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Patients' satisfaction and quality of life after dental implant rehabilitation: A cross-sectional study

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Abstract

Perceiving patients' satisfaction and improving patients' quality of life is a challenging task. This study aimed to assess the patient's quality of life and satisfaction after receiving a dental implant rehabilitation. All patients with dental implant placed between 2015 and 2019 were included. A self-administered questionnaire consisted of a demographic, patient satisfaction assessment, and the short version of the Malaysian Oral Health Impact Profile, S-OHIP (M) questionnaire. The patients indicated their rate on a 5-point Likert scale from 0 to 4. Statistical analyses were made using the SPSS version 26, statistical significance was considered for p<0.05. A total of 58 patients with 91 implants completed the questionnaire were included. In general, the majority of participants 56 (96.6%) were satisfied with the dental implant mainly with the speech function and maintenance procedure. The Cronbach's Alpha coefficient for the nine items of satisfaction was 0.798. The mean OHIP-14 score was 2.1 (SD: 3.11; range from 0 to 12) with the highest score for psychological discomfort (mean: 0.92, SD: 1.35) and the lowest score for psychological disability (mean: 0.00, SD: 0.00). All domains of OHIP-14 had Coefficient of Variance, CV > 1 (ranged from 1.47 to 8.77) which considered being high variance. Overall, all participants had OHIP-14 scores ranging from 0 to 12 which can be considered a low score that indicated higher Oral Health-Related Quality of Life (OHRQoL). The correlation between patient satisfaction and quality of life is significant (P<0.05).

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Introduction

The term "oral health-related quality of life" or OHRQoL refers to a multidimensional concept that includes biopsychosocial components of oral health (Locker & Allen, 2007) and is based on the World Health Organization definition that considers health as the state of complete physical, mental and social well-being. Most researchers defined OHRQoL as the individual's perception of orofacial disorders and dental treatments (John, 2021).

The Oral Health Impact Profile (OHIP) is one of the most extensively used methods for measuring OHRQoL. Slade and Spencer (1994) established the OHIP with 49 items (OHIP-49) derived from remarks acquired in interviews with dental patients. These questions were distributed based on seven variables derived from Locker's theoretical model which consists of functional limitation, physical pain, psychological

discomfort, physical disability, psychological disability, social disability, and handicap (Locker, 1998a). Based on the same variables, Slade (1997) produced a 14-question short form called OHIP-14, which demonstrated strong reliability, validity, and accuracy.

Improving the quality of life is a significant treatment goal for implant-supported prostheses, and patient satisfaction should be recognized as a critical component of treatment quality and therapeutic success (Wang *et al.,* 2021). With the growing popularity of dental implant awareness, patients are more likely to understand and accept the drawbacks of implant therapy. However, since patient education was still limited (Kohli *et al.*, 2015), it was difficult to balance patients' expectations with dentists' evaluations of prosthesis function. In general, the implant therapy approach also prioritized implant preservation and peri-implantitis prevention, nevertheless, patients were more likely to emphasize comfort and aesthetics (Jayasinghe *et al.,* 2017).

Hence, it has been suggested that the impact of implant treatment outcome should be additionally evaluated by the treatment in terms of patients' satisfaction (Zarb & Albrektsson, 1998). Professionals' inability to accommodate patients' expectations might lead to oral rehabilitation failure and result in common psychosocial responses such as anxiety, insecurity, low self-esteem, and introversion. (Cibirka *et al.,* 1997). The evaluation of dental implants considers a variety of factors, including aesthetics, comfort, usefulness, longevity, hygiene, presentation, and psychological satisfaction (Dong *et al.,* 2019).

Analysis regarding patients' satisfaction and quality of life after dental implant rehabilitation was rarely reported (Lang & Zitzmann, 2012). Only one pilot study concerning patient-reported outcomes is available in Malaysia with 95.2% of subjects satisfied with its function (Alam *et al.,* 2015). Meanwhile, no research has been carried out to measure patients' quality of life and satisfaction with dental implants placed in the Periodontal Specialist Clinic, Mak Mandin in Seberang Perai Utara, Pulau Pinang. Therefore, the objective of this research is to assess the quality of life and satisfaction level following dental implant treatment among patients in Periodontal Specialist Clinic, Mak Mandin by evaluating their OHRQoL using OHIP-14.

Materials and Methods

This cross-sectional study was performed in accordance with the Declaration of Helsinki 1975, as revised in 2013, registered with the National Medical Research Register (NMRR-20-2750-57068) and approved by the National Institutes of Health (NIH) and Medical Research and Ethics Committee (MREC). All patients were informed about possible risks and benefit as well as the procedures of the study and all gave written informed consent. All participants were given sufficient time for consideration of their participation in this study.

Populations/ patients selection

All invited patients were treated in a government dental clinic (Periodontal Specialist Clinic, Mak Mandin, Seberang Perai Utara Pulau Pinang) with at least one dental implant rehabilitation within the years 2015 to 2019. Ninety-one dental implants with 17 placed in the anterior region and 74 placed in the posterior region were included. All patients had to fulfill the following criteria:

Inclusion:
- Adult patients at age 18 years old and above.
- Received and completed dental implant/s treatment a year prior to inclusion.
- Received at least a single Straumann® dental implant.
- Voluntary consent was given to participate in the study.
- Completed questionnaires.

Exclusion:
- Non-Malaysian citizen.

- Ongoing dental implant treatment or had placed dental implant/s less than one year.
- Uncontrolled systemic conditions

Intervention

The use of questionnaire was designed in Malay and English and contained 3 parts which included:

1. Demographic

Demographics data related such as age, gender, race, educational level, medical status, and smoking status.

2. Patient satisfaction

Patients answered nine questions adopted from Kim *et al*. (2014) and Pommer *et al.* (2011) regarding their satisfaction with chewing function, speech function, implant comfort, cleanability, appearance or aesthetic, surgical placement procedure, maintenance procedure, cost, and general use of a five-point Likert scale: completely unsatisfied, unsatisfied, uncertain, satisfied and completely satisfied.

3. Oral health impact profile (OHIP)

The last part consisted of patients' oral health-related quality of life assessment regarding their dental implants. The question was designed according to the short version of the Malaysian Oral Health Impact Profile, S-OHIP(M) (Saub *et al.,* 2005). The assessment was carried out in terms of function, appearance, physical and psychological comfort, and social ability. Patients were asked about the frequency of complaints during the last few months using a five-point Likert scale: never, rare, occasional, often, and very often. A total of 14 OHRQoL-factors were rated on a scale of 0–4 (0 = "never", 1 = "rarely", 2 = "occasionally", 3 = "often", 4 = "very often"). There was no weighting of every single factor (Allen & Locker, 1997). The OHIP summary score was calculated as the sum of the 14 sub-scores (range 0–56) and characterized impairment.

A higher OHIP score indicates a poorer OHRQoL. If more than five questions in total, two questions in a subgroup, or one of the three questions on problems specific to patients with prostheses were not answered, the patient was excluded.

Outcomes

The primary outcomes of this study were the level of satisfaction and quality of life among patients who received dental implant rehabilitation while the secondary outcome of this present study was the correlation between satisfaction and quality of life.

Analysis

Data were imported into the Microsoft Excel Spreadsheet Software. For statistical analysis, the IBM SPSS data editor version 26.0 (IBM, Armonk, New York, USA) software was used. Descriptive analysis was conducted using mean, standard deviation, median, minimum, and maximum for continuous data. For categorical data, percentages were given. A P-value less than 0.05 was considered statistically significant.

Results

Demographic

Fifty-eight (58) out of seventy-three (73) patients were enrolled in this study, with a total number of 91 implants installed. In these analyses, 38 patients (65.5%) were females. The reasons for the exclusion of fifteen (15) patients are given in Figure 1.

All enrolled patients graduated at least from secondary school with 74.1% being college/university graduates. At the time of intervention, 5.2% of the patients were smokers and 5.2% were former smokers with the remaining were non-smokers (n=52, 89.7%).
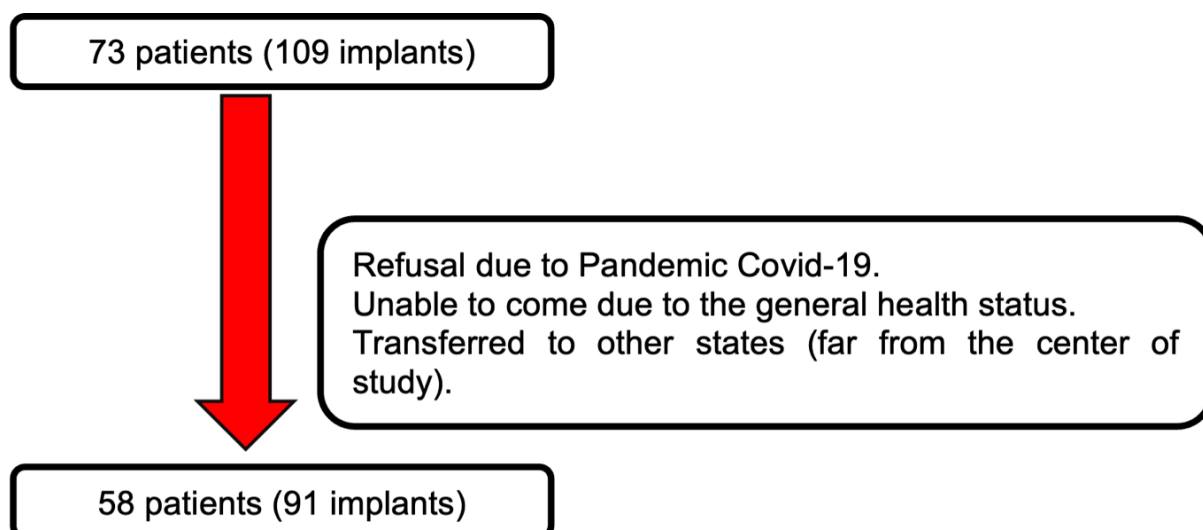
Figure 1. Recruitment of patients.

Patients were aged 28–75 years (mean 51.78 years, SD ± 10.115 years). Follow-up time was 1-6 years (mean 3.64 years, SD ± 1.465 years) after implant placement. The patients received one to nine implants (mean 1.57, SD ± 1.186) (Table 1). No patient received implant-supported dentures, while 63.7% were restored with fixed single crowns, and 36.3% were restored with bridges.

Table 1. Patients' characteristic.

Total 58 patients / 91 implants	Number (percentage)	Mean (SD)
Gender		
Male	20 (34.5%)	
Female	**38 (65.5%)**	
Race		
Malay	15 (25.9%)	
Chinese	**40 (69.0%)**	
Indian	3 (5.2%)	
Age (years)		
20 to 29	1 (1.7%)	51.78 ± 10.115
30 to 39	8 (13.8%)	
40 to 49	14 (24.1%)	
50 to 59	**22 (37.9%)**	
60 to 69	12 (20.7%)	
70 and above	1 (1.7%)	
Education level		
No formal education	0 (0%)	

Primary school	0 (0%)	
Secondary school	15 (25.9%)	
College/ University	**43 (74.1%)**	
Medical condition		
No known medical illness	**36 (62.1%)**	
Medical illness	22 (37.9%)	
Smoking status		
Non-smoker	**52 (89.7%)**	
Smoker	3 (5.2%)	
Former smoker	3 (5.2%)	
Implants live (year)		
1	10 (11%)	3.64 ± 1.465
2	13 (14.3%)	
3	14 (15.4%)	
4	23 (25.3%)	
5	**25 (27.5%)**	
6	6 (6.6%)	
Number of implants		
1	**37 (63.79%)**	1.57 ± 1.186
2	15 (25.86%)	
3	5 (8.62%)	
9	1 (1.72%)	
Prosthesis		
Single crown	**58 (63.7%)**	
Bridge	33 (36.3%)	
Implant-supported denture	0 (0%)	

SD: Standard Deviation

Patients' satisfaction

The answers for all 9 questions regarding the satisfaction of the 58 evaluable questionnaires are summarized in Figure 2. Half (29) of them gave a total satisfaction level of the dental implant in each item.

- **General satisfaction:** 89.7% of all patients were completely satisfied with their implant therapy. Only 6.9%

responded with satisfied and 3.4% were uncertain.

- **Cost:** 87.9% of the patients were satisfied with the cost of implant rehabilitation, and only 12.1% responded as less satisfied with the overall cost of the dental implant.

- **Maintenance procedure:** 87.9% of the patients were very satisfied with the maintenance of the implant-supported

restoration, and 12.1% responded and rated themselves as satisfied.

- **Surgical placement procedure:** 86.2% of the patients were completely satisfied with the surgical placement procedure, 10.3% responded to be mostly satisfied, and 3.4% of patients were less satisfied with the surgical procedure.

- **Aesthetics/appearance:** 77.6% of the patients were completely satisfied with the aesthetics of the implant-supported restoration, 15.5% responded were satisfied, and 6.9% of patients were uncertain about the aesthetics.

- **Cleansibility:** 96.6% of the patients had no problems with the cleanability of their restoration. Only two patients (3.4%) perceived the cleanability to be inferior.

- **Implant comfort:** 82.8% of patients answered completely satisfied.

- **Speech function:** 93.1% of patients were completely satisfied with their speech function, and 6.9% of patients responded as satisfied.

- **Chewing function:** 75.9% of the patients were completely satisfied with their implant chewing function.

The Cronbach's Alpha coefficient for the nine items of satisfaction was 0.798. All satisfaction items had a low and acceptable coefficient of variance (CV) of distribution (CV<0.3). Satisfaction of speech function and maintenance procedure recorded a very good coefficient of variance (CV<0.1).
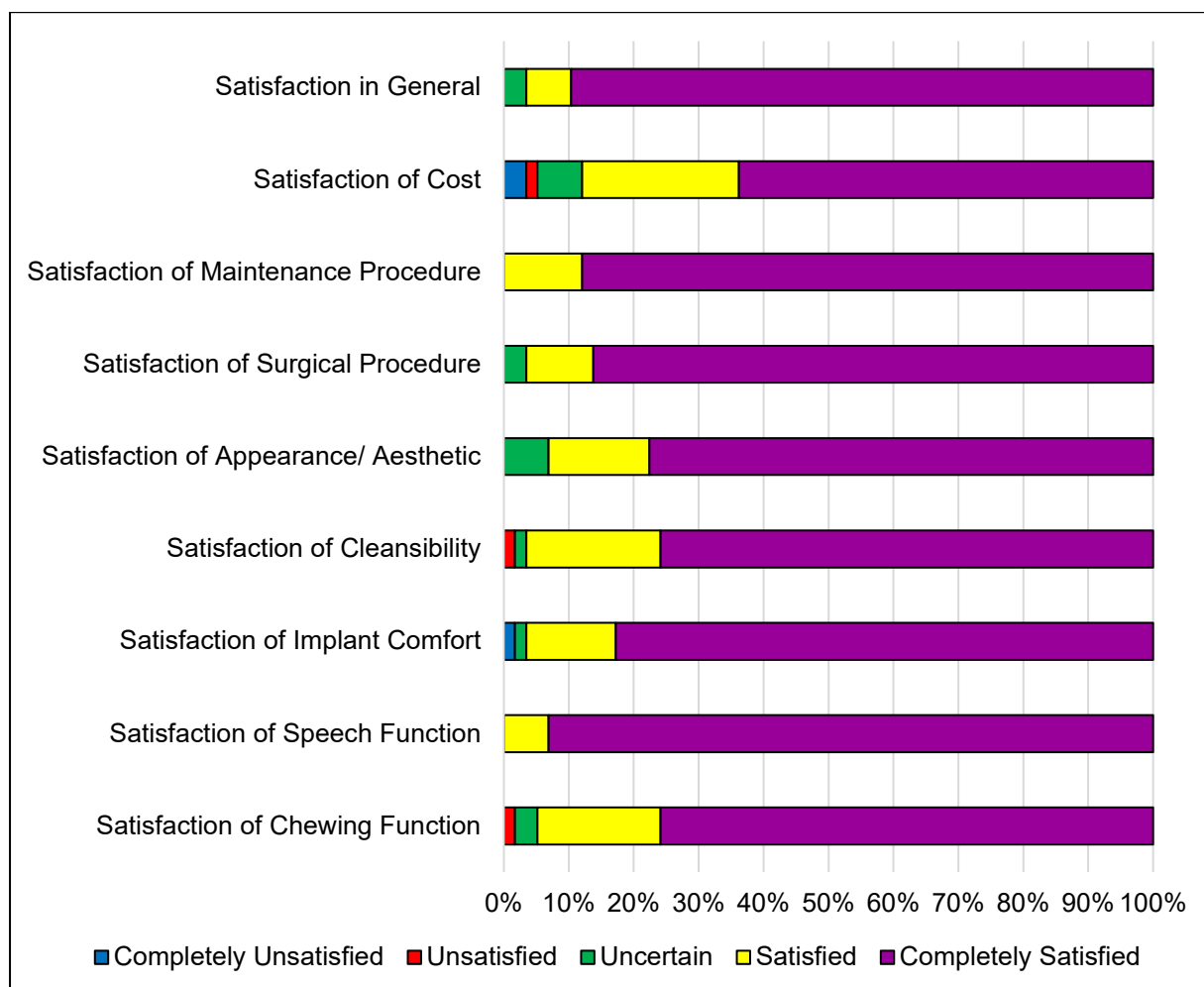

Figure 2. Patients' satisfaction answered in ordinal categories.

Table 2. Analysis of distribution in the level of satisfaction

Item/ domain	Mean	SD	CV
Satisfaction of patients			
General	3.86	0.437	0.11
Cost	3.43	0.957	0.28
Maintenance Procedure	3.88	0.329	**0.08**
Surgical Placement Procedure	3.83	0.464	0.12
Appearance/ Aesthetic	3.71	0.593	0.16
Cleansibility	3.71	0.593	0.16
Implant Comfort	3.76	0.657	0.17
Speech Function	3.93	0.256	**0.07**
Chewing Function	3.69	0.627	0.17
Cronbach's Alpha coefficient			
Items/ domains		0.798	

Oral-Health Impact Profile-14 (OHIP-14)

The answers for all 14 questions of the 58 evaluable questionnaires are summarized in Figure 3. The mean OHIP-14 score was 2.1 (SD: 3.11; median:1, range from 0 to 12) with the highest score for psychological discomfort (mean: 0.92, SD: 1.35) and the lowest score for psychological disability (mean: 0.00, SD: 0.00).

All domains had CV > 1 (ranging from 1.47 to 8.77). The Cronbach's Alpha coefficient for the domains and sub-domains of OHIP-14 was 0.634 and 0.610 respectively.

Twenty-eight (28) patients (48.3%) experienced no impairment of OHRQoL of the dental implant in the last few months, thus exhibiting the best possible OHIP score of zero. Nine (15.5%) of them avoided eating certain food due to the implant. Twenty-five (43.1%) of them felt discomfort due to food getting stuck in between the implant. Only five (8.6%) of the participants had trouble chewing food because of the implant.

Correlation between satisfaction and OHIP-14

Statistical analysis showed a statistically significant correlation between general satisfaction and total S-OHIP-14 score (p-value = 0.047). There was noted a statistically significant correlation between total satisfaction and total S-OHIP-14 score (p-value = 0.028).

Discussion

This study evaluated the effect of dental implant rehabilitation on OHRQoL and satisfaction. It was shown that implant treatment had a beneficial effect on OHRQoL and patient satisfaction with regard to dental appearance, function, and comfort.

A low impact was observed for almost all the items included in the OHIP questionnaire with 74.1-100% of responses ranging from "Never" to "Rare" with no significant differences between groups. A higher impact was only observed for the item "food stuck discomfort". There was no significant correlation between the item "food stuck

discomfort" and the types of prosthesis (single crown and linked crown or bridge) or location of the implant (anterior, premolar, and molar) with a p-value more than 0.05. Whereas the average satisfaction level of all the items was very high which was between 87.9% to 100% with the main drawback being satisfaction regarding the cost of the therapy. To summarize, these results indicate profound patient satisfaction.

Table 3. Analysis of OHIP-14.

| Domain/ Subdomain	Mean (SD)	CV
Functional limitation	0.22 (0.75)	3.41
Chewing difficulty	0.17 (0.653)	
Bad breath	0.05(0.223)	
Physical pain	0.21 (0.669)	3.19
Eating Discomfort	0.16 (0.556)	
Ulcers	0.05 (0.292)	
Psychological discomfort	**0.92 (1.35)**	**1.47**
Food Stuck Discomfort	0.93 (1.323)	
Felt Shy	0.03 (0.184)	
Physical disability	0.55 (1.202)	2.19
Avoid Certain Food	0.55 (1.202	
Avoid Smiling	0.00 (0.00)	
Psychological disability	**0.00 (0.00)**	-
Disturb Sleep	0.00 (0.00)	
Disturb Concentration	0.00 (0.00)	
Social disability	0.03 (0.263)	**8.77**
Avoid Going Out	0.00 (0.00)	
A problem in Daily Activities	0.03 (0.263)	
Handicap	0.12 (0.462)	3.85
Spend Money due to Implant Problem	0.10 (0.447)	
Felt Less Confident	0.02 (0.131)	
Total score	**2.1 (3.11)**	1.48
Cronbach's Alpha coefficient		
Domains	**0.634**	
Subdomains	**0.610**	
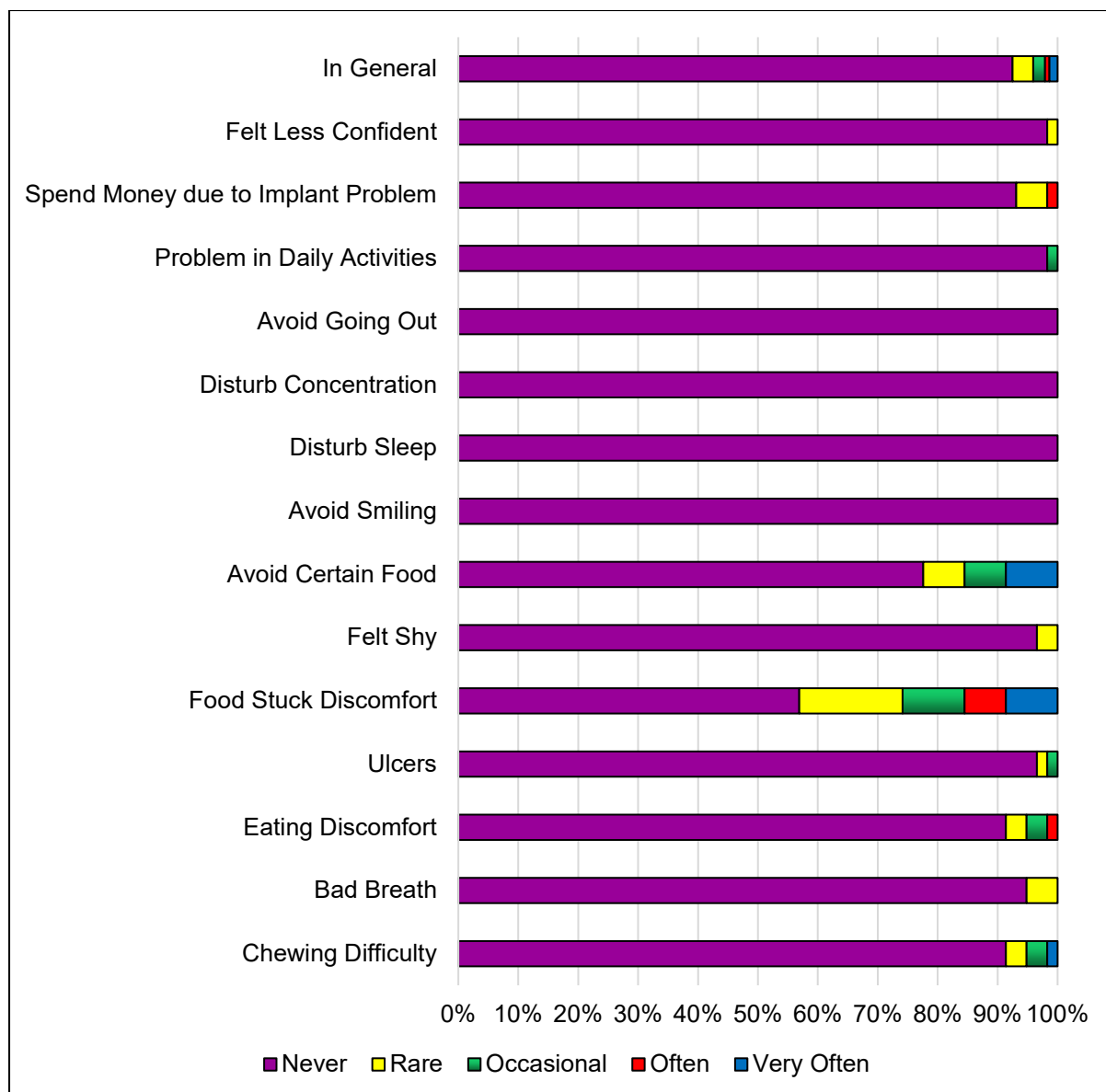
Figure 3. OHIP-14 answer in ordinal categories.

A new current study of 26 participants reported that the total OHIP-14 score was low (7.87) for dental implants after 2 years of placement (Sanz *et al.,* 2022). Another study showed that the mean OHIP score was 11.3 after 10 years of dental implant placement among 95 participants (Wang *et al., 20*21). These reports are concomitant with the present study which showed a low S-OHIP-14 score. All the participants in this study had lower OHIP-14 scores indicating higher Oral Health-Related Quality of Life (OHRQoL).

A study with small samples indicated that 20 out of 21 (95.2%) participants with posterior dental implants were satisfied with the implant function and stability (Alam *et al.,* 2015). However, there was no timing of the intervention or changes in satisfaction over a certain period of time following implant installation reported in this study. This study concluded that the satisfaction of implant patients was high, which was in relation to the successful clinical success criteria and surface electromyography (sEMG) findings. The majority of participants in this present study demonstrated high satisfaction with dental implant rehabilitation. These results might have been influenced by the fact that treatments were performed by specialists.

According to Cronbach's Alpha coefficient, this present study had acceptable internal (inter-items) consistency (reliability) within the group of domains and sub-domains of S-OHIP-14 and had good and acceptable internal consistency within the nine items of satisfaction. It is mean how closely related a set of items are as a group (Ursachi *et al.,* 2015).

In regard to dental patient satisfaction, there was no standard questionnaire available (Yao *et al.,* 2018). In this study, patient satisfaction was evaluated through nine specific questions, regarding function, aesthetics, comfort, procedures, cost, cleanability, and general. Literally, previous studies have shown that these items influence patients´ decisions (Azarpazhooh *et al.,* 2016).

There are some limitations in the present study even after strict inclusion and exclusion criteria. Firstly, subjects with systemic diseases such as renal and hepatic disease, AIDS, diabetes mellitus, and CVD were not sought in this study. A recent systematic review showed that prediabetes and poorly controlled diabetes mellitus suffer more often from peri-implantitis, especially in the post-implantation time (Wagner *et al.,* 2022). A study by French *et al.* (2021) indicated an over two times higher risk for dental implant failure in patients with diabetes mellitus. Moreover, these patients show higher implant loss rates than healthy individuals in the long term (Wagner *et al.,* 2022). According to Kanjevac *et al.* (2018), complications in bone mineral metabolism are occasionally in patients with kidney diseases compared with individuals without kidney-related disorders. Likewise, crestal bone loss around dental implants has been reported among patients with AIDS, cardiovascular diseases, and liver diseases (May *et al.,* 2016; Yoon *et al.,* 2016; Ting *et al.,* 2018).

Different implant systems may have different types of implant surface & abutment connections that may affect different outcomes/implant success/survival. In a long clinical study, the authors concluded that the roughest titanium plasma-sprayed surface demonstrated the highest probability for failure, while the anodized showed the lowest probability (Wennerberg *et al.,* 2018). However, another study showed that the implant-abutment connection design had no influence on implant survival and biological complication rates, only the conical connections showed lower marginal bone loss and fewer prosthetic complications than external hexagonal connections after 1 year of loading (Camps-Font *et al.,* 2021)

A major limitation of this present study is it is a cross-sectional study with no available baseline data for comparison. There were no data regarding patients' expectations at baseline regarding the therapeutic outcome of dental implant rehabilitation, which may also influence satisfaction (Yao *et al.,* 2014). To overcome these limitations and avoid a possible 'recall bias' (Locker, 1998b), prospective studies are required in the future.

Conclusion

Within the limitation of this study, it can be concluded that a high level of patient satisfaction and quality of life after dental implant rehabilitation was found among patients in Periodontal Specialist Clinic, Mak Mandin. The study also concluded that the OHRQoL give a positive impact on patients' satisfaction levels. Further study is required to explore any correlation between the level of satisfaction and OHRQoL with clinical and radiographic evaluation. A multi-center study should be considered, so a larger sample size can be obtained involving other states in Malaysia to get a more significant result.

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Author Contribution

NAS conceived and planned the presented idea. NAS and NIO performed the experiment and wrote the manuscript under YAY and EEAM supervision and support. The installation of the implants was performed by other clinicians who were not involved in this study and some of the implants were installed by YAY. NAS performed the data analysis in consultation with the EEAM.

Conflict of Interest

The authors declare no conflict or competing interests exist.

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