missing teeth (MT), and location. Significantly greater odds ratio (OR) (OHIP-14) were revealed among males (OR = 1.35, $P = 0.02$), urban residents (OR = 1.13, $P = 0.002$), those < 45 years of age (OR = 1.23, $P = 0.01$), those without DT (OR = 1.48, $P = 0.002$) and without MT (OR = 1.08, $P = 0.03$).
Conclusion: The rural and urban study subjects had a fair clinical status. The presence of dental caries had greatest impacts on OHRQoL. In addition, rural subjects faced greater impact than urban subjects.

Key words:
Oral health, oral health impact profile-14, reliability, Udaipur

Introduction

There are several systemic diseases that manifest in the oral cavity either prior to the occurrence of disease or concomitantly.[1] Oral diseases are the most common of the chronic diseases and are important public health problems because of their prevalence, their impact on individuals and society, and the expense of their treatment.[2] Oral health is understood as "a dentition that is comfortable, functional, and with such an appearance that allows the people to perform

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their social functions and daily activities without physical, psychological or social inconveniences."[3]

Quality of life (QoL) is concerned with "the degree to which a person enjoys the important possibilities of life". Oral health-related quality of life (OHRQoL) characterizes a person's perception of how oral health influences an individual's life quality and overall well-being.[4] Additional motivation for measuring both negative and positive changes in oral health status has arisen during the last decade as dental researchers have been called upon to broaden their focus on the patho-physiological assessment of clinical disease to incorporate psycho-social assessments of QoL. The need for more comprehensive approach stimulated the development of sociodental indicators to supplement clinical indicators, by adding a social impact dimension.[5,6]

The assessment of OHRQoL also has an important role to play in clinical practice. Such is the interest in this area of research that a number of instruments have been developed to assess the functional, social and psychological outcomes of oral disorders.[7] The increased emphasis on inclusion of patient-centered outcome measures in clinical research studies by agencies such as the World Health Organization (WHO) is one of the many factors that has led to an increase in QoL research over the last 40 years.[8,9]

Quality of life is an important measurable outcome of care for conditions that do not threaten life. In dentistry, parallel OHRQoL measures also known as socio-dental indicators, oral health measures and oral health outcome measures have evolved particularly from the debate about measuring dental treatment "need".[10] Dental health outcomes has been conceptualized in terms of clinical indicators of oral health status or measures like decayed, missing or filled teeth (DMFT) index, Russell's periodontal index or community periodontal index (CPI) are subjected to more serious limitations. They tell us nothing about the functioning of either the oral cavity or person as a whole and nothing about subjectively perceived symptoms such as pain or discomfort. The limitations of the current measures of oral disorders have been recognized in recent discussions of oral disease and QoL.[11]

Oral health-related quality of life can become a tool to understand and shape not only the state of clinical practice, dental research, and dental education but also that of the community at large.

The oral health impact profile (OHIP) developed by Locker and Miller (1994) is a well-known method for identifying dimensions in OHRQoL, as it is one of the most sophisticated and popular instruments for measuring OHRQoL. OHIP-14 was developed by Slade as a shorter version of the OHIP for settings where the full battery of 49 questions was inappropriate. It has emerged as a powerful tool in the assessment of OHRQoL and consists of 14 items organized in seven subscales that address aspects of oral health that may compromise a person's physical, psychological and social well-being.[12]

Documenting variations in OHRQoL in a population provides important information for the evaluation of oral healthcare. The oral disease burden in India is showing a steady increase in recent years. The findings of the previously reported National Oral Health Survey conducted by the Dental Council of India (2002–2003) reported the caries prevalence among adults in India between 80% and 85% with the mean DMFT ranging from 5.4 to 14.9 among different regions. Similarly, the prevalence of periodontal disease (CPI and loss of attachment) among adults was reported at 80–90%.[13] Although numerous studies on OHRQoL and its associated factors in adult populations have been reported from many developed and developing countries, no such studies have been reported from India. Because of different findings for overall and specific clinical conditions it was worthwhile carrying out research to explore the associations between specific clinical dental measures and OHRQoL indicators.

Hence, an attempt has been made to investigate the association between OHRQoL using OHIP-14 scale and clinical dental status among rural and urban adults of Udaipur, India.

Materials and Methods

Study design and study population

A cross-sectional descriptive survey was conducted among patients attending outdoor patient department in Pacific Dental College and Hospital, Udaipur, Rajasthan, India from January 2013 to June 2013. Study population consists of rural (600) and urban (600) population attending the outdoor patient department.

Ethical clearance and official permission

The study protocol was reviewed by the Ethical Committee of Pacific Dental College and Hospital and was granted ethical clearance. Official permission was taken from the principal of Pacific Dental College and Hospital, Udaipur.

Inclusion and exclusion criteria

All patients who were physically and mentally capable of responding the questionnaire and provided informed consent for the study were included. Persons below the age of 20, suffering from systemic disease and having oral mucosal lesions, temporomandibular joint problems, Dental Fluorosis and Malocclusion were excluded.

Pilot survey

Based on results of pilot study, prevalence was obtained for rural and urban populations. At 95% confidence level and 5% allowable error, the sample size was calculated and was determined to be 1092 which was rounded off to 1200.

Survey proforma

The survey proforma was prepared using OHIP-14 questionnaire to assess OHRQoL. WHO oral health assessment form (1997) was used to assess the oral health status of the population.[14] It included recording of demographic data like name, age, sex, occupation, income, education and clinical parameters like CPI, loss of attachment, dentition status and treatment needs and prosthetic status. Socioeconomic

status (SES) was classified according to prasad's classification of SES scale[15] according to which it was stratified into five categories, viz., Upper High, High, Upper Middle, Lower Middle and Low. After which the Upper High and High categories were merged together as High and Upper Middle and Lower Middle categories were merged together as a medium.

Structure of the questionnaire

The OHIP questionnaire consists of the 14 statements. Respondents are asked to indicate on a five-point Likert scale how frequently they experienced each problem within a reference period (within last 1-year). Response categories for the five-point scale were: "Very often," "Fairly often," "Occasionally," "Hardly ever" and "Never." Respondents were also offered a "don't know" option for each question.

Reliability and validity of the questionnaire

For internal reliability, standardized alpha coefficient was estimated. Cronbach's coefficient was found to be 0.85 for rural and 0.89 for the urban population. The first 10% of respondents who were interviewed and examined were again contacted after a week and subjected to the same procedure. For criterion and validity, Face validity was also assessed, and it was observed that 92% of the participants found the questionnaire to be easy.

Methodology

Data collection schedule was prepared according to sample size requirement. On predecided schedule, examiner worked in an outpatient department (OPD) and conducted examinations. Study subjects were selected randomly from the OPD belonging from both urban and rural areas of Udaipur.

Statistical analysis

The recorded data were compiled and entered in a spreadsheet computer program Microsoft Excel, 2007 (Microsoft Corp., USA) and then exported to data editor of SPSS version 19.0 (IBM SPSS Statistics Inc., Chicago, Illinois, USA). Independent variables to be studied were CPI, loss of attachment, dentition status, and prosthetic status. Dependent variables were OHIP-14 and its domains. Descriptive statistics included computation of percentages, means, and standard deviations. The Chi-square test, Student's *t*-test and analysis of variance were used for comparison of all clinical indicators between age, gender, SES and location groups. Multiple logistic regression analysis was applied to OHIP-14 and its domains as dependent variables. The variables found to be significantly associated with OHIP-14 in bivariate analysis were dichotomized and were entered as independent variables in OHIP-14 model.

Results

A total of 1200 subjects (rural = 600 and urban = 600) participated in the survey. Concerning the gender of the sample population, more than half of the rural (62.7%) and urban (72.2%) participants were males. Majority of rural (26.8%) and urban (26.8%) subjects were in the age group of 40–49 years and 30–39 years respectively [Table 1]. A higher proportion of participants were from middle socioeconomic class both in rural (50%) and urban (54.2%) study population according to prasad scale.

Majority of rural study subjects suffered from calculus (31%) followed by 4–5 mm deep pockets (21.7%) while in urban population, calculus and 4–5 mm deep pockets were present among 35.7% and 15.2% subjects respectively. The prevalence of loss of attachment was high (51.1%) among rural population and low in urban population (43.1%). Rural population had significantly higher prevalence of periodontal disease (CPI and loss of attachment) than urban population (P = 0.001). Mean decayed teeth (DT), missing teeth (MT) and DMFT were significantly (P < 0.05) greater among rural population (DT = 2.66 ± 1.93, MT = 2.07 ± 5.99, DMFT = 5.1 ± 6.34) than among urban population (DT = 2.13 ± 2.26, MT = 1.22 ± 4.56, DMFT = 3.72 ± 4.99). However mean FT was found to be significantly (P = 0.002) greater among urban subjects (0.39 ± 0.98) than rural subjects (0.2 ± 0.72). Around 88.2% rural subjects and 85.5% urban subjects in age group of 20–29 years had no prosthesis. Urban population showed significantly greater proportion of subjects with prosthesis as compared to rural population (P = 0.001) [Table 2].

Cronbach's alpha for internal consistency for OHIP-14 instrument and was 0.85 and 0.89 for rural and urban population respectively. Cronbach's alpha for the OHIP-14 domains ranged from 0.53 to 0.66 and 0.54 to 0.62 for rural and urban populations respectively [Table 3].

According to bivariate analysis, mean OHIP-14 score revealed significant association ($P \leq 0.005$) with age, DT,

Table 1: Distribution of study subjects by age and gender

Age in years	Gender *n* (%)					
	Rural			Urban		
	Male	Female	Total	Male	Female	Total
20-29	77 (82.8)	16 (17.2)	93 (15.5)	177 (77.6)	51 (22.4)	228 (38)
30-39	89 (73.6)	32 (26.4)	121 (20.2)	115 (71.8)	46 (28.6)	161 (26.8)
40-49	72 (44.7)	89 (55.3)	161 (26.8)	62 (69.7)	27 (30.3)	89 (14.8)
50-59	76 (59.4)	52 (23.2)	128 (21.3)	39 (70.9)	16 (29.1)	55 (9.2)
60-69	41 (67.2)	20 (32.8)	61 (10.2)	31 (70.5)	13 (29.5)	44 (7.3)
70-79	21 (58.3)	15 (41.7)	36 (6)	9 (39.1)	14 (60.9)	23 (3.8)
Total	376 (62.7)	224 (37.3)	600 (100)	433 (72.2)	167 (27.8)	600 (100)

Table 2: Comparison of clinical dental status among rural and urban population

Variables	Rural	Urban (*n*)	*P*
CPI *n* (%)			
Healthy	51 (8.5)	92 (15.3)	0.001*
Bleeding	82 (13.7)	155 (25.8)	
Calculus	186 (31)	214 (35.7)	
4-5 mm pocket	130 (21.7)	91 (15.2)	
6-8 pocket	94 (15.7)	26 (4.3)	
Excluded sextant	57 (9.5)	22 (3.7)	
LOA *n* (%)			
0-3 mm	236 (39.3)	319 (53.2)	0.001*
4-5 mm	174 (29)	179 (29.8)	
6-8 mm	57 (9.5)	53 (8.8)	
9-11 mm	50 (8.3)	21 (3.5)	
≤12 mm	26 (4.3)	6 (1)	
Excluded sextant	57 (9.5)	22 (3.7)	
DT (mean±SD)	2.66±1.93	2.13±2.26	0.001*
MT (mean±SD)	2.07±5.99	1.22±4.56	0.006*
FT (mean±SD)	0.2±0.72	0.39±0.98	0.007*
DMFT (mean±SD)	5.1±6.34	3.72±4.99	0.002*
Prosthetic status *n* (%)			
No prosthesis	475 (79.2)	471 (78.5)	0.001*
Bridge	22 (3.7)	56 (9.3)	
More than one bridge	8 (1.3)	11 (1.8)	
Partial denture	40 (6.7)	22 (3.7)	
Both bridge and partial denture	24 (4)	20 (3.3)	
Full denture	31 (5.2)	20 (3.3)	

Test applied: Chi-square test, *t*-test, one-way ANOVA.*$P \leq 0.05$ statistically significant. LOA: Loss of attachment, CPI: Community periodontal index, SD: Standard deviation, DMFT: Decayed, missing or filled teeth, DT: Decayed teeth, MT: Missing teeth, FT: Filled teeth, ANOVA: Analysis of variance

Table 3: Internal consistency reliability of OHIP-14 domains among rural and urban population

OHIP-14 domains	Cronbanch's alpha	
	Rural	Urban
Functional limitation	0.53	0.54
Physical pain	0.66	0.61
Psychological discomfort	0.62	0.59
Physical disability	0.62	0.60
Psychological disability	0.54	0.56
Social handicap	0.57	0.61
Handicap	0.66	0.62
Total OHIP-14	0.85	0.89

OHIP-14: Oral health impact profile-14

and MT among rural and urban population. In multivariate analysis, OHIP-14 strongly significantly associated with the presence of DT among both rural (odds ratio [OR] =2.17) and urban (OR = 1.9) population.

Age and gender were significantly associated with physical pain and physical disability domains. Mean psychological discomfort score decreased significantly with age. Also, males had greater mean psychological disability (2.77 ± 1.18) (P = 0.001) score than females. Rural resident and study subjects with DT had greater mean physical pain (2.88 ± 2.65, 5.07 ± 2.38), physical disability (5.61 ± 1.27, 5.46 ± 1.59) and psychological disability (2.78 ± 1.26, 3.71 ± 1.28) score than their counter parts. Presence of MT was significantly associated with physical pain (5.97 ± 2.45) (P = 0.04), physical disability (5.88 ± 1.39) (P = 0.001) and handicap (3.79 ± 0.85) (P = 0.03) domains. Bivariate analysis results depicted a significance association of mean OHIP-14 score with age (P = 0.004), gender (P = 0.05), DT (P = 0.01), MT (P = 0.004), location (P = 0.001), toothache (P = 0.03), third molar problem (P = 0.04) and difficulty in chewing (P = 0.001). Significantly greater OR (OHIP-14) were revealed among males (OR = 1.35, P = 0.02), urban residents (OR = 1.13, P = 0.002), those <45 years of age (OR = 1.23, P = 0.01), those without DT (OR = 1.48, P = 0.002) and without MT (OR = 1.08, P = 0.03) [Tables 4 and 5].

Discussion

Quality of life is increasingly acknowledged as a valid, appropriate and significant indicator of service need and intervention outcomes in contemporary public health research and practice. Assessing the consequences of impaired oral health from the patient's perspective has emerged as an important research area. This has led to an increase in the use of patient-centered oral health status measures, primarily attempting to measure the impact of oral health on QoL.[16]

The present study was attempted to explore the relationship between clinical dental status and its impacts among rural and urban population of Udaipur, India. The execution of epidemiological studies and dissemination of data such as that of the present study seek to advocate that different strategies need to be planned for the improvement of oral health status of the population. To this extent, the findings of the present study provide the basis for the assessment of treatment needs and development of preventive dental health care strategies. Many of the QoL indicators in dentistry have focused primarily on older age groups, partly on the assumption that they would have had a lifetime's experience of oral ill health and thus are likely to perceive oral health as having a greater impact on their QoL.[17] Therefore, the present study had focused on the adult population (>20 years). In addition, the effect of location on OHRQoL was being assessed after adjusting for other variables.

A short OHIP version has emerged as a powerful instrument for the subjective assessment of OHRQoL. The OHIP-14, was developed by Slade in 1997[12] and validated for use in the adult population in England,[18] Scotland,[19] Shri Lanka[20] and China.[21] Studies have shown that OHIP-14 presents good psychometric properties when employed in more distinct populations.[12,22] Before using an OHRQoL measure in a new setting, it is necessary to re-establish its psychometric properties. Cronbach's alpha values from 0.5 to 0.7 (for both rural and urban population) are generally considered to indicate sufficient reliability for an instrument or scale to be used to make group comparisons; instruments or scales with coefficients above

Table 4: Association of OHIP-14 and its domains (mean±SD) with several independent variables among study subjects (*n*=1200)

Independent variables	Functional limitations	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social handicap	Handicap	Total OHIP-14
Age								
20-29	3.07±1.55	5.86±2.81	4.09±2.89	5.86±1.5	3.03±1.89	3.4±0.95	3.08±0.56	26.53±8.85
30-39	2.8±1.49	5.69±2.64	3.04±2.63	5.47±1.34	2.89±1.35	2.15±0.56	3.16±0.56	25.46±8.11
40-49	2.84±1.31	5.36±2.56	3.2±2.63	5.16±1.03	2.73±1.22	2.18±0.64	2.45±0.9	24.09±8.27
50-59	2.67±1.3	4.97±2.63	3.22±2.87	4.62±1.93	2.74±1.12	2.22±0.71	2.48±0.94	24.68±8.55
60-69	2.68±1.28	4.48±2.46	3.04±2.16	4.44±1.11	2.69±1.25	2.21±0.66	2.62±0.64	24.45±8.27
70-79	2.01±1.05	3.69±2.52	2.98±2.72	3.16±1.07	1.53±1.95	2.15±0.58	2.41±0.79	24.37±8.2
P	0.42	0.001*	0.006*	0.03*	0.89	0.61	0.44	0.004*
Gender								
Male	2.86±1.37	5.89±2.72	3.3±2.14	5.78±1.04	2.77±1.18	2.54±0.69	2.39±0.84	26.26±8.21
Female	2.62±1.49	5.17±2.5	3.1±2.32	5.4±1.4	2.62±1.14	2.24±0.75	2.25±0.75	25.88±8.07
P	0.08	0.002*	0.51	0.02*	0.03*	0.89	0.7	0.05*
SES								
Low	2.74±1.49	5.83±2.49	3.37±2.19	5.34±1.4	2.59±1.05	2.21±0.66	2.22±0.19	25.05±8.63
Medium	2.78±1.44	5.89±2.6	3.4±2.35	5.47±1.23	2.6±1.6	2.33±0.49	2.31±0.77	26.4±8.8
High	2.77±1.46	5.73±2.63	3.28±2.14	5.4±1.11	2.46±1.25	2.29±0.88	2.24±0.79	26.67±8.47
P	0.92	0.70	0.73	0.16	0.22	0.32	0.33	0.12
CPI								
Healthy	2.73±1.4	5.71±2.18	3.3±2.39	5.51±1.37	2.68±1.19	2.27±0.08	2.25±0.7	25.26±8.78
Unhealthy	2.77±1.46	5.85±2.58	3.37±2.24	5.85±1.49	2.87±1.5	2.34±0.73	2.3±0.79	25.87±8.99
P	0.77	0.95	0.72	0.62	0.91	0.66	0.46	0.07
LOA								
Absent	2.84±1.51	5.79±2.56	3.5±2.4	5.44±1.36	2.69±1.16	2.3±0.83	2.29±0.8	25.22±8.79
Present	2.71±1.41	5.88±2.6	3.24±2.12	5.47±1.23	2.66±1.15	2.18±0.62	2.3±0.76	25.9±8.91
P	0.11	0.56	0.04	0.78	0.63	0.54	0.81	0.63
DT								
Absent	2.76±1.42	4.49±2.12	3.34±2.03	4.45±1.41	2.78±1.12	2.23±0.57	2.31±0.84	25.1±8.45
Present	2.78±1.47	5.07±2.38	3.4±2.31	5.46±1.59	3.71±1.28	2.35±0.11	2.69±0.74	26.6±8.87
P	0.84	0.001*	0.33	0.004*	0.01*	0.43	0.65	0.01*
MT								
Absent	2.68±1.39	5.25±2.17	3.42±1.96	5.24±1.27	2.62±1.09	2.23±0.73	2.12±0.55	24.55±6.01
Present	2.91±1.54	5.97±2.45	3.76±2.63	5.88±1.39	2.75±1.24	2.25±0.74	3.79±0.85	26.01±8.49
P	0.66	0.04*	0.23	0.001*	0.08	0.72	0.03*	0.004*
FT								
Absent	2.77±1.46	5.88±2.58	3.4±2.29	5.46±1.25	2.7±1.17	2.25±0.76	2.32±0.82	26.33±8.3
Present	2.76±1.45	5.6±2.51	3.21±2.1	5.44±1.49	2.52±1.03	2.18±0.58	2.17±0.56	24.06±8.96
P	0.9	0.15	0.25	0.82	0.22	0.15	0.19	0.73
Prosthetic status								
Absent	2.79±1.52	5.85±2.48	3.6±2.34	5.66±1.27	2.75±1.25	2.27±0.78	2.45±0.52	26.55±7.9
Present	2.76±1.44	5.65±2.05	3.54±2.18	5.4±1.3	2.65±1.13	2.23±0.72	2.31±0.8	25.92±8.87
P	0.81	0.35	0.42	0.65	0.21	0.41	0.44	0.47
Location								
Rural	2.8±1.51	5.88±2.65	3.48±2.28	5.61±1.27	2.78±1.26	2.39±0.89	2.49±0.79	25.6±8.96
Urban	2.67±1.4	5.41±2.3	3.25±2.23	5.2±1.31	2.46±1.03	2.3±0.7	2.19±0.66	24.03±7.06
P	0.5	0.001*	0.06	0.001*	0.001*	0.97	0.47	0.001*
Total	2.77±1.45	5.84±2.58	3.36±2.26	5.46±1.3	2.67±1.15	2.24±0.73	2.3±0.78	26.03±8.06

Test applied: *t*-test, one way ANOVA. *$P \leq 0.05$ statistically significant. OHIP-14: Oral health impact profile-14, SD: Standard deviation, LOA: Loss of attachment, CPI: Community periodontal index, SES: Socioeconomic status, DT: Decayed teeth, MT: Missing teeth, FT: Filled teeth, ANOVA: Analysis of variance

0.85 are considered reliable enough for individual patient comparisons according to McDowell and Newell.[23] The results showed that the OHIP-14 was reliable for the present study population with an alpha value of 0.85 for the rural population and 0.89 for the urban population.

The analysis of the demographic characteristics of the studied population revealed that the majority of the rural population was male adults (40–49 years) and from middle SES (prasad scale). The finding corresponds to the finding of Lawrence *et al.* among New Zealand population.[24] In the

Table 5: Multivariate logistic regression considering association between the dependent variable (OHIP-14) and independent variables among study population (*n*=1200)

	Adjusted OR	*P*	95% CI
Age			
<45 years/>45 years	1.23	0.01*	0.94-1.61
Sex			
Male/Female	1.35	0.02*	1.04-1.74
Location			
Urban/rural	1.13	0.002*	0.41-2.71
Decayed teeth			
Absent/Present	1.48	0.002*	1.15-1.89
Missing teeth			
Absent/Present	1.08	0.03*	0.84-1.39

*$P \leq 0.05$ statistically significant. Nagelkerke $R^2=0.284$. OHIP-14: Oral health impact profile-14, OR: Odds ratio, CI: Confidence interval

urban population, most participants were 20–29 years old, probably reflecting the large proportion of young individuals in the Udaipur population or the possibility that most escorts were young. Acharya also showed that nearly half of the respondents were below 35 years of age.[25]

The present study showed that 82.1% of the rural population and 81% of urban population suffered from various forms of periodontal disease as assessed by CPI. Majority of the rural (31.5%) and urban (37.5%) participates suffered from calculus. The prevalence in a rural area is consistent with the findings of the study conducted by Kumar *et al.* on Bhil tribe in Rajasthan,[26] and by Kumar *et al.* on rural population in Haryana.[27] In addition to these, calculus prevalence among rural and urban subjects in the present study was comparable to those of Malaysian and Turkey adults.[28,29] Also, prevalence of deep pockets in the present study (rural = 15.7%, urban = 4.3%) coincides approximately with the previous study (rural = 17.19%, urban = 4.95%) conducted by Kamath *et al.* among Karnataka population.[30] An approximating frequency of attachment loss with the earlier study was observed in the present study sample.[31,32]

Age-related increase in periodontal disease (CPI and loss of attachment) achieved in the present study is in agreement with the general trend observed in the majority of the studies.[26,31,32] The strong association between age and periodontal destruction is mostly due to the effect of age as a surrogate for the length of exposure to etiologic factors.

In the present study, the prevalence of periodontal disease was higher in the low-income than in the high-income category. Difference in the prevalence of periodontal disease according to SES was also observed in other studies.[33] However, some studies have shown a weak association between SES and periodontitis after adjustment for oral hygiene and smoking.[34,35] The association between SES and periodontal disease (CPI and loss of attachment) may be attributed to the difficulty in affording dental treatment and oral hygiene aids among low SES category.

The mean DMFT per person among rural subjects in the present study was found to be 5.1 ± 6.34 which is comparable to the mean score obtained by Varenne *et al.* among African rural adults population (4.5 ± 5.11).[36] Urban subjects experience mean DMFT of 3.72 ± 4.99 in the present study that corroborates with the findings of Petersen and Razanamihaja among urban Madagascar adults population (3.6 ± 2.34).[37]

In present study, rural population demonstrated males with greater mean number of decayed and MT than females. Mean DT, MT and DMFT scores augmented with increasing age among the rural population. Similar observations had been made in previous studies in Northern India in rural Punjab and rural Karnataka.[38,39] The probable reason might be inappropriate use of oral hygiene aids, high preponderance of cervical caries and xerostomia due to dehydration, salivary hypofunction, radiation therapy and increased use of xerostomic drugs (in case of poorly controlled diabetes, Sjogren's syndrome). Xerostomia is also a common side effect of various medications including some antidepressants, amphetamines, and antihistamines. Xerostomia can result in the dramatic rise in the number of cavities, as the protective effect of saliva is no longer present and can make the mucosa and periodontal tissue vulnerable to infection. Rural residents in the present study also depicted a greater mean FT among middle age groups and thereafter diminishing in older age groups. This finding is comparable to the results obtained by Lin *et al.*, among Chinese adult population.[40] This might be because of false belief of extraction rather than restoration in rural elderly. Higher mean FT established in high SES among present rural residents is in agreement with a previous study.[41]

Prosthetic status (20.4% in rural and 21.4% in urban) of the present study population was higher as compared to the findings of Chandra Shekar and Reddy.[42] Factor determining prosthetic status may be attitude and awareness toward dental care and the cost of dental treatment. The most prevalent prosthesis among urban subjects was evidenced to be a bridge (9.3%) which was higher as compared to the prevalence obtained by Al-Ghannam *et al.*[43] Rural subjects in the present study demonstrated a prevalence of 6.7% subjects with partial denture when which was lower than Saudi Arabian rural (8.6%) population.[43] Rural females depicted greater prevalence of prosthetic status as compared to males in the present study that in agreement with the previous study.[44] Consistent with the findings of previous study,[45] a significant increase in prevalence of prosthetic status was observed with increasing age among rural and urban subjects.

Present study elicited worse periodontal health among the rural population than among their urban counterparts. This finding correlates with the findings observed by Rao *et al.* (1993) among Indian population.[46] In addition, the mean DT, MT and DMFT in rural subjects were also higher than in the urban subjects in the present study that corroborates with the previous studies.[47,48] The prevalence of prosthetic status in the present study was observed to be higher among the urban population.[43] The increased dental disease among rural population then among urban population might have been due to difference in lifestyle between the two groups and exposure of certain risk factors such as smoking, chewing

tobacco and use of indigenous oral hygiene methods for cleaning teeth. Also, lack of oral hygiene awareness among the rural population might have contributed to the increased risk of dental diseases among them.[49] The better oral health among urban residents may also be because of the more number of dentists serving in urban areas. Majority of the hospitals and teaching institutions (dental colleges) are also located in urban areas. Dental schools organize oral health check-up camps in rural areas and also inform/motivate people regarding prevention and treatment of existing dental diseases, but it is little difficult for them to get benefit of the facilities available in dental colleges located in nearby towns/city, because of some practical reasons like conveyance.[31] Additionally, higher mean FT observed among urban residents then among rural residents in the present study was similar to Shah and Sundaram's conclusion, indicating lack of awareness and motivation for good oral health among rural subjects.[50] In addition, most of the individuals in rural areas prefer extractions rather than restorations.

Based on the responses obtained for OHIP-14 in the present study, majority of urban and rural populations had problems of physical pain and physical disability during the last year which is comparable to the findings of Acharya among Indian population[25] and Ulinski *et al*. among Brazilian population.[31]

The present study revealed a diminishing impact of increasing age on OHIP-14 among rural and urban populations that is in conformity with the findings of McGrath and Bedi among UK adult population.[51] The study by Steele *et al*., with national representative samples from Australia and the UK, also reported less impact on the elderly when the co-variable keys were controlled.[52]

The present study depicted no impact of periodontal disease on OHIP-14 that is in conformity with the results obtained by Needleman *et al*.[53] However, this diverges from the findings of Ng and Leung,[16] where significant impact was observed. Disease does not always negatively affect subjective perceptions of well-being, and when it does; its impact is influenced by the nature of the disease as well as the expectation, preferences and financial, social and psychological resources.[54]

In the present study domains of physical pain, physical disability, and psychological discomfort were associated oral disadvantages but Chavers *et al*. have shown that pain and functional limitation were strong predictors. The difference in the findings might be because of the difference in study populations.[55] Chavers *et al*. conducted the study on edentulous subjects and hence functional limitation might have been due to MT.[55]

Silva *et al*. suggested that, although the absence of teeth and the use of prosthesis do not interfere in daily activities or social relations, these conditions result in impacts on some of the OHIP dimensions, such as psychological discomfort, physical pain, and disability.[56] No association with prosthetic status with OHRQoL among rural and urban subjects in the present study may be because they might be satisfied or adapted with their prosthesis.

In our study, rural residents depicted a poorer OHRQoL than urban residents which is supported by the argument given by, Chavers *et al*. that rural people have much less access to health services, which would lead to the late search for treatment, due to pain.[55] Few studies tested the residential area, regardless of it being located in a rural or urban area as a source of the possible association with perception of OHRQoL impacts.[57-59]

In the present study, we found that males having a greater impact on their QoL than females, a finding that disagrees with previous authors.[24] In addition, male who were defined as cases of greater oral disease had a threefold greater risk of frequent oral impacts than females. Gender differences in OHRQoL cannot be solely explained by poor oral health status; to further understand differences in OHRQoL between men and women, the different life course influences for each sex must be considered.[60] There was no association found between OHRQoL and SES. The finding corresponds to the finding of Sousa *et al*. among Brazilian population.[61] This issue could be linked principally to the fact that the sample was not different socioeconomically although there were situated from a different location.

Some of the possible limitations of this study were that a convenience sample of dental patients was used and it was possible that dental patients would perceive an impact of their oral health on their QoL compared with a nonpatient. Another possible limitation would be the response and social desirability bias. This may be one of the reasons for a high percentage of respondents scoring one for most of the OHIP-14 items.

The impact of health on the QoL has received increased attention in both medicine and dentistry. McGrath *et al*. claimed that positive and negative health states and experiences are distinct, in that "the absence of a negative does not necessarily imply a positive and a positive state can coexist with a negative state."[62] The QHRQoL-UK attempts to asses both positive and negative effects of oral health, while the OHIP-14 assesses only negative effects of oral health.[63] So this is a limitation for OHIP-14 in capturing the global conception of health and well-being. Till the present years, so many studies had investigated the relationship between oral condition and their impact on people's lives. Various instruments were developed in an attempt to understand and assess how the oral problems have affected the daily lives of people. Kushnir *et al*. mentioned that oral health status was closely associated with QoL, and that a problem in oral health might seriously decrease a patient's QoL.[64] On the other hand, Gregory *et al*. mentioned that QoL could be variable, according to patient perceptions.[65] Therefore, the associations between QoL and clinical status can be weak or nonexistent. In the present study, investigators tried to handle the issue from the patient's perspective, and we used each patient's first complaint that made them to come to our hospital. Investigators determined the nature of their complaints and then observed if there was an association between these complaints and their OHRQoL.

The present study showed there is the relationship of OHRQoL with dental caries. These findings have significant implications for employment of patients centered outcome measures as objective clinical parameters of dental diseases in assessment, planning and provision of treatment, and subsequent evolution of care. Future, longitudinal studies are needed to better understands and interprets OHRQoL measures and to assess whether the measure of OHRQoL as a patients cantered outcome is sensitive to change in clinical dental status over time and also at the level of individual.

The results exhibited a comprehensive assessment of oral health and perceived oral impacts in the sample of Udaipur population. The OHIP-14 showed acceptable psychometric properties and is considered a valid, reliable and practical inventory for use among rural and urban adults of Udaipur city, Rajasthan, India. The rural and urban study subjects had a fair clinical status. The presence of dental caries had greatest impacts on OHRQoL. In addition, rural subjects faced greater impact than urban subjects.

As oral health often appears to be a low priority issue for Government and health policy makers, oral health care professionals should be at the forefront advocating for resource mobilization to improve access to appropriate oral health care for rural population. So, further research emphasizing the need and method for incorporation of OHRQoL in treatment need estimation system involving larger sample representative of general population, by targeting different age groups and utilizing different scales of OHRQoL should be conducted. This will help in planning services and for assessing outcomes in future effectiveness trials of dental treatments from patient's perspectives.

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