Indonesian Journal of Community Engagement
Jurnal Pengabdian kepada Masyarakat
Vol. 10, No. 1, March 2024, Page. 49-56
DOI: http://doi.org/10.22146/jpkm.90557

Rehabilitation of Toothless Conditions with Dental Implants to Improve the Nutritional Status and General Health of the Terban Village Community

Yosaphat Bayu Rosanto[1*], Dyah Listyarifah[1], Hanni Handayani Budi Nagari[2]
[1]Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Gadjah Mada, Yogyakarta, Indonesia
[2]Department of Dental Biomedical Sciences, Faculty of Dentistry, Universitas Gadjah Mada, Yogyakarta, Indonesia

Submitted: November 09th 2023; Revised: March 04th 2024; Accepted: March 08th 2024

Keywords:
BMI
DMFT
General Health Questionnaire 12 (GHQ12)
Health Utilities Index Mark 3 (HUI3)
OHIS

Abstract Terban Village is a village that has a significant number of residents who suffer from toothless conditions. This condition directly affects the village population's nutritional status and general health. This community service aimed to rehabilitate the condition of toothlessness with dental implants to improve the nutritional status and general health of the people of Terban Village. The methods used in this community service were counseling, general health, mental and dental examinations, health utility levels, radiological examinations, and dental implant treatment for the residents. The output of this community service was a counseling session that involved 70 Terban Village residents. The DMFT index of Terban Village residents was 7.47 and was still above the WHO baseline. Five respondents were selected to undergo rehabilitation procedures with dental implants. Rehabilitation of edentulous conditions with dental implants will have a positive impact on improving the nutritional status and general health of the people of Terban Village. In addition, the general health of the population has also experienced improvements, such as reducing the number of cases of nutrition-related diseases and improving the overall quality of life.

1. INTRODUCTION

Dental and oral health conditions were still not a concern for the people of Terban. FKG UGM, in December 2022, carried out an examination of dental health in the Terban Community. The DMF-T index in the Terban community is in the very high category, namely 9.125. The number of missing people in the Terban community is 4.25. The causes of poor DMF-t include lack of knowledge, minimal awareness, and low economic conditions. This is one of the unique things about Terban village, which is located very close to education and health centers. The lack of public knowledge regarding the importance of dental and oral health causes people to become less sensitive to their own dental and oral health (Baseer et al., 2012; Tadin et al., 2022). People still consider the condition of their teeth and mouth to be unimportant, so awareness is still lacking, and the incidence of caries is still high in the Terban community.

The role of the Faculty of Dentistry (FKG) Universitas Gadjah Mada (UGM) in improving the dental and oral health of the people of Terban Village is needed to accelerate development and develop the potential of Terban Village as one of the Villages supported by Universitas Gadjah Mada, so that it can become a driver of development in various fields needed. FKG UGM, as a center for education and research in the field of dentistry, has great

ISSN 2460-9447 (print), ISSN 2541-5883 (online)
*Corresponding author: Yosaphat Bayu Rosanto
Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Gadjah Mada , Jl. Denta 1, Yogyakarta, 55281, Indonesia
Email: yosaphatbr@ugm.ac.id

potential in the form of human resources to play a role in improving the dental and oral health of Terban Village. One of the roles that FKG can carry out is providing free dental implant services for the people of Terban Village, which is expected to improve their nutritional adequacy and general health.

Dental implants can replace missing teeth so that the patient's masticatory function can return to perfection, the patient's phonation improves, and the aesthetics of the patient's smile improves with the arrangement of teeth similar to their natural teeth (Baseer et al., 2012). Dental implants are surgically implanted into the soft tissue or the jawbone so that artificial teeth can be placed over them. Apart from dental implants, several options can also be used to replace missing or damaged teeth, such as dental bridges and removable dentures. Compared to the two tooth replacement options, dental implants have several advantages, namely (Papaspyridakos et al., 2011):

1. They make it easier to chew food without pain and worry that the teeth will shift, such as when using removable dentures.
2. They are more comfortable than removable dentures and do not cause difficulty speaking, because it fit securely.
3. They closely resemble real teeth.
4. They are easier to install, because you don't have to shift or change the position of the teeth.
5. They are easier to care for than removable dentures or dental bridges, because it do not have to be removed and no longer use adhesive.
6. They can last a lifetime without needing to be replaced, whereas removable dentures and dental bridges need to be replaced every 7-15 years.

Losing teeth has many negative impacts on many aspects of one's life. Reduced functional teeth can cause problems with mastication and eating patterns, thereby disrupting nutritional status. Individuals who are missing back teeth will have four times more problems with chewing. The impact of tooth loss can result in the emergence of systemic diseases such as nutritional deficiencies and osteoporosis. Diet is an important component in living a healthy life as it has a role in the etiology and, thus, the prevention of many chronic conditions such as obesity, cardiovascular disease, diabetes, and cancer, among other chronic conditions. Tooth loss and nutritional intake are interconnected. The oral cavity is not only the entrance for nutritional intake, but the main function of teeth is chewing. Tooth loss reduces masticatory function and chewing ability, limiting food choices and variety in the diet. Nutrient intake has been considered a mediator between tooth retention and several diet-related chronic diseases (Gaewkhiew et al., 2017; Hung et al., 2003).

The problem that we will solve through this community service program is that toothlessness in the people of Terban Village can affect their nutritional status and general health. Dental implants for the people of Terban Village can be a solution for rehabilitating edentulous conditions so that nutrition and general health can be met. This program is intended to help solve the problem of tooth loss faced by the people of Terban Village so that they can lead the community towards a healthier and more prosperous life, help and improve the socio-economic conditions of the residents, and facilitate residents' access to information and knowledge. The Assisted Village Program is implemented as a synergistic collaborative network between the Terban Village community, health service facilities, alumni, lecturers, and students, and it is oriented towards restoring the toothless condition of the Terban Village community.

2. METHOD

The preparation stage was carried out by creating outreach materials. The media used for the outreach are presentation materials and educational posters. Educational materials were created using the Microsoft PowerPoint 2021 application, while educational posters were created using the Corel Draw 2020 application (64-bit). Presentation materials and educational posters contained definitions, materials, and the process of installing dental implants; the relationship between dental health and general health; causes and consequences of missing teeth; benefits of dental implants for general health; and dental implant care and maintenance. The presentation material was explained through oral education to the Terban Village community. At the same time, educational posters were distributed as attachments to invitations to residents to attend the outreach event at the Terban Village Hall.

Administrative preparations were also carried out with the Yogyakarta City Health Service to collaborate with the Gondomanan I Community Health Center, which is the first-level health facility that houses Terban Village. Collaboration with the Gondomanan I Community Health Center was carried out in conjunction with non-infectious screening activities so that Terban Village residents could get more benefits when attending counseling. This collaboration also aims to increase community involvement so that the program can be sustainable. After completing technical and administrative preparations, we gathered 70 residents of Terban Village. All residents were educated and underwent dental and oral health examinations, while the Gondokusuman I Community Health Center carried out examinations for non-communicable diseases. DMF-T, OHI-S, debris index, and calculus index are recorded to prepare the oral cavity before installing dental implants. Damaged teeth were removed. Bad tooth fillings and dental caries were filled. Tartar was cleaned. This is necessary to achieve dental implant cleanliness. General health checks include checking body weight and height to determine Body Mass Index (nutritional status), blood pressure, and mental health using the General Health

Questionnaire 12 (GHQ12) questionnaire and health utility level using the Health Utilities Index Mark 3 (HUI3) questionnaire. After obtaining data on the condition of toothlessness, five Terban Village residents will be selected who match the indications for implant installation and dental prostheses. The sample in this study was non-probability sampling with a purposive sampling type, where samples were taken purposively by selecting subjects based on specific criteria set by the researcher. Inclusion criteria are single tooth edentulous, alveolar width > 6.5 mm, interocclusal space > 7 mm, and good oral hygiene. Exclusion criteria are medically compromised patients, alcoholism, and refusal to treatment. Five selected patients underwent subjective, clinical, complete blood laboratory and radiological examinations with Cone-Beam Computed Tomography. Installation of dental implants using a one-stage surgical technique (Taper Kit, Osstem, Korea). Post-intervention examination will be done one year after the implantation. The community service carried out in this period would only provide dental implant installation services and would be evaluated in future programs.

3. RESULT AND DISCUSSION

Community service Rehabilitation of Toothless Conditions with Dental Implants to Improve the Nutritional Status and General Health of the Terban Village Community has been completed. This activity collaborates with the Gondokusuman II Community Health Center with non-communicable disease examination activities.

3.1 Counseling

Not many people in Terban know about the rapid process of caries, so if a tooth has a cavity, people don't immediately go to the dentist to treat it. People come to the dentist if the condition of their teeth is serious and can no longer be maintained and needs to be extracted (Cárcamo-España et al., 2022). Low economic conditions and the perceived high cost of going to the dentist also mean that people do not immediately check the condition of their teeth (Northridge et al., 2020). The extension activity held in Terban village was a success (Figure 1), with 70 enthusiastic residents actively taking part. People who previously did not understand the benefits of dental implants for health and nutritional status are now understanding. Things that the Terban people now understand include dental implants, which replace missing teeth with artificial teeth that are similar to natural teeth by involving the insertion of titanium into the jawbone and attaching an artificial dental crown on top. Dental implants allow users to chew food properly, which helps in better digestion and optimal nutrient absorption. Dental implants help prevent the shifting of neighboring teeth, which can interfere with the function of chewing and digestion of food. Dental implants can maintain healthy gum tissue and jaw bones, preventing bone resorption that occurs after tooth loss (Gupta et al., 2023). Teeth that are healthy and complete again with dental implants will increase self-confidence and contribute to mental health (Takemae et al., 2012). People who use dental implants as artificial teeth will restore the ability to eat well, increase self-confidence, and ultimately improve the overall quality of life.

Figure 1 . Education to the public about the benefits of dental implants for health and nutritional status

3.2 Medical health checkup

Table 1 shows the results of measurements of height, weight, and BMI of 74 Terban residents who underwent examination. Forty-six people were overweight and obese. Excess body weight is closely related to a person's lifestyle, such as lack of physical activity and poor eating patterns, which causes an imbalance between the energy that comes in and the body's energy that is released (Lin & Li, 2021). One example of a lack of physical activity is rarely exercising regularly, while examples of poor eating patterns include rarely consuming fruit and vegetables and excessive sugar and salt intake (Joo et al., 2019).

Table 1 . BMI calculation results (kg/m^2)

BMI Criteria			
Underweight	**Normal**	**Overweight**	**Obese**
1	27	12	34

The amount measured = 72

Excess body weight is a risk factor for hypertension (Akil & Ahmad, 2011). Table 2 shows blood pressure in Terban residents based on BMI grouping. A total of 46 people fell into the overweight category (overweight and obese), and 35 people (76%) showed an increase in blood pressure.

Table 2 . Blood pressure measurement results (mmHg)

Blood Pressure	<120/<80	>120/>80
Obese	8	26
Overweight	3	9
Normal	13	14
Underweight	1	0

Apart from poor lifestyle and lack of physical activity, the cause of increased blood pressure can also be caused by stress (Cherfan et al., 2020). Stress that occurs in society can be caused by various aspects such as economic factors, personal problems, family problems, social problems, and pressure from the environment, as well as stress due to illness, depending on the individual's ability to overcome this stress (Schneiderman et al., 2005). If stress persists for a long time, it can cause health problems such as

hypertension and a decrease in a person's quality of life (Spruill, 2010).

3.3 Mental health screening and health utility rates

HUI3 is used as an indicator of health status. A low score indicates the patient's best health. The higher the score, the worse the health condition (Bolbocean et al., 2023). The mean of each health variable examined, along with its standard deviation, is displayed in Table 3. The mean score of all variables was >1, with high scores for visual health (1.80), memory (1.82), and pain (1.82). This shows that the general health of patients with tooth loss has decreased, with the most severe decline in vision, memory, and pain. The decline in these functions could also be due to the majority of elderly patients. The general health level of patients with tooth loss in Terban is lower than those who have lost teeth from research in Japan (Takemae et al., 2012). Takemae et al. (2012) study showed that patients with tooth loss (edentulous) in all age groups had a score ≤ 1.

Table 3 . Mean score and standard deviation of Health Utility Index (HUI3), n=52

Variables	Mean (Score Range)	+Standard Deviation
Vision	1.80 (1-6)	1.05
Hearing	1.35 (1-6)	0.66
Talk	1.48 (1-5)	0.68
Mobility	1.16 (1-6)	0.42
Dexterity	1.28 (1-6)	0.50
Emotion	1.42 (1-5)	0.88
Memory	1.82 (1-6)	1.00
Painful	1.82 (1-5)	0.87

Table 4 . Mean score and standard deviation of Health Utility Index (HUI3), n=52

No	Variable GHQ12	Mean	+Standard Deviation
1	Ability to concentrate	0.98	0.35
2	Lack of sleep	1.14	0.55
3	Play a useful role	0.93	0.59
4	Able to make decisions	1.04	0.68
5	Under pressure	1.74	0.95
6	Not able to overcome difficulties	1.25	0.71
7	Enjoy daily activities	2.24	0.43
8	Facing problems	2.05	0.49
9	Feeling unhappy and depressed	1.35	0.93
10	Losing self-confidence	1.55	0.94
11	Thinking of yourself as worthless	1.33	1.06
12	Feeling quite happy	2.07	0.72
	Score range	9-24	
	Average individual scores	17.28	

The aim of using the GHQ-12 questionnaire is to measure the psychological characteristics of the mental health of people who experience edentulous conditions (Hu et al., 2007). Table 4 shows the overall variable item scores, individual score means, and individual score ranges from the GHQ-12. GHQ-12 questionnaire scores range from 0-36 (higher scores indicate worse mental health) (Liang et al., 2016). Scores exceeding the limit of 12 can be classified as cases indicating poor mental health. Four respondents had a total score of <12, and the remaining 53 respondents had a score of >12. The range of scores from respondents in the communities examined was 9-24, with an average individual score of 17.28 (>12), which shows that, on average, people who experience the condition of having no teeth are at high risk of developing mental illness.

Tooth loss can result in many problems, such as anatomical, aesthetic, and biomechanical problems, and can also have serious psychological impacts on the patient. Those who have difficulty accepting the reality of tooth loss tend to experience decreased self-esteem, avoid talking about tooth loss, and are at higher risk of depression. Psychological responses to tooth loss can also be influenced by the patient's personality or mental health condition. The results of this study have important clinical implications. Tooth loss can have a significant psychological impact on a person's life, regardless of attitudes and socio-economic conditions (Shah et al., 2015). Therefore, it is important to encourage patients to maintain their oral health by diligently using oral hygiene aids. If tooth loss is unavoidable, patients need to be provided with adequate information and education about the consequences to better cope with the situation. Additionally, screening for depression in patients who are struggling due to tooth loss can help identify undiagnosed depression, which can then be treated through counseling, behavioral therapy, and/or appropriate medication. In addition to public health intervention programs related to edentulous conditions, which include education on preventing tooth loss, how to overcome difficulties with tooth loss, and screening of patients' psychological conditions, efforts to restore lost teeth with dental implants or dental prostheses may be able to improve the mental quality in particular and the patient's overall health.

3.4 Dental and oral health examination

Maintaining healthy teeth is very important because teeth are part of the chewing apparatus in the digestive system of the human body. Dental and oral hygiene status is a condition that describes the cleanliness of a person's teeth and mouth (Tadin et al., 2022). The assessment index uses an oral hygiene index or Oral Hygiene Index Simplified (OHI-S), which is a combination index between the debris index and the calculus index to measure dental and oral health problems, namely the lack of knowledge about dental and oral hygiene (D'Elia et al., 2023). Dental and oral health problems, such as caries, gingivitis, and dental and oral hygiene, can be measured using the Oral Hygiene Index Simplified (OHI-S) from Green and Vermilion. The assessment criteria are 0.0 – 1.2 (good), 1.3 – 3.0 (medium), and 3.1 – 6.0 (bad) (Deradjat et al., 2013). The results of

dental and oral health examinations of the Terban Village community are shown in Table 5.

Table 5 . Dental and oral health examination results

Examination	Result
Number of People Examined	65
Number of Teeth Examined	165
Total Debris Score	143
Calculus Score	173
Decay Score	201
Missing Score	197
Filling Score	88

$$\text{Debris Index} = \frac{\text{Total Debris Score}}{\text{Total Teeth Examined}} = \frac{143}{165} = 0.87$$

$$\text{Calculus Index} = \frac{\text{Total Calculus Score}}{\text{Total Teeth Examined}} = \frac{173}{165} = 1.95$$

$$\text{DMFT Index} = \frac{D + M + F}{\text{Total Population Examined}} = \frac{486}{65} = 7.47$$

The debris index measures the accumulation of plaque or food residue on the surface of the teeth. In this case, the debris index result is 0.87. This number shows the level of oral hygiene. The lower the debris index number, the better the oral hygiene. The calculus index measures the accumulation of tartar (calculus) on the tooth surface (Aghanashini et al., 2016). The calculus index result is 1.95. Table 5 shows the rate of calculus accumulation. The higher the calculus index number, the more calculus accumulates in the teeth (Fons-Badal et al., 2020). The calculus index of the Terban Village community shows that a certain amount of calculus forms on the surface of the teeth, and dental treatment may be needed to clean it. According to Green and Vermilion's guidelines, a debris index result of 0.87 indicates a relatively good level of oral hygiene. However, a calculus index of 1.95 indicates calculus accumulation that requires further treatment. Therefore, it is necessary to carry out regular dental cleanings to avoid more serious dental health problems in the future.

The DMFT index measures the level of tooth decay (Moradi et al., 2019). The DMFT index result for the Terban community is 7.47. This number is the total number of damaged teeth (D=Decay), missing teeth (M=Missing), and teeth that have been filled (F=Filling). The DMFT index shows several dental problems, such as damaged or missing teeth (Kamyab et al., 2021). Dental care is necessary to maintain good dental health. The World Health Organization (WHO) encourages efforts to prevent dental disease through understanding and maintaining good dental health (World Health Organization, 2019). A DMFT index result of 7.47 indicates that several teeth are damaged or missing. This indicates the need for more preventive and corrective care to maintain overall dental health. It is important to understand that the results of this index provide an overview of the condition of the mouth and teeth, and it is necessary to consult a dentist for further treatment and advice on maintaining optimal dental health.

3.5 CBCT examination

CBCT examination (Figure 2) before installing dental implants has several important functions, including evaluating bone structure and size (Table 6) to obtain a three-dimensional image of the patient's alveolar bone, assessing the strength and density of the bone (Table 6) where the implant will be placed or planted for more accurate planning and determining the location and installation of implants, the identification of anatomical structures such as nerves, blood vessels, and sinuses adjacent to the implant placement area, thereby avoiding damage to these structures during the procedure, and screening for health problems such as infections or pathological conditions (Poedjiastoeti et al., 2022).

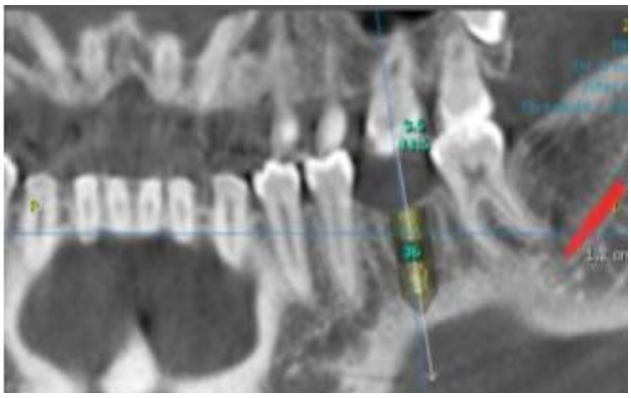

Figure 2 . Result of CBCT examination and simulation of dental implant placement

3.6 Dental implant placement

Residents of Terban Village who underwent dental implants are shown in Figure 3 and Table 6. The dental implant procedure can be performed to replace one or more missing or damaged teeth, whether due to tooth loss, cavities, infection, gum disease, or injury. The aim of replacing teeth with this procedure can be to restore tooth function or improve appearance. Apart from dental implants, several options can also be used to replace missing or damaged teeth, such as dental bridges and removable dentures. Compared to the two tooth replacement options, dental implants have several advantages, namely, making it easier to chew food without pain and worrying about teeth shifting, more comfortable than removable dentures, and not making it difficult to speak because they are attached firmly and look like real teeth, easy to care for because it does not have to be removed and does not use adhesive anymore. It can last a lifetime without needing to be replaced (Gupta et al., 2023).

Losing teeth has many negative impacts that affect many aspects (Kimmie-Dhansay et al., 2021). Loss of back teeth in one jaw arch can disrupt the chewing system. If tooth loss is left for too long, it will cause shifting of the remaining teeth, shrinkage of the jawbone, decreased chewing function, and speech problems, and it can also affect the jaw joints (Dosumu et al., 2014). Loss of teeth can cause reduced tooth function and systemic disease and have an emotional impact on individuals (Nazir, 2017).

Table 6 . Dental implant placement in selected patients from terban village residents

Patient	Gender	Age (years)	Tooth	Implant Size (mm) (diameter x height)	Bone Density
WS	Female	49	44	3.5 x 13	D4
VG	Female	29	36	3.5 x 11.5	D4
HH	Female	44	14	3.5 x 11	D4
DS	Female	38	14	3.5 x 13	D4
LK	Female	29	36	5 x 11	D3

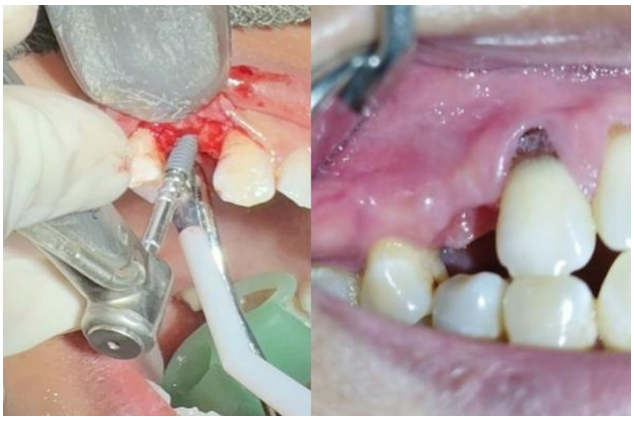

Figure 3 . Dental implant placement procedures

Reduced functional teeth can cause problems with mastication and eating patterns, thereby disrupting nutritional status (Kossioni, 2018). Individuals who are missing back teeth will have four times more problems with mastication (Dosumu et al., 2014).

Tooth loss can cause the emergence of systemic diseases such as nutritional deficiencies and osteoporosis (Nazir, 2017). Emotional impacts are feelings or reactions shown by individuals regarding tooth loss, which can change the shape of the face, facial height, and vertical dimensions, giving rise to reactions of feeling sad, depressed, losing self-confidence, and feeling old (Davis et al., 2000). Loss of teeth, which has other functional impacts, can include speech disorders. Speech function will decrease because teeth play an important role in speaking. Individuals who experience tooth loss, especially the teeth in the front, will find it difficult to pronounce some letters, which will disrupt the process of speaking and communicating (Nadelman et al., 2021).

One of the obstacles encountered in implementing this service was to convince the public that this action was safe to carry out. Although an oral and maxillofacial surgery resident performs the procedure, this procedure is under close supervision by a specialist implant and maxillofacial surgery consultant. In the end, the patient was convinced and felt happy that his teeth were intact again. The ability or inability to swallow food orally has a major impact on a person's general health condition, not only physically but also mentally, especially in the elderly, who often lose teeth (Ney et al., 2009). The systemic effects of tooth loss need to be fully and adequately evaluated, and these effects significantly affect the quality of life (QoL) of the elderly (Takemae et al., 2012). Post-intervention examination will be done one year after implantation. The community service carried out in this period will only provide dental implant installation services and will be evaluated in future programs.

4. CONCLUSION

The rehabilitation of toothless conditions with dental implants for the people of Terban Village will improve nutritional status, general health, and mental health. This program can help solve the problem of tooth loss faced by the people of Terban Village, so that it can lead the community towards a healthier and more prosperous life, help and improve the socio-economic conditions of citizens, and facilitate citizens' access to information and knowledge. Post-intervention examination will be done one year after implantation. The community service carried out in this period will only provide dental implant installation services and will be evaluated in future programs.

ACKNOWLEDGMENT

We would like to thank oral and maxillofacial residents of the Faculty of Dentistry, Universitas Gadjah Mada who greatly assisted this program. All activites were funded by Universitas Gadjah Mada's Directorate of Community Service.

CONFLICT OF INTERESTS

All authors have read this manuscript and approved for submission. Each author believes that the manuscript represents honest work. Written consent was obtained from all patients.

REFERENCES

Aghanashini, S., Puvvalla, B., Mundinamane, D. B., Apoorva, S., Bhat, D., & Lalwani, M. (2016). A comprehensive review on dental calculus. *Journal of Health Sciences & Research, 7*(2), 42–50. https://doi.org/10.5005/jp-journals-10042-1034

Akil, L., & Ahmad, H. A. (2011). Relationships between obesity and cardiovascular diseases in four Southern States and Colorado. *Journal of Health Care for the Poor and Underserved, 22*(4), 61–72. https://doi.org/10.1353/hpu.2011.0166

Baseer, M. A., Alenazy, M. S., Alasqah, M., Algabbani, M., & Mehkari, A. (2012). Oral health knowledge, attitude and practices among health professionals in King Fahad

Medical City, Riyadh. *Dental Research Journal, 9*(4), 386–392.

Bolbocean, C., Anderson, P. J., Bartmann, P., Cheong, J. L. Y., Doyle, L. W., Wolke, D., & Petrou, S. (2023). Comparative evaluation of the health utilities index mark 3 and the short form 6D: Evidence from an individual participant data meta-analysis of very preterm and very low birthweight adults. *Quality of Life Research, 32*(6), 1703–1716. https://doi.org/10.1007/s11136-023-03344-x

Cárcamo-España, V., Reyes, N. C., Saldivar, P. F., Chimenos-Küstner, E., Devesa, A. E., & López-López, J. (2022). Compromised teeth preserve or extract: A review of the literature. *Journal of Clinical Medicine, 11*(18), 5301. https://doi.org/10.3390/jcm11185301

Cherfan, M., Vallée, A., Kab, S., Salameh, P., Goldberg, M., Zins, M., & Blacher, J. (2020). Unhealthy behaviors and risk of uncontrolled hypertension among treated individuals-The CONSTANCES population-based study. *Scientific Reports, 10*(1). https://doi.org/10.1038/s41598-020-58685-1

D'Elia, G., Floris, W., Marini, L., Corridore, D., Rojas, M. A., Ottolenghi, L., & Pilloni, A. (2023). Methods for evaluating the effectiveness of home oral hygiene measures—a narrative review of dental biofilm indices. *Dentistry Journal, 11*(7), 172. https://doi.org/10.3390/dj11070172

Davis, D. M., Fiske, J., Scott, B., & Radford, D. R. (2000). The emotional effects of tooth loss: A preliminary quantitative study. *British Dental Journal, 188*(9), 503–506. https://doi.org/10.1038/sj.bdj.4800522

Deradjat, A. P., Mariam, M. S., & Yubiliana, G. (2013). Oral hygiene status based on blood types of dentistry students. *Padjadjaran Journal of Dentistry, 25*(2). https://doi.org/10.24198/pjd.vol25no2.26787

Dosumu, O. O., Ogunrinde, J. T., & Bamigboye, S. A. (2014). Knowledge of consequences of missing teeth in patients attending prosthetic clinic in U.C.H. Ibadan. *Annals of Ibadan Postgraduate Medicine, 12*(1), 42–48.

Fons-Badal, C., Fons-Font, A., Labaig-Rueda, C., Solá-Ruiz, M. F., Selva-Otaolaurruchi, E., & Agustín-Panadero, R. (2020). Analysis of predisposing factors for rapid dental calculus formation. *Journal of Clinical Medicine, 9*(3), 858. https://doi.org/10.3390/jcm9030858

Gaewkhiew, P., Sabbah, W., & Bernabé, E. (2017). Does tooth loss affect dietary intake and nutritional status? A systematic review of longitudinal studies. *Journal of Dentistry, 67*, 1–8. https://doi.org/10.1016/j.jdent.2017.10.012

Gupta, R., Gupta, N., & Weber, D. K. K. (2023). Dental implants. *NCBI Bookshelf*. https://www.ncbi.nlm.nih.gov/books/NBK470448/

Hu, Y., Stewart-Brown, S., Twigg, L., & Weich, S. (2007). Can the 12-item General Health Questionnaire be used to measure positive mental health? *Psychological Medicine, 37*(7), 1005–1013. https://doi.org/10.1017/s0033291707009993

Hung, H.-C., Willett, W., Ascherio, A., Rosner, B. A., Rimm, E., & Joshipura, K. J. (2003). Tooth loss and dietary intake. The *Journal of the American Dental Association, 134*(9), 1185–1192. https://doi.org/10.14219/jada.archive.2003.0353

Joo, J., Williamson, S. A., Vazquez, A. I., Fernandez, J. R., & Bray, M. S. (2019). The influence of 15-week exercise training on dietary patterns among young adults. *International Journal of Obesity, 43*(9), 1681–1690. https://doi.org/10.1038/s41366-018-0299-3

Kamyab, N., Kamalabadi, Y. M., & Fathollahi, M. S. (2021). DMFT of the first permanent molars, DMFT and related factors among all first-grade primary school students in Rafsanjan Urban Area. *Journal of Dentistry, 22*(2), 109–117. https://doi.org/10.30476/dentjods.2020.85573.1136

Kimmie-Dhansay, F., Pontes, C. C., Chikte, U. M. E., Chinhenzva, A., Erasmus, R. T., Kengne, A. P., & Matsha, T. E. (2021). Impacts of tooth loss on ohrqol in an adult population in Cape Town, South Africa. *International Journal of Environmental Research and Public Health, 18*(9), 4989. https://doi.org/10.3390/ijerph18094989

Kossioni, A. (2018). The association of poor oral health parameters with malnutrition in older adults: A review considering the potential implications for cognitive impairment. *Nutrients, 10*(11), 1709. https://doi.org/10.3390/nu10111709

Liang, Y., Wang, L., & Yin, X. (2016). The factor structure of the 12-item general health questionnaire (GHQ-12) in young Chinese civil servants. *Health and Quality of Life Outcomes, 14*. https://doi.org/10.1186/s12955-016-0539-y

Lin, X., & Li, H. (2021). Obesity: Epidemiology, pathophysiology, and therapeutics. *Frontiers in Endocrinology, 12*. https://doi.org/10.3389/fendo.2021.706978

Moradi, G., Bolbanabad, A. M., Moinafshar, A., Adabi, H., Sharafi, M., & Zareie, B. (2019). Evaluation of oral health status based on the decayed, missing and filled teeth (DMFT) index. *Iranian Journal of Public Health, 48*(11), 2050–2057.

Nadelman, P., Magno, M. B., Pithon, M. M., Castro, A. C. R. de, & Maia, L. C. (2021). Does the premature

loss of primary anterior teeth cause morphological, functional and psychosocial consequences? *Brazilian Oral Research, 35*. https://doi.org/10.1590/1807-3107bor-2021.vol35.0092

Nazir, M. A. (2017). Prevalence of periodontal disease, its association with systemic diseases and prevention. *International Journal of Health Sciences, 11*(2), 72–80.

Ney, D. M., Weiss, J. M., Kind, A. J. H., & Robbins, J. (2009). Senescent swallowing: Impact, strategies, and interventions. *Nutrition in Clinical Practice: Official Publication of the American Society for Parenteral and Enteral Nutrition, 24*(3), 395–413. https://doi.org/10.1177/0884533609332005

Northridge, M. E., Kumar, A., & Kaur, R. (2020). Disparities in access to oral health care. *Annual Review of Public Health, 41*(1), 513–535. https://doi.org/10.1146/annurev-publhealth-040119-094318

Papaspyridakos, P., Chen, C.-J., Singh, M., Weber, H.-P., & Gallucci, G. O. (2011). Success criteria in implant dentistry. *Journal of Dental Research, 91*(3), 242–248. https://doi.org/10.1177/0022034511431252

Poedjiastoeti, W., Perwira Lubis, M. N., Ariesanti, Y., Farizka, I., Dipankara, J., & Inglam, S. (2022). Alveolar bones density assessment of dental implant sites using cone-beam computed tomography. *Padjadjaran Journal of Dentistry, 34*(3), 264. https://doi.org/10.24198/pjd.vol34no3.42383

Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and health: Psychological, behavioral, and biological determinants. *Annual Review of Clinical Psychology, 1*(1), 607–628. https://doi.org/10.1146/annurev.clinpsy.1.102803.144141

Shah, R. J., Diwan, F. J., Diwan, M. J., Chauhan, V. J., Agrawal, H. S., & Patel, G. C. (2015). A study of the emotional effects of tooth loss in an edentulous Gujarati population and its association with depression. *The Journal of the Indian Prosthodontic Society, 15*(3), 237-243. https://doi.org/10.4103/0972-4052.161564

Spruill, T. M. (2010). Chronic psychosocial stress and hypertension. *Current Hypertension Reports, 12*(1), 10–16. https://doi.org/10.1007/s11906-009-0084-8

Tadin, A., Poljak Guberina, R., Domazet, J., & Gavic, L. (2022). Oral hygiene practices and oral health knowledge among students in Split, Croatia. *Healthcare, 10*(2), 406. https://doi.org/10.3390/healthcare10020406

Takemae, R., Uemura, T., Okamoto, H., Matsui, T., Yoshida, M., Fukazawa, S., Tsuchida, K., Teruya, K., & Tsunoda, T. (2012). Changes in mental health and quality of life with dental implants as evaluated by General Health Questionnaire (GHQ) and Health Utilities Index (HUI). *Environmental Health and Preventive Medicine, 17*(6), 463–473. https://doi.org/10.1007/s12199-012-0275-9

World Health Organization. (2019). Oral health. *World Health Organization: WHO*. https://www.who.int/health-topics/oral-health#tab=tab_1