OPEN ACCESS

Saudi Journal of Oral and Dental Research

Abbreviated Key Title: Saudi J Oral Dent Res
ISSN 2518-1300 (Print) |ISSN 2518-1297 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

The Relationship between Fixed Prosthodontics and Gingival Problems: A Systematic Review

Dr. Hind Majed E. Alotaibi*, Dr. Laila Mohammad Alanazi, Dr. Waad Mohammed Alghamdi, Dr. Musab Majed E Alotaibi, Dr. Razan Salem Alzahrani, Dr. Rawan Nasser Almutairi, Dr. Ahmed Bin Sawad, Dr. Dalal Jumah Alturaif, Dr. Mohammed Ahmed Al Attas, Dr. Fatima Sultana

Department of Dentistry, Riyadh, Kingdom of Saudi Arabia

DOI: 10.36348/sjodr.2021.v06i08.006 | **Received:** 02.07.2021 | **Accepted:** 04.08.2021 | **Published:** 25.08.2021

***Corresponding author:** Dr. Hind Majed E. Alotaibi

Abstract

The specialization of dentistry dealing with the replacement of missing teeth is primarily considered as prosthodontics. Prosthodontics maybe divided into two types: fixed prosthodontics and removable prosthodontics. The fixed prosthodontics plays a crucial role in restoring the function and mastication of the teeth, restoring aesthetics of the face, maintaining integrity and health of the dental arch, and support temporomandibular joint (TMJ). Gingivitis, also known as the gum inflammation is a mild symptom reported after fixing of Fixed Denture Prostheses. Untreated gingivitis over the period of time with the development of bacteria can lead to periodontitis. Periodontitis is a serious gum disease that can damage the soft tissue and bone that can cause tooth loss. To search the online databases like MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL) and PubMed. All the articles in English language were selected to review. It was designed in accordance to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. About 10 articles were finalized manually by the investigators for full analysis based on their eligibility to the present topic of study. Various studies have accounted for the association between fixed prostheses and the gingival problem. The health of the gingiva can be determined by using the diagnostic tools like Plaque Index (PI) and Gingival Index (GI). While reviewing all the articles related to the gingival problems associated with the fixed prostheses, we found that there is lack of knowledge given to the patient related to maintaining the prostheses.

Keywords: Fixed Denture Prostheses, Gingivitis, Periodontitis, Gingival problems, periodontal disease, gum inflammation, plaque.

INTRODUCTION

The most common gingival problems that occur during the fixed prosthodontic treatment are gingivitis and periodontitis. Gingivitis, also known as the gum inflammation occurs much earlier then periodontitis, that's a kind of gum disease. Gingivitis is generally a mild symptom of the gingiva that is often ignored. When untreated, gingivitis can lead to big problems in the oral cavity. Mostly gingivitis is treated by following proper oral hygiene, like brushing your teeth twice a day, dental flossing, dental cleaning using mouthwash and dental checkup [1].

During the gingivitis at its early stage, bacteria develop in the plaque deposited on the teeth, leading to to inflammation and bleeding of the gums. At this phase, the gums are highly irritated but still planted inside the socket. The bacteria found in the plague buildup, release acid that dissolves the outer shell called enamel. Plaque turns into tartar in approximate 72 hours, making it difficult to clean the gums and teeth completely [2].

Gingivitis is commonly a non-destructive gingival problem that when left untreated can progress into periodontitis. The gingival disease is basically of two types: Plague induced and non-plaque induced. The common causes and risk factors associated with the development of gingival diseases are: menopause, menstrual cycle, pregnancy, puberty; and some diseases like diabetes, cancer and HIV; few anticonvulsant and anti-angina drugs; chain smokers; old age people; deficiency of vitamin c; and hereditary factors. The early signs and symptoms of gingivitis may be halitosis, red or purple gums, inflamed gums, bleeding while brushing or flossing; soft and receding gums. If left untreated, the gum diseases can lead to several

complications like development of infection and formation of abscess in the jaw bone, reoccurring gingivitis and trench mouth which is associated with ulceration of gums[3].

Periodontitis is a serious gum disease that can damage the soft tissue and the bone that can cause tooth loss. Untreated gingivitis over the period of time with the development of bacteria can lead to periodontitis. The common symptoms related to periodontitis are: the gums become tender, swollen, with bright red or purple coloured gums; with gum bleeding, loss of teeth or loose teeth, formation of pus between teeth and gums, development of new spaces between the teeth, receding gums, counting of blood while brushing for dental floss, pain while chewing. The common causes for the development of periodontitis is the formation of plaque on the teeth, that may result in the formation of tartar or calculus, leading to gingivitis, and untreated gingivitis may lead to periodontitis.

The risk factors associated with the development of periodontitis are genetics; obesity; lack of Nutrition especially Vitamin C deficiency, gingivitis, poor oral hygiene, chain smoking and consumption of tobacco, conditions like leukaemia, HIV, diseases like rheumatoid arthritis, diabetes and crohn's disease, hormonal imbalance due to pregnancy or menopause, certain medications that can cause Xerostomia [4]. The major complication of periodontitis is losing of permanent teeth or loosening of teeth; periodontitis is often linked with rheumatoid arthritis, coronary artery disease, respiratory disease and diabetes. The other parts of the body might be affected by the bacteria that cause periodontitis, as it enters into the bloodstream via gum tissue. Periodontitis can be prevented by maintaining good oral hygiene and having regular dental checkups for every six months and treating of gingivitis. In severe cases the treatment can be done using antibiotics or dental surgery. In a survey conducted in the United States of America nearly 70% of the the people are affected with periodontitis who are above 65 years of age. Globally, males are more often affected by periodontitis when compared to the females [5].

The specialization of dentistry dealing with the replacement of missing teeth is primarily considered as prosthodontics. Prosthodontics maybe divided into two types: fixed prosthodontics and removable prosthodontics. In case of removable prosthodontics, the dental device can be removed for cleaning. and in fixed prosthodontics, the replaced teeth are permanently fixed inside the oral cavity. Mostly the devices used to replace the teeth permanently are a non-biological material. The fixed prosthodontics plays a crucial role in restoring the function and mastication of the teeth, restoring aesthetics of the face, maintaining integrity and health of the dental arch, and support temporomandibular joint (TMJ) [6].

The various types of cast restorations are: porcelain veneers, inlay, onlay, porcelain fused to metal crown, full crown, fixed Bridge, three quarter crown, and resin bonded bridge. The basic components of a fixed prosthodontic denture contains abutment, pontic, retainer and connector [7]. The advantages of using a metal crown is that it provides high strength, great resistance form, good protection for a tooth to be restored, modification of occlusion in case of over eruption, modification of root in case of open contact, great retention and ideal restoration for teeth with development defects. A few disadvantages reported by using the fixed prosthodontics restoration is that it can give bad aesthetic, no detection of pulp vitality and incipient caries and extensive tooth reduction. In spite of the fact that the dental implants are so popular in the present day, the removable prosthodontic appliances are commonly used, especially in developing countries. Therefore a proper formulation of effective methods to enhance the dental awareness related to the periodontal problems associated with the fixed prosthodontics is required.

METHODOLOGY

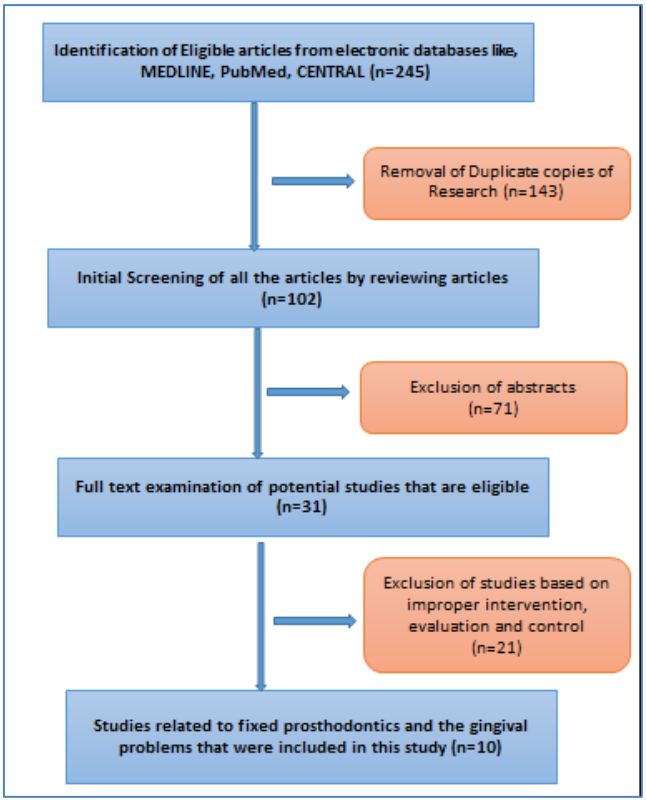
Study Protocol: The protocol for the study of association between the fixed prosthodontics and the gingival health was designed in accordance to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.

Inclusion Criteria: It is a type of study with Systematic review of literature related to the association between fixed prosthodontics and gingival problems. The articles included in this study need to have a fixed prostheses, it need to be in English language, the articles need to be peer reviewed, the participants that reported periodontal diseases after the fixed prostheses, and the participants of the study need to be adults.

Strategy of Search: To search the online databases like MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL) and PubMed were used. All the articles in English language were selected to review. The MeSH terms related to fixed prosthodontics and gingival diseases were selected.

RESULTS

Selection of Articles: About 245 potentially related articles that studied the gingival problems associated with fixed prosthodontics were selected from the electronic data-bases like CENTRAL, MEDLINE and PubMed. Applying filters, 102 articles were short listed. Later only 31 articles were identified according to the eligibility criteria. Incomplete articles with only abstracts were removed from the study. About 10 articles were finalized manually by the investigators for full analysis based on their eligibility to the present topic of study. Any disagreements between the investigators were resolved by consensus.



Around 143 articles were removed as they were duplicate copies of research when all the results from the databases were compared. 71 articles had only abstracts and the complete article was not available for study and 21 articles were excluded based on improper intervention, evaluation and control. Thus only 10 articles met the eligibility criteria for reviewing the literature related to gingival problems associated with fixed denture prostheses.

Author's Name	Year of Publication	Journal Name	Investigation done on	Findings of the Investigation	Outcome to the findings
Abduo J, Lyons KM	2017	Periodontol 2000	Interdisciplinary interface between fixed prosthodontics and periodontics.	Adequate oral hygiene are essential for longevity of the prosthesis, and regular reviews provide an opportunity for early detection and treatment of failures.	To avoid an unsatisfactory treatment outcome, may require extensive and expensive retreatment
Bluma E, Vidzis A, Zigurs G	2016	Stomatologija	The influence of fixed prostheses on periodontal health.	Aesthetical outcome of soft tissue health could be improved in case of mucosa around implants and extraction sites, crown gingival connection	To obtain a maximum aesthetic effect and prostheses strength, the hygienic possibilities may be disregarded
Ercoli C, Tarnow D, Poggio CE, Tsigarida A, Ferrari M, Caton JG, Chochlidakis K.	2021	J Prosthodont.	The Relationships Between Tooth-Supported Fixed Dental Prostheses and Restorations and the Periodontium	Periodontal diagnostic criteria should be thoroughly reviewed before fixed restorative treatments are planned and executed.	To critically evaluate the findings on the periodontal outcomes of restorations and tooth-supported fixed prostheses
Lulic M, Brägger U, Lang NP, Zwahlen M, Salvi GE	2007	Clin Oral Implants Res.	a systematic review on survival rates and complications of fixed dental prostheses (FDPs) on severely reduced periodontal tissue support.	These results showed that (i) masticatory function could be established and maintained in subjects receiving fdps on abutment teeth with severely reduced but healthy periodontal tissue support and (ii) fdps survival rates compared favourably with those of fdps incorporated in subjects without severely periodontally compromised dentitions.	To systematically review the impact of severely reduced, but healthy periodontal tissue support on the survival rate and complications of fdps after a mean follow-up time of at least 5 years.

Goodacre CJ, Bernal G, Rungcharassaeng K, Kan JY	2003	J Prosthet Dent	Clinical complications with implants and implant prostheses	The most common implant complications (those with a greater than a 15% incidence) were loosening of the overdenture retentive mechanism (33%), implant loss in irradiated maxillae (25%), hemorrhage-related complications (24%), resin veneer fracture with fixed partial dentures (22%), implant loss with maxillary overdentures (21%), overdentures needing to be relined (19%), implant loss in type iv bone (16%), and overdenture clip/attachment fracture (16%).	To identify the types of complications that have been reported in conjunction with endosseous root form implants and associated implant prostheses.
Knoernschild KL, Campbell SD	2000	J Prosthet Dent	Periodontal tissue responses after insertion of artificial crowns and fixed partial dentures	Clinically deficient restorations, as well as clinically acceptable restorations, can contribute to gingival inflammation.	To critically evaluate published evidence on the effects of artificial crowns and fixed partial dentures (fpds) on adjacent periodontal tissue health
Dina MN, Mărgărit R, Andrei OC.	2013	Rom J Morphol Embryol.	Pontic morphology as local risk factor in root decay and periodontal disease.	In cases of single unit bridges with very narrow pontics, even in patients with a very good oral hygiene and metal-ceramic restorations, we can still find micro-organisms that can potentially generate decay or periodontal disease on the abutments, located in the gingival area underneath these pontics. These bacteria can have negative implications on the long-term prognosis of prosthetic restorations.	To highlight the presence and the types of the microorganisms that can be found under the pontic even in an ideal situation
Erpenstein H.	1986	Int Dent J.	The role of the prosthodontist in the treatment of periodontal disease	If optimum prospects for oral hygiene have been created by good coordination between the periodontist and the prosthodontist, the prognosis in the maintenance phase is considerably improved.	The inter-relationships between the periodontal situation of a patient and a prosthetic appliance should be regarded in particular from the aspect of oral hygiene.
Seibert JS, Cohen DW.	1987	Dent Clin North Am.	Periodontal considerations in preparation for fixed and removable prosthodontics.	It is probably true that prosthodontists are more sensitive to the emotional concerns and needs of patients that have sustained ridge-jaw deformities.	The newer concepts and techniques that have been developed to treat a problem that has been of major concern to the prosthodontist: The problem of favorable periodontal support and poor or deformed edentulous ridges.
Mojon P, Rentsch A, Budtz-Jørgensen E	1995	Int J Prosthodont.	Relationship between prosthodontic status, caries, and periodontal disease in a geriatric population.	Indicates the importance of oral hygiene instruction and regular recalls among removable partial denture wearers.	To evaluate the influence of prosthodontic status on caries a and periodontal disease in a hospitalized population of elderly people.

Abduo J, Lyons KM; studied about Interdisciplinary interface between fixed prosthodontics and periodontics and reported that adequate oral hygiene are essential for longevity of the prosthesis [8]. Bluma E, Vidzis A, Zigurs G; studied the influence of fixed prostheses on periodontal health, and reported that aesthetical outcome of soft tissue health could be improved in case of mucosa around implants and extraction site [9]. Ercoli C, Tarnow D, Poggio CE, Tsigarida A, Ferrari M, Caton JG, Chochlidakis K, studied the relationships between tooth-supported fixed dental prostheses, restorations, periodontium; and

confirmed Periodontal diagnostic criteria should be thoroughly reviewed before fixed restorative treatments are planned and executed [10]. Lulic M, Brägger U, Lang NP, Zwahlen M, Salvi GE carried out a systematic review on survival rates and complications of fixed dental prostheses (FDPs) on severely reduced periodontal tissue support and stated that FDPs survival rates is favourable with those of FDPs incorporated in subjects without severely periodontally compromised dentition's [11]. Goodacre CJ, Bernal G, Rungcharassaeng K, Kan JY studied the Clinical complications with implants and implant prostheses, and reported the conjunction of endosseous root form implants and associated implant prostheses with gingival problems [12]. Knoernschild KL, Campbell SD, reviewed Periodontal tissue responses after insertion of artificial crowns and fixed partial dentures and stated that Clinically deficient restorations, as well as clinically acceptable restorations, can contribute to gingival inflammation [13].

Dina MN, Mărgărit R, studied Andrei OC. Pontic morphology as local risk factor in root decay and periodontal disease and confirmed that the bacteria developing in the pontics can have negative implications on the long-term prognosis of prosthetic restorations [14]. Erpenstein H. did a study on the role of the prosthodontist in the treatment of periodontal disease and reported that if optimum prospects for oral hygiene have been created by good coordination between the periodontist and the prosthodontist, the prognosis in the maintenance phase is considerably improved [15].

Seibert JS, Cohen DW did research on Periodontal considerations in preparation for fixed and removable prosthodontics and stated that It is probably true that prosthodontists are more sensitive to the emotional concerns and needs of patients that have sustained ridge-jaw deformities [16]. Mojon P, Rentsch A, Budtz-Jørgensen E had reviewed the literature related to relationship between prosthodontic status, caries, and periodontal disease in a geriatric population and concluded the importance of oral hygiene instructions and regular recalls among removable partial denture wearer [17]. Thus with the systematic review of all the above mentioned articles, we can state that there is an association of Fixed denture prostheses with gingival disease in patients lack knowledge about oral hygiene, dental flossing and use of an antiseptic mouth wash.

DISCUSSION

In the present study, a search strategy using the MeSH terms for the systematic review was done. During this research, the studies with participants less than 18 years was excluded because there were very few or almost negligible cases of prosthodontics and gingival disease in small children. For restoring the health of the oral tissues, fixed prostheses is the best known dental clinical practice used.

The fixed prostheses appliance is made up of various materials like, ceramics, metal and metal fused to porcelain [18]. Many risks factor may account for the failure of the fixed prostheses. One of the commonly reported biological complications are the gingival diseases or periodontal diseases.

Mostly the periodontal/gingival diseases occur due to the development of bacteria in the plaque deposited on the teeth, poor oral hygiene and infrequent visits to the dentist for maintenance therapy [19]. Apart from the bacterial plaque accumulated on the teeth, the other factor for the failure of the fixed prostheses may be ill-fitted prostheses and over-hanging crowns.

Various studies have accounted for the association between fixed prostheses and the gingival problem. The health of the gingiva can be determine by using the diagnostic tools Plaque Index (PI) and Gingival Index (GI). The Plaque Index and Gingival Index between 0 and 1 is considered to be satisfactory. It was also reported in other studies that taking professional advice from the dental doctor with instructions and re-instructions contribute to the overall good health of the gums [20].

Also a study reported that galvanoceramic crowns have good stabilizing effect and is more favourable to the gingival health of the oral cavity. Periodontal diseases and the formation of dental abscess is attributed to the poor oral hygiene after the fixed prosthodontics appliances [21]. In a study carried out in Saudi Arabia, it was reported that 47% of the patients did not receive any oral hygiene instructions after placement of the Fixed Denture prostheses from their dental specialist [22].

Thus it is very crucial to evaluate the complications and success of the the fixed prosthesis. Hence the present topic was selected to understand the relationship between the fixed prosthodontics and gingival problems by carrying out a systematic review of the literature available online. With this, we can improve doctors ability to plan the most suitable treatment, realistic expectations and formulation to maintain fixed prosthesis in the patient. Scurria reported the survival rate of fixed prostheses to 92% for 10 years and 75% for 15 years.

With this study we could conclude that one of the common complication or risk factor associated with the fixed prostheses is the periodontal diseases or gingival diseases. Despite many investigations carried out to examine the failure and complications of fixed prosthesis, the present topic of studying the relationship between the fixed prosthodontics and gingival problems was not done and much research is required in this

field. Various studies in this systematic review reported the high prevalence of the gingival or periodontal problems associated with fixed prosthodontics to poor oral hygiene and lack of professional maintenance therapy.

CONCLUSION

While reviewing all the articles related to the gingival problems associated with the fixed prostheses, we found that there is lack of knowledge given to the patient related to maintaining the prostheses. Proper instructions need to be given by the dental practitioner to the patient for tooth cleaning using electronic brushes, dental floss and use of antiseptic mouth washes. The patients using the Fixed denture prostheses need to be made aware about the super floss in order to reduce the gingival problems. The dental practitioners need to be emphasized about following the proper guidelines to instruct the patient after applying fixed prostheses. Follow-up, re-examination and re-instructions by the doctor had to be improved to reduce the incidence of gingival problems after FDP. The doctor also needs to keep a track of other medical conditions of the patients for better results of dental treatment.

More workshops and training need to be given in this field to the doctor for better understanding of post-operative care in case of FDP.

REFERENCES

1. Øzhayat, E. B., & Gotfredsen, K. (2019). Patient-reported effect of oral rehabilitation. *Journal of oral rehabilitation*, *46*(4), 369-376.
2. Saito, T., & Shimazaki, Y. (2007). Metabolic disorders related to obesity and periodontal disease. *Periodontology 2000*, *43*(1), 254-266.
3. Valderhaug, J., & Heloe, L. A. (1977). Oral hygiene in a group of supervised patients with fixed prostheses. *Journal of periodontology*, *48*(4), 221-224.
4. Ferencz, J. L. (1991). Maintaining and enhancing gingival architecture in fixed prosthodontics. *The Journal of prosthetic dentistry*, *65*(5), 650-657.
5. Silness, J. (1980). Fixed prosthodontics and periodontal health. *Dental Clinics of North America*, *24*(2), 317-329.
6. Wunderlich, R. C., & Caffesse, R. G. (1985). Periodontal aspects of porcelain restorations. *Dental clinics of North America*, *29*(4), 693-703.
7. Bral, M. (1989). Periodontal considerations for provisional restorations. *Dental Clinics of North America*, *33*(3), 457-477.
8. Abduo, J., & Lyons, K. M. (2017). Interdisciplinary interface between fixed prosthodontics and periodontics. *Periodontology 2000*, *74*(1), 40-62.
9. Bluma, E., Vidzis, A., & Zigurs, G. (2016). The in. fluence of fixed prostheses on periodontal health. *Stomatologija*, *18*(4), 112-21.
10. Ercoli, C., Tarnow, D., Poggio, C. E., Tsigarida, A., Ferrari, M., Caton, J. G., & Chochlidakis, K. (2021). The Relationships Between Tooth- Supported Fixed Dental Prostheses and Restorations and the Periodontium. *Journal of Prosthodontics*, *30*(4), 305-317.
11. Lulic, M., Brägger, U., Lang, N. P., Zwahlen, M., & Salvi, G. E. (2007). Ante's (1926) law revisited: a systematic review on survival rates and complications of fixed dental prostheses (FDPs) on severely reduced periodontal tissue support. *Clinical Oral Implants Research*, *18*, 63-72.
12. Goodacre, C. J., Bernal, G., Rungcharassaeng, K., & Kan, J. Y. (2003). Clinical complications with implants and implant prostheses. *The Journal of prosthetic dentistry*, *90*(2), 121-132.
13. Knoernschild, K. L., & Campbell, S. D. (2000). Periodontal tissue responses after insertion of artificial crowns and fixed partial dentures. *The Journal of prosthetic dentistry*, *84*(5), 492-498.
14. Dina, M. N., Mărgărit, R., & Andrei, O. C. (2013). Pontic morphology as local risk factor in root decay and periodontal disease. *Rom J Morphol Embryol*, *54*(2), 361-364.
15. Erpenstein, H. (1986). The role of the prosthodontist in the treatment of periodontal disease. *International dental journal*, *36*(1), 18-29.
16. Seibert, J. S., & Cohen, D. W. (1987). Periodontal considerations in preparation for fixed and removable prosthodontics. *Dental Clinics of North America*, *31*(3), 529-555.
17. Mojon, P., Rentsch, A., & Budtz-Jørgensen, E. (1995). Relationship between prosthodontic status, caries, and periodontal disease in a geriatric population. *International Journal of Prosthodontics*, *8*(6).
18. Alrumyyan, A., Quwayhis, S., Meaigel, S., Almedlej, R., Alolaiq, R., Nafesah, R. B., ... & Alzamil, S. (2020). Oral health–related quality of life and oral hygiene practice of adults with fixed dental prostheses in Riyadh, Saudi Arabia. *Journal of International Society of Preventive & Community Dentistry*, *10*(1), 62.
19. Alkahtani, F. H., Baseer, M. A., Ingle, N. A., Assery, M. K., Al Sanea, J. A., AlSaffan, A. D., & Al-Shammery, A. (2019). Oral Health Status, Treatment Needs and Oral Health Related Quality of Life among Hearing Impaired Adults in Riyadh City, Saudi Arabia. *The journal of contemporary dental practice*, *20*(6), 744.
20. Alkhadra, T. (2017). Prevalence of dental caries and oral hygiene status among juvenile prisoners in the kingdom of Saudi Arabia. *The journal of contemporary dental practice*, *18*(11), 991-5.
21. Özhayat, E. B., & Gotfredsen, K. (2012). Effect of treatment with fixed and removable dental prostheses. An oral health- related quality of life study. *Journal of oral rehabilitation*, *39*(1), 28-36.
22. Özhayat, E. B., & Gotfredsen, K. (2013). Oral health-related quality-of-life in patients to be treated with fixed or removable partial dental prostheses. *Acta Odontologica Scandinavica*, *71*(1), 113-119.