

# A study of the emotional effects of tooth loss in an edentulous Gujarati population and its association with depression

Rupal J. Shah, Fatema J. Diwan, Munira J. Diwan<sup>1</sup>, Vishal J. Chauhan, Hemal S. Agrawal, Ghanshyam C. Patel<sup>2</sup>

Department of Prosthodontics, Government Dental College and Hospital, <sup>2</sup>Cliantha Research Limited, Ahmedabad, Gujarat, <sup>1</sup>Department of Endodontics, Maulana Azad Institute of Dental Sciences, New Delhi, India

## Abstract

**Context:** To fully estimate the burden of illness due to edentulism and establish valid treatment outcomes measures in this regard, it is equally important to study its psychosocial repercussions.

**Aims:** The aim was to conduct a study to explore the emotional reactions to tooth loss, screen for current depressive symptoms and test for association between the two; among an edentulous Gujarati population.

**Settings and Design:** A total of 147 edentulous people visiting the Prosthodontics Department were surveyed.

**Subjects and Methods:** A questionnaire (based on previous studies) to test the emotional reactions to tooth loss and Nine Item-Patient Health Questionnaire to test for depression were used.

**Statistical Analysis Used:** The data were analyzed using the Chi-square ( $\chi^2$ ) test with the help of SPSS v. 18.0 (IBM Corp., Armonk, NY, USA).

**Results:** Totally, 100 out of 147 edentulous people returned the questionnaire of which 58% experienced difficulties in accepting tooth loss and 37% felt unprepared for its effects. Those with difficulties accepting tooth loss had a greater effect on self esteem and social life, had more reservation about discussing tooth loss and was more likely to experience depression. Both groups were satisfied with dentures, had no problem meeting their friends or partners without dentures and leaving out dentures at night.

**Conclusion:** About 58% of edentulous people had difficulties accepting tooth loss, which was unrelated to denture satisfaction. Respondents appeared to be restricted in social activities mainly due to functional limitations. Those with difficulties accepting tooth loss were more likely to experience depression.

**Key Words:** Depression, edentulous Gujarati population, emotional effects, study, tooth loss

## Address for correspondence:

Dr. Fatema J. Diwan, 2/E Najmi Apartment, Jamiya Saifiyah Marg, Zhampa Bazaar, Surat - 395 003, Gujarat, India. E-mail: fatemadwn@gmail.com

**Received:** 08<sup>th</sup> March 2015, **Accepted:** 21<sup>st</sup> May, 2015

## INTRODUCTION

Although the face represents only a small proportion of the

surface of the body, it embodies our social identities.<sup>[1]</sup> The body schema (the psychological image of physical self) is heavily invested with emotional meaning and significant changes in body image can result in varying degrees of emotional instability.<sup>[2]</sup> The loss of teeth which causes many adverse anatomic, esthetic, and biomechanical sequelae can also prove to be a terrible psychological shock to patients. In order to fully understand “the burden of illness” among the edentulous patient group, one must, therefore, cultivate an understanding of the physical, as well as the psychosocial dimensions of tooth loss. Dentistry has witnessed much research into the physical

Access this article online	
Quick Response Code:	Website: www.j-ips.org
	DOI: 10.4103/0972-4052.161564

aspects of tooth loss.<sup>[3-9]</sup> An interest in studying the nonclinical dimensions or the impact of oral health on quality of life has also been noted.<sup>[10,11]</sup> The Oral Health Impact Profile<sup>[12,13]</sup> is one such measurement, which is used to determine the adverse impact of oral conditions on daily life.<sup>[14,15]</sup> It covers the aspects of functional limitation, disability, and handicap due to oral disease based on a theoretical model by Locker.<sup>[16]</sup>

A national survey of adult dental health in the United Kingdom reported that an increasing number of adults find the prospect of total tooth loss upsetting.<sup>[17]</sup> The emotional reactions and feelings experienced by edentulous and partially dentate people as a result of tooth loss have been explored qualitatively and quantitatively in previous studies in the United Kingdom.<sup>[18-20]</sup> The social context in which we live is important in shaping responses to diseases and the experience of health and illness.<sup>[21]</sup> To determine the societal and cultural influences, transcultural studies comparing emotional reactions to tooth loss between Eastern and Western societies have also been carried out.<sup>[22,23]</sup> In order to be more representative of the general population, in Hong Kong, such a study has been conducted among the community-dwelling individuals.<sup>[24]</sup> However, not much in this respect has been reported in India.<sup>[25]</sup>

The edentulous state is usually associated with an elderly population. One emotional problem often associated with aging is depression.<sup>[26]</sup> Psychological response to tooth loss and denture wearing may be influenced by patient personality or the current state of mental health.

To the knowledge of the authors, the relationship between emotional reactions to tooth loss and depression has not yet been researched. The aims of the present study were to investigate (1) The emotional reactions to tooth loss among the edentulous patients visiting the Prosthodontics Department of Govt. Dental College and Hospital, Ahmedabad (2) screen for current depressive symptoms among such patients and (3) test if the patients' emotional reactions to tooth loss were influenced by their mental health status.

## SUBJECTS AND METHODS

Prior to the initiation of the study, approval was granted by Ethical Committee of the Institute.

A questionnaire based on previous qualitative and quantitative research<sup>[18,19,22-24]</sup> was translated into colloquial languages (Hindi and Gujarati) and pilot tested among 15 subjects (not included into the study) for comprehension and accuracy following which necessary revisions were made. The questionnaire contained three sections. The first section included questions on general information like demographics and questions to test the participant's beliefs and attitudes regarding dental health and

awareness. The second section included questions exploring the emotional reactions toward tooth loss and those about the denture-wearing experience. The third section consisted of the Nine Item Patient Health Questionnaire (PHQ-9) rating scale. The PHQ-9 is a self-administered scale that was drawn from the Primary Care Evaluation of Mental Disorders and it is based on the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (American Psychiatric Association, 2000) criteria for major depressive disorder.<sup>[27]</sup>

The study was carried out from December 2014 to February 2015 among the edentulous subjects receiving routine prosthodontic care under various undergraduate and Postgraduate students in the Department of Prosthodontics, Govt. Dental College and Hospital, Ahmedabad. Based on information from previous studies, statistical power was calculated using a sample size of 100. It achieves 80% power to detect an effect size ( $W$ ) of 0.4000 using 3° of freedom Chi-square ( $\chi^2$ ) test with a significance level of 0.05000.

Only those patients, who were in the process of getting new dentures made, were included. A total of 200 potential subjects were approached (more subjects were enrolled to account for potential dropouts) at the initial stage of their treatment and invited to take part. Those who agreed to participate were distributed questionnaires to be filled at home. Selecting this sampling strategy increased compliance as the patients were likely to come with self-completed questionnaires at their next appointment. Moreover, the participants could be encouraged not to leave any questions unanswered. For those subjects who could not read, questionnaires were filled in the form of a structured interview by students involved with their treatment. Inclusion criteria for the study were patients completely edentulous in both arches, patients who were in the process of getting a new set of dentures made and those who were able to read or at least understand (through verbal explanation) the language of questionnaires. Patients with communication difficulties, cognitive impairment and those unwilling to participate were excluded.

The data from the questionnaires similar to a previous quantitative study<sup>[19]</sup> were analyzed using  $\chi^2$  test with Yates' continuity correction for  $2 \times 2$  contingency tables in which expected frequencies were greater than five; and using Fisher's exact test (two-tailed) for  $2 \times 2$  contingency tables in which expected frequencies were less than five. For all other analyses,  $\chi^2$  test was used. In the following text,  $\chi^2$  test with Yates' continuity correction has been used unless otherwise indicated. All statistical analyses were performed using SPSS v. 18.0 (IBM Corp., Armonk, NY, USA).  $P < 0.05$  was considered to be statistically significant.

**RESULTS**

Totally, 200 potential subjects who satisfied the inclusion criteria were approached out of which 53 denied to participate. Of the remaining 147, those who had filled incomplete details or who did not return the questionnaire was excluded from the study, yielding a final sample size of 100. There were a total of 62 males and 38 females among the respondents. A total of 10 participants were aged between 31 and 50 years, 7 between 51 and 70 years and 23 were aged 71 years and over. Totally, 35 people had been edentulous for more than 5 years. The remaining characteristics of the study group and answers to questions directed toward judging their beliefs and attitudes about oral health are depicted in Table 1.

Did you find it difficult to accept losing your teeth?

Fifty-eight of the respondents which means 58% stated that they experienced difficulties in accepting their tooth loss while 42 (42%) stated that they experienced no difficulties.

How long was it before you felt you had accepted losing your teeth? [Table 2].

People who had difficulties in accepting tooth loss took longer to come to terms with it compared with people who had no difficulties ( $P < 0.001$ ). About 64% of the group with no difficulties accepted their loss immediately. About 76% of people with difficulties took within 6 months to more than a year to accept tooth loss compared with 36% of people with no difficulties.

Thinking back to when you lost your last tooth, how did you feel? [Table 3].

The emotion most commonly experienced by individuals of both groups (with difficulties and without difficulties) was that of relief (28 and 25 people, respectively). Other emotions commonly experienced among the people with no difficulties was that of being unconcerned and a sense of resignation (18 and 17 people respectively). Among the people with difficulties there were a wider range of responses with other frequently expressed emotions being sad, losing part of oneself, feeling of getting old, dismayed, and a sense of resignation (19, 19, 16, 16, and 14, respectively).

Did you try to keep tooth loss a secret?

About 33% of the group with difficulties tried to hide their tooth loss compared with 5% with no difficulties. The difference was significant ( $P = 0.001$ ).

Did you consider tooth loss a taboo subject that could not be discussed with partner, family, friends or others?

**Table 1: Characteristics and attitudes of the study group**

Characteristic	Distribution Number (%)
Education	
Primary (up to 7 <sup>th</sup> grade)	37 (37)
Secondary (8 <sup>th</sup> -10 <sup>th</sup> grade)	27 (27)
Higher secondary (11 <sup>th</sup> -12 <sup>th</sup> grade)	6 (6)
College graduate	9 (9)
Higher education (after graduation)	6 (6)
Uneducated	15 (15)
Reason of tooth loss (self-reported)	
Periodontal problem	62 (62)
Caries	25 (25)
Other	32 (32)
Wearing dentures	
Yes	64 (64)
No	36 (36)
Do you visit a dentist only if you have a problem?	
Yes	84 (84)
No	16 (16)
Do you consider tooth loss a part of the normal aging process?	
Yes	69 (69)
No	31 (31)
Do you think of dentures as good substitutes for the natural teeth?	
Yes	69 (69)
No	31 (31)

**Table 2: Time-related to accepting tooth loss**

Responses	Number of responses	
	Difficulties	No difficulties
Immediately	14	27
Within 6 months	29	14
Within a year	12	1
Took over a year	3	0
Still have not accepted it	-	-

**Table 3: Feelings associated with losing the last remaining tooth**

Responses	Number of responses	
	Difficulties	No difficulties
Relieved	28	25
Fearful	5	0
Angry	3	0
Gloomy	1	0
Sad	19	3
Dismayed	16	3
Resigned	14	17
Old	16	6
Shocked	7	0
Depressed	6	2
Not happening to me	3	0
Lost part of myself	19	3
Unconcerned	0	18

About 17 respondents (17%) could not discuss tooth loss with their partners, 25 (25%) with their families, 35 (35%) with their friends, and 40 (40%) with others. About 24% people with difficulties could not discuss tooth loss with partners compared with 7% people with no difficulties ( $P = 0.026$ ); 36% with difficulties could not discuss tooth loss with family compared with 9.5% with no difficulties ( $P = 0.002$ ); 50%

with difficulties could not discuss tooth loss with friends compared with 14% with no difficulties ( $P < 0.001$ ); and 55% with difficulties could not discuss tooth loss with others compared with 19% with no difficulties ( $P < 0.001$ ).

Did you perceive a change in other people's behavior or attitude toward you as a result of tooth loss?

About 29% of people with difficulties felt that following tooth loss, the attitude of other people toward them had changed compared with 5% with no difficulties ( $P = 0.002$ ).

Did losing your teeth affect your self-confidence? [Table 4].

About 38% of people with difficulties felt their confidence was affected after losing teeth, compared with 9.5% with no difficulties ( $P = 0.001$ ).

Because of losing your teeth, have you ever been restricted in carrying out any of the following range of activities? [Table 5].

Seventy-eight respondents (78%) restricted their choice of food, 28% avoided going out in public, 30% avoided eating in public, 73% did not enjoy food as much, 33% avoided laughing in public, 19% avoided forming close relationships, 11% avoided interactions with their family, 18% avoided interactions with friends/co-workers, and 19% avoided interactions with others. Members of both groups did not enjoy food, as well as before ( $P = 0.095$ ). Those with difficulties accepting tooth loss were more likely to avoid going out ( $P < 0.001$ ), avoid eating ( $P < 0.001$ ), and laughing in public ( $P = 0.001$ ). They were also more likely to feel restricted about the choice of food ( $P = 0.005$ ), avoid forming close relationships ( $P < 0.001$ ), avoid interactions with family ( $P = 0.019$ ), with friends/co-workers ( $P = 0.003$ ), and with others ( $P = 0.002$ ). Differences between the two groups were statistically significant for all activities except in terms of not being able to enjoy the food as much.

Do you think that the shape of your face has changed since you lost your teeth?

Eight-six respondents (86%) – including 88% with difficulties and 83% with no difficulties; felt that the shape of their face had changed after tooth loss. Although the difference was not statistically significant between the two groups ( $P = 0.513$ ), people with difficulties were more likely to be upset as a result of the perceived change (51% compared with 23%), which was statistically significant ( $P = 0.009$ ).

Do you think that having dentures have improved your appearance, confidence, and social life?

Of 64 respondents who used dentures; 54 (84%) felt that dentures improved their appearance, 48 (75%) felt that they improved their confidence, and 50 (78%) felt that they improved their social life. There was no statistical significance between the groups with difficulties and no difficulties. The distribution of responses between the two groups and the respective  $P$  values are shown in Table 6.

Do you feel comfortable leaving out your dentures at night?

About 50 respondents (78%) of the 64, who used dentures felt comfortable leaving out their dentures at night. Among the group which expressed difficulties accepting tooth loss, 30 out of 36 (83%) and among the group with no difficulties, 20 out of 28 (71%) respondents had no problem about leaving out their dentures at night. There was no statistical difference between their responses ( $P = 0.253$ ).

Do you ever avoid looking at yourself without your dentures in place?

Forty-seven percent of people with difficulties accepting tooth loss avoided looking at themselves without dentures in place compared with 14% of people without difficulties. The difference was statistically significant ( $P = 0.005$ ).

**Table 4: Tooth loss and self-confidence**

Responses	Number of responses	
	Difficulties	No difficulties
Yes	22	4
No	36	38

**Table 5: Activities restricted due to tooth loss**

Statement	Number of responses			
	Difficulties		No difficulties	
	Yes	No	Yes	No
Choice of food restricted	51	7	27	15
Avoid going out in public	25	33	3	39
Avoid eating in public	27	31	3	39
Not enjoyed food as much	46	12	27	15
Avoid laughing in public	27	31	6	36
Avoid forming close relationships	18	40	1	41
Avoid interactions with family	10	48	1	41
Avoid interactions with friends/co-workers	16	42	2	40
Avoid interactions with others	17	41	2	40

**Table 6: Perceived improvement with dentures**

Improvement with dentures	Number of responses				$P$
	Difficulties		No difficulties		
	Yes	No	Yes	No	
Appearance	33	3	21	7	0.069
Confidence	27	9	21	7	1.000
Social life	30	6	20	8	0.253



Do you avoid letting your partner or your friends see you without your dentures in place?

Eighty-nine percent of people with difficulties accepting tooth loss and 96% without difficulties had no problem letting partners see them without their dentures ( $P = 0.265$ ). Similarly, a majority (81% and 96%, respectively) had no problem letting friends see them without their dentures ( $P = 0.057$ ). There was no significant statistical difference observed for both sets of responses.

Do you consider your dentures to be part of yourself, a foreign body, or neither of these? [Table 7].

A majority of people in both groups with difficulties and without difficulties (83% and 86%, respectively) felt their dentures to be part of themselves. The difference was not statistically significant ( $P = 0.713$ ).

Did you feel prepared for the effects that the loss of your teeth had on you?

Of the 100 respondents, only 37 (37%) felt unprepared for effects of tooth loss. About 45% of people in the group with difficulties and 26% of the group without difficulties felt that they had been unprepared. The difference was not statistically significant ( $P = 0.057$ ).

The screening for depression using PHQ-9 revealed that 79% (39% with difficulties, 40% without difficulties) had none to minimal depression, 13% (11% with difficulties, 2% with no difficulties) had mild depression, 4% had moderately severe depression (4% with difficulties and 0% without difficulties), and the remaining 4% (4% with difficulties and 0% without difficulties) had severe symptoms. None had symptoms for moderate depression. The group which had difficulties accepting tooth loss was more likely to exhibit depressive symptoms than the group with no difficulties [Figure 1]. The association was significant ( $P = 0.007$ ).

## DISCUSSION

The present study attempted to explore emotional reactions to tooth loss in a group of edentulous Gujarati patients seeking prosthodontic services in the Department of Prosthodontics, Govt. Dental College and Hospital, Ahmedabad. The group was

**Table 7: Perception of dentures related to self**

Responses	Number of responses	
	Difficulties	No difficulties
Part of yourself	30	24
A foreign body	3	3
Neither of these	3	1

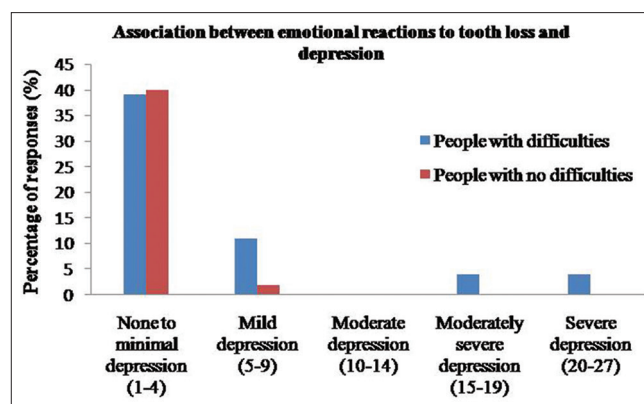
also screened for depression and association between the two parameters was tested. Such association has not been analyzed in previous studies.

The questionnaire used in this study was pilot tested and based on previous qualitative and quantitative studies. The PHQ-9 depression scale has been proved an attractive dual purpose instrument for making diagnoses and assessing the severity of depressive disorders because of its comparable sensitivity and specificity combined with its brevity and criterion validity.<sup>[27]</sup> It is effective in the geriatric population and is consistent across different specialties and cultures. A version of PHQ-9, which was already validated into Gujarati and Hindi was used for the purpose of this study.<sup>[28]</sup>

As the sample size was relatively small, the data should be interpreted with some caution and an emphasis placed on data trends. In order to reduce the rate of dropout, the study sample consisted of patients who were in the process of getting new dentures made. It could be argued that selection bias would result due to the likelihood of difficult denture patients in such a group. However, the fact that the majority of patients were satisfied with their dentures removed this possibility.

To eliminate the possibility of response bias, questionnaires were filled at the outset of treatment before provision of a new set of complete dentures so that participants did not attempt to answer in a way deemed favorable by the interviewer. Furthermore, for all those participants who could read and understand, questionnaires were filled by them in the privacy of their homes enabling them to express their views freely. However, due to the low level of education among participants; many questionnaires were filled through an interview format.

Fifty-eight percent of participants experienced difficulties in accepting the loss of teeth while 42% stated that they had no difficulties. There was no significant difference in age, sex, education, time since total tooth loss and denture wearing



**Figure 1:** Percent distribution of responses for depression symptoms within the study group

between the two groups. In comparison with people who had no difficulties accepting the situation, these people took longer to come to terms with the loss, were more likely to keep tooth loss a secret, consider it a taboo subject for discussing, perceive a change in other's behavior following tooth loss, feel less confident, feel restricted in social activities, feel upset as a result of change in appearance, and avoid looking at themselves without their dentures in place. These findings were similar to the findings of a quantitative study in the UK.<sup>[19]</sup>

It was expected that given the circumstances such as this where the study group consisted of people coming from relatively modest socioeconomic backgrounds with low education, prevalent periodontal problems, low awareness about dental health, and opinions that tooth loss is natural with aging; the emotional reactions to tooth loss would be less. However, much to the conflict of these expectations, emotional reactions were quite significant. This may be an extension of cultural influence as Gujaratis lend much social meaning to eating experiences that form a major part of social gatherings and festivals. Restriction in social activities, hence were common findings, as loss of teeth may impair the food related social experiences and make one feel left out. This is also borne out by the fact that unlike the previous quantitative study in the UK,<sup>[19]</sup> in the present study, even a substantial percentage of people without difficulties accepting tooth loss (about 64%) felt that their choice of food was restricted and did not enjoy their food, as well as before. A similar restriction of eating activities was noted in the study of aging North Indian Community.<sup>[25]</sup> Those with difficulties accepting tooth loss had an even greater effect on self-esteem and social life and consequently had more reservation about discussing tooth loss.

Contradictory to the above findings, both the groups had no problem with letting their partners or friends see them without their dentures in place. Furthermore, only 37% felt unprepared for the effects of tooth loss. Although more people in the group with difficulties (45% compared to 26% with no difficulties) felt unprepared, the difference was not statistically significant. Thus, similar to studies of Hong Kong Chinese people,<sup>[22,24]</sup> it can be assumed that even though the group felt reasonably prepared for the effects of tooth loss, impact on confidence and social life was still present. This disparity could be due to the prevalent attitudes and beliefs among the study group. In this study, only 31% felt that losing teeth was not a part of the normal aging process and that the dentures were not good substitutes for natural teeth.

Although some respondents (34%) felt upset as result of change in appearance and avoided looking at themselves without their dentures in place (33%), a majority had no problem meeting their friends or partners without dentures and leaving

out dentures for the night. This fact shows that the functional limitation with dentures rather than appearance could be the main reason for social handicap. The studies of Hong Kong Chinese people<sup>[22,24]</sup> also showed that they were less concerned about letting their friends or partners see them without their dentures in place. They too found it acceptable to leave the dentures out at night.<sup>[22]</sup>

Questions regarding denture wearing and usage revealed that a majority (regardless of their emotions pertaining to tooth loss and mental health status) were satisfied with dentures and felt that dentures improved their appearance, confidence, and social life. It says much about the fact that the emotional effects encountered by the participants appeared quite unrelated to and uninfluenced by their denture wearing. Previous studies to determine a relationship between patient personality, psychological factors, and denture satisfaction have yielded varying results.<sup>[29-31]</sup>

None of the respondents reported moderate depression severity. This raises the probability of acquiescence and extreme responding bias that might have occurred. There is evidence that both acquiescence and extreme responding trends are associated with older age, low education, and low income.<sup>[32]</sup> The characteristics of our study group also reveal similar attributes. However, the fact that people with difficulties were more likely to suffer from depressive symptoms than those without, would mean that participants were quite truthful while answering about their symptoms. It is likely that depression aggravated the emotional reactions to tooth loss in such patients. Studies have also reported an association between depression and dental diseases.<sup>[33,34]</sup>

The relationship between the emotional effects of tooth loss and depressive symptoms, however, may be bidirectional. That the event of tooth loss triggered or compounded existing depression is also possible. Edentulism through other variables such as ethnicity, socioeconomic status, or age may carry a significant risk for depression.

The findings of this study have clinical implications. Regardless of the attitudes and socioeconomic conditions, tooth loss can have a major psychological impact on the life of a person and must be avoided at all costs. Patients must be motivated to maintain oral health through the regular use of oral hygiene aids. The periodontal disease, which is a major contributing factor for tooth loss among the North Gujarat population and also widely over India must be prevented by containment of destructive oral habits. If tooth loss is inevitable, such patients must be properly informed and educated about its effects, which would help them to cope better with the loss. Furthermore, screening for depression in patients experiencing difficulties due to tooth loss will help in identifying undiagnosed depression

that must be dealt with using proper counseling and behavioral therapy and/or pharmacotherapy.

This study is also subject to several limitations, the greatest one being the possibility of response bias. As already discussed; although all attempts were made to eliminate it, different modes of questionnaire administration (self-administered and face-to-face interview in this case) are likely to affect the quality of data collected both due to biasing influences within and between different modes.<sup>[35]</sup> In order to be truly representative of the study population, the sample subjects need to be large in numbers and widely scattered. Hence, future studies with larger sample size are required. As this study was carried out among people seeking dental care, it is possible that the results were overestimated. This warrants future studies outside the health care environment.

## CONCLUSION

About 58% of edentulous people studied had difficulties accepting tooth loss, which was unrelated to denture satisfaction. Respondents appeared more affected by the restriction in social activities due to functional limitation rather than appearance. Those who had difficulties accepting tooth loss were also more likely to experience depressive symptoms.

## ACKNOWLEDGMENTS

The authors would like to thank Dr. Ghanshyam C. Patel for helping with the statistical analysis of the data.

## REFERENCES

1. Hobkirk JA, Zarb GA. The edentulous state. In: Zarb GA, Hobkirk JA, Eckert SE, Jacob RF, editors. *Prosthodontic Treatment for Edentulous Patients*. 13<sup>th</sup> ed. St. Louis: Mosby; 2012. p. 1.
2. Zarb GA, Hobkirk JA. History taking, treatment planning, and improving denture-bearing for edentulous patients. In: Zarb GA, Hobkirk JA, Eckert SE, Jacob RF, editors. *Prosthodontic Treatment for Edentulous Patients*. 13<sup>th</sup> ed. St. Louis: Mosby; 2012. p. 55.
3. Bergman B, Carlsson GE. Clinical long-term study of complete denture wearers. *J Prosthet Dent* 1985;53:56-61.
4. Budtz-Jørgensen E. Oral mucosal lesions associated with the wearing of removable dentures. *J Oral Pathol* 1981;10:65-80.
5. Tallgren A. Positional changes of complete dentures. A 7-year longitudinal study. *Acta Odontol Scand* 1969;27:539-61.
6. Tallgren A, Lang BR, Miller RL. Longitudinal study of soft-tissue profile changes in patients receiving immediate complete dentures. *Int J Prosthodont* 1991;4:9-16.
7. Heath MR. The effect of maximum biting force and bone loss upon masticatory function and dietary selection of the elderly. *Int Dent J* 1982;32:345-56.
8. Shinkai RS, Hatch JP, Rugh JD, Sakai S, Mobley CC, Saunders MJ. Dietary intake in edentulous subjects with good and poor quality complete dentures. *J Prosthet Dent* 2002;87:490-8.
9. Steele JG, Sheiham A, Marcenes W, Walls AW. *National Diet and Nutrition Survey: People Aged 65 Years and Over*. Vol. 2. Report of the Oral Health Survey. London: The Stationary Office; 1998.
10. Ettinger RL. Oral disease and its effect on the quality of life. *Gerodontology* 1987;3:103-6.
11. Leao A, Sheiham A. The development of a socio-dental measure of dental

- impacts on daily living. *Community Dent Health* 1996;13:22-6.
12. Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. *Community Dent Health* 1994;11:3-11.
13. Slade GD. Derivation and validation of a short-form Oral Health Impact Profile. *Community Dent Oral Epidemiol* 1997;25:284-90.
14. Slade GD, Spencer AJ, Locker D, Hunt RJ, Strauss RP, Beck JD. Variations in the social impact of oral conditions among older adults in South Australia, Ontario, and North Carolina. *J Dent Res* 1996;75:1439-50.
15. Allen PF, McMillan AS. The impact of tooth loss in a denture wearing population: An assessment using the Oral Health Impact Profile. *Community Dent Health* 1999;16:176-80.
16. Locker D. Measuring oral health: A conceptual framework. *Community Dent Health* 1988;5:3-18.
17. Kelly M, Steele J, Nuttall N, Bradnock G, Morris J, Nunn J, *et al.* *Adult dental health survey. Oral health in the United Kingdom 1998*. London: The Stationary Office; 2000.
18. Fiske J, Davis DM, Frances C, Gelbier S. The emotional effects of tooth loss in edentulous people. *Br Dent J* 1998;184:90-3.
19. Davis DM, Fiske J, Scott B, Radford DR. The emotional effects of tooth loss: A preliminary quantitative study. *Br Dent J* 2000;188:503-6.
20. Fiske J, Davis DM, Frances C, Gelbier S. The emotional effects of tooth loss. *Proc Eur Prosthodontic Assoc* 1997;21:24. [Abstract].
21. Locker D. Health outcomes of oral disorders. *Int J Epidemiol* 1995;24 Suppl 1:S85-9.
22. Scott BJ, Leung KC, McMillan AS, Davis DM, Fiske J. A transcultural perspective on the emotional effect of tooth loss in complete denture wearers. *Int J Prosthodont* 2001;14:461-5.
23. Fiske J, Davis DM, Leung KC, McMillan AS, Scott BJ. The emotional effects of tooth loss in partially dentate people attending prosthodontic clinics in dental schools in England, Scotland and Hong Kong: A preliminary investigation. *Int Dent J* 2001;51:457-62.
24. McMillan AS, Wong MC. Emotional effects of tooth loss in community-dwelling elderly people in Hong Kong. *Int J Prosthodont* 2004;17:172-6.
25. Naik AV, Pai RC. Study of emotional effects of tooth loss in an aging North Indian community. *ISRN Dent* 2011;2011:395498.
26. Pilling LF. Emotional aspects of prosthodontic patients. *J Prosthet Dent* 1973;30:514-5.
27. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med* 2001;16:606-13.
28. Kochhar PH, Rajadhyaksha SS, Suvarna VR. Translation and validation of brief patient health questionnaire against DSM IV as a tool to diagnose major depressive disorder in Indian patients. *J Postgrad Med* 2007;53:102-7.
29. Bolender CL, Swoope CC, Smith DE. The Cornell Medical Index as a prognostic aid for complete denture patients. *J Prosthet Dent* 1969;22:20-9.
30. Reeve PE, Watson CJ, Stafford GD. The role of personality in the management of complete denture patients. *Br Dent J* 1984;156:356-62.
31. van Waas MA. The influence of psychologic factors on patient satisfaction with complete dentures. *J Prosthet Dent* 1990;63:545-8.
32. Meisenberg G, Williams A. Are acquiescent and extreme response styles related to low intelligence and education? *Pers Individ Dif* 2008;44:1539-50.
33. Genco RJ, Ho AW, Grossi SG, Dunford RG, Tedesco LA. Relationship of stress, distress and inadequate coping behaviors to periodontal disease. *J Periodontol* 1999;70:711-23.
34. Anttila SS, Knuutila ML, Sakki TK. Depressive symptoms favor abundant growth of salivary lactobacilli. *Psychosom Med* 1999;61:508-12.
35. Bowling A. Mode of questionnaire administration can have serious effects on data quality. *J Public Health (Oxf)* 2005;27:281-91.

**How to cite this article:** Shah RJ, Diwan FJ, Diwan MJ, Chauhan VJ, Agrawal HS, Patel GC. A study of the emotional effects of tooth loss in an edentulous Gujarati population and its association with depression. *J Indian Prosthodont Soc* 2015;15:237-43.

**Source of Support:** Nil, **Conflict of Interest:** None.