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The Effectiveness of Oral Hygiene Education on Oral Health-Related Quality of Life of Adolescent Orthodontic Patients: A Review

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ABSTRACT

In recent years, as the flourish of oral hygiene education, concern for oral health and aesthetic needs has signif-icantly increased. Consequently, more and more adolescents have joined the ranks of orthodontic treatment. The oral health-related quality of life during orthodontic treatment has been increasingly valued by patients and their families. Oral hygiene education has a comprehensive positive impact on the oral health-related quality of life, including physical function, psychological function, social function et al., which makes it the focus for oral nursing surveys. Adolescents' special physiological and psychological state renders them more prone to perio-dontal diseases, which means teenagers are the group that needs assistance above all. This article summarizes its current research status on the relationship between oral hygiene education and adolescent orthodontic patients' oral health-related quality of life, also, previous evaluation scales of oral health-related quality of life for adolescents, in a bid to provide ideas for the future development of oral hygiene education.

Introduction

In China, the incidence rate of malocclusion among children and adolescents amounts to 67.82% (Chen, 2017). Two main causes of malocclusion are genetic factors and environmental factors, such as enamel demineralization, periodontitis, bad oral habits et al. (Fu et al., 2002). Adolescence (12 to 18) is the best age stage for orthodontic treatment, correction of malocclusion and early preven-tion of bony deformity, because of their malleable bones and better healing abilities. (Liu et al., 2019).

Oral hygiene education, as a type of health education, aims to disseminate oral health knowledge and information to the public, which can enhance people's ability of protecting the oral hygiene condition of themselves and others. Lectures, on-site teaching, websites, videos, even social appli-cations have now become approaches for popularizing oral hygiene education. Teeth misalignment caused by genetic factors is permanent, but environmental factors can be improved through scien-tific methods to prevent teeth misalignment and oral diseases. Besides, the main causes of gum diseases are undesirable oral habits and lack of oral hygiene knowledge. Therefore, oral hygiene education, have an essential function in boosting patients' oral health-related quality of life during orthodontic therapy. Adolescents, who are in the physiological stage of continuous growth and psychological state of extreme instability, require different modes of education to adults. This arti-cle attempts to briefly discuss the consequence of oral hygiene education on the quality of life as-sociated with oral health of adolescent orthodontic patients according to their oral hygiene condi-tions and living standards, as well as obtaining theoretical knowledge for future health education and more comfortable preventive treatment for adolescent orthodontic patients.

Discussion

Oral Hygiene Education

The World Health Organization regards health education as “any combination of learning experi-ences intended to assist individuals and communities in improving their health by augmenting their knowledge or affecting their atti-tudes.” Health education strives to strengthen knowledge, atti-tudes, and skills to positively influence health behaviors of individuals and communities, since knowledge by itself may not be potent enough to motivate change, which pre-vents the occur-rence and spread of disease (WHO, 1998). Oral hygiene education, a kind of health education, fo-cuses on the publicity of oral health maintenance, the formation of proper lifestyle and habits, the prevention of gum diseases.

Various forms of oral hygiene education have emerged in order to satisfy the requirements of all kinds of patients. One worldwide way of oral hygiene education is the direct explanation of oral care knowledge and the ap-propriate demonstration of oral hygiene upkeep during orthodontic treatment. Its extensive use benefits from its facil-ity and universality. Plus, lectures and on-site teaching, representations of large-scale education, have notable effect among children and the elderly. Personalized education, formulated comprehensively based on various factors such as pa-tients' oral health condition, compliance, self-control and requirements, is the most effective method which fully mobilized patients’ initiation (Ke et al., 2018). However, its impracticality, is of major concern to dentists, because customizing a particular education mode for each patient seems to be laborious and cumbersome. Utilizing informati-zation platforms for oral health educa-tion, by contrast, is more efficient. Informatization health education is a planned, scientific and sys-tematic way of health education, which creates a resultful mechanism for nurse-patient communi-cation. Carrying out oral health education based on the social applications has the characteristics of timeliness, con-venience and interactivity. It can promptly answer patients' questions and offer cor-responding guidance at each stage of treatment, timely handle various emergencies during the cure period, prompt patients to cooperate with the nursing work, and provide a guarantee for the continuity and effectiveness of the treatment work (Zhao, 2018; Deng, 2016). The survey carried out by Xu (2021) revealed that the implementation of health education on the WeChat platform serves as the continuation and supplementation of in-hospital nursing work, thus competently im-prove the therapeutic effect. Due to its superiorities, digital health education is progressively turn-ing into the mainstream of health knowledge popularization.

Oral Health-Related Quality of Life of Adolescent Orthodontic Patients

Oral health-related quality of life (OHRQoL), a multi-dimensional concept, including subjective evaluations of per-sonal oral health, functional health, social and emotional health, self-image, ex-pectation and satisfaction (Shi, 2020). Oral health is an essential part of a person's holistic health. Thus, a person's quality of life will be degraded dramati-cally with undesirable oral health and expe-rience detriments of appearance, pronunciation, eating and social interac-tion. However, orthodon-tic treatment in any form will have negative impacts on OHRQoL. In addition to a dramatic increase in the incidence of enamel demineralization and puberty gingivitis, it may also result in an escala-tion in anxiety level and pain perception among juveniles (Lai et al., 2022). Therefore, a crucial por-tion of clinical work is showing concern for maintaining the oral health-related quality of life of ado-lescent orthodontic patients during the therapeutic process (De Oliveira et al., 2004; Hakami et al., 2020).

Adolescents, as the core group of orthodontic therapy, have a unique physiological and psychologi-cal state, plus, a close relationship exists between biological development and mental health (Guo et al., 2018). Physiologically, they are in the high-incidence period of caries, enamel demineraliza-tion, puberty gingivitis, as well as harmful oral habits; psychologically, adolescents’ poor compli-ance, inferior oral self-cleaning ability, prominent negative emo-tions, and labile psychological states differentiate them from adult patients. Thus, juveniles have higher probability of

complica-tions, like enamel demineralization, periodontal tissue lesions, mucosal ulcers, root resorption, and pain perception during orthodontic treatment. These symptoms, along with oral health-related quality of life comprising patients' physical feelings, emotional state, and social activities are usually directly or indirectly related (Li et al., 2019). Hence, paying attention to the physical and mental health of adolescent patients, augmenting OHRQoL by improving their oral health self-management capability through oral health education which leads to the amelioration of orthodon-tic treatment effect, will become an inevitable trend for oral nursing care.

Previous Evaluation Scales of Oral Health-Related Quality of Life for Adolescents

With the extensive development of orthodontics, assessing orthodontic cure' s effectiveness on the OHRQoL of teen-agers grow over more unignorable. The utilization of relevant scales helps to evaluate the various impacts of ortho-dontic treatment comprehensively and objectively. Besides, it also reflects the variations in patients' subjective feel-ings, psychological activities and social be-haviors during the treatment. In order to conduct reliable evaluations of specific activities, behav-iors, social relationships and psychometric aspects of patients, a variety of evaluation scales for oral health-related quality of life of adolescents have been designed.

Speaking of evaluation scales for oral health-related quality of life of adolescents, COHQoL (child oral health questionnaire), originally designed to analyze clinical trials and appraise research results, comes to my mind (Hassan et al., 2010). It assesses the oral health-related quality of life of children ranging from 6 to 14 years old. P-CPQ (parents-child perceptibility questionnaire) for parents or guardians and CPQ (child perceptibility questionnaire) to-gether form COHQoL. Furthermore, Child-OIDP (child-oral impact on daily performance), which evolved from the DLOIS (daily life oral impact scale), quantitatively evaluates how the daily behaviors of 11-12-year-old children can be impacted by oral problems through interviews (Marshman et al., 2007). Child-OIDP principally includes the fol-lowing eight aspects: language and clear pronunciation, eating, oral cleaning, sleeping, emotions, smiling, learning, and other social communication and contact. Moreover, COHIP (child oral health impact profile) involves 34 ques-tions and contents in 5 fields, mainly investigating oral symptoms, functional status, social and emotional status, campus environment, and self-image (O' Brien et al., 2007). This scale has good item reliability and test-retest relia-bility when applied to children aged 8-15. Evolved from definite theoretical oral health-related quality of life models, COHQoL and Child-OIDP, containing the content of psychometric assessment, are widely used. COHIP and Child-OIDP belong to oral disease-specific scales, which emphasize the effect of oral diseases on living quality, comprising the current situation of buccal illnesses, the impact of oral diseases on psychology and daily activities, and patients' satisfaction. Consequently, they have been broadly applied in oral ep-idemiological research and clinical evaluation research.

The Influence of Oral Hygiene Education on The Oral Health-Related Quality of Life of Adolescent Orthodontic Patients

Oral Hygiene Education and Puberty Gingivitis

Gingivitis is relatively common among children and adolescents, with a high prevalence rate ranging from 44.3%. Gingivitis begins at the age of 5, then its morbidity and severity gradually increase with age, reaching a peak during adolescence (Xue et al., 2024). Due to changes in sex hormones in the body, adolescents have a drastic response to bacterial stimulation, which can cause puberty gingivi-tis. An important factor in the occurrence of gingivitis is the accumulation of dental plaque (Lu et al., 2008). Tiainen L et al. (1992) attest that the onset of puberty gingivitis is associated with oral hygiene conditions during gingival inflammation. During adolescence, owing to the replacement of permanent teeth, irregular dentition, mouth breathing and wearing orthodontic appliances, ardu-ous tooth cleaning becomes an issue. Coupled with the fact that patients of this age generally do not attach importance to good oral hygiene habits, it is uncomplicated to cause the accumulation of plaque and induce gingivitis.

Previous surveys have found that adolescent orthodontic patients are more prone to oral health problems than adults, and their oral health self-management ability is feebler than that of adults (Liu et al., 2018). Prior studies have shown that oral health self-government skills are primarily as-sociated with an individual's oral health knowledge, attitude and behavior (Alexandre et al., 2021; Zhang et al., 2023;). The research on the oral self-care behavior of orthodontic patients conducted by Yujuan Yao et al. indicates that the oral self-care behavior of orthodontic patients is affected by many factors such as orthodontic knowledge, self-efficacy, and family care. Judith E. N. Albino et al. (1991) believe that regarding the cooperative behavior of adolescent orthodontic patients, par-ents' attitudes are the best symptom for predicting their treatment cooperation. Jinlian Huang (2011) manifest that family intervention can also affect the oral health of orthodontic patients. The research results of these two scholars all exhibit that the oral health self-management capability is influenced by the parents of teenagers, which conforms to the research results of Siwei Liu. The research on the health self-control ability of patients with periodontitis conducted by Yanliang Zheng et al. (2015) found that the low oral health self-regulatory faculty of patients with periodon-titis is determined by both the patient's disease cognition level and the social support level. There-fore, oral hygiene self-management competence of young individuals receiving orthodontic care is not only affected by their own factors such as self-awareness, treatment attitude, self-efficacy, and cooperative behavior, but also the attitude and care of parents and other non-negligible social support. Apparently, promote oral health education in collaboration with parents is an operative method to improve the oral health self-regulation faculty of adolescents, prevent oral hygiene dis-eases, and enhance their living quality connected with oral health condition.

Medical staff often focus on three aspects: tooth cleaning, rational diet, and regular follow-up ex-amination. Periodic oral hygiene conservation, including tooth brushing, which can remove plaque and thus maintain gum health, and dental floss, which has an irreplaceable role in eliminating plaque on adjacent surfaces (Sambunjak et al., 2019), can forestall puberty gingivitis. The Bass method or the Rolling method are internationally recognized scientific tooth-brushing methods cur-rently. The Bass method, also known as the sulcus cleaning method, mainly cleans the teeth by vibrating the toothbrush back and forth, paying close attention to getting under the gumline. The Rolling method, also known as the rotary toothbrushing method, mainly cleans the teeth by mak-ing small circular rotary movements of the toothbrush towards the crown. Toothbrushing methods vary from person to person. Some studies suggest that the Rolling method is easy to master, espe-cially for eradicating plaque in the posterior teeth area (Xu et al., 2003). Conducting oral health ed-ucation for patients and teaching them the correct way of using tooth brushes, dental floss and interdental brushes, thereby sustaining healthy oral hygiene habits and developing teenagers' self-management capacity which effectively reduce the incidence of gingivitis. On the other hand, adolescents often like sweets but hardly pay attention to brushing and rinsing their teeth after eat-ing. The amassment of food leads to an increase in bacteria and soft dirt piled up on the tooth sur-face, resulting in plaque and causing gingivitis. Therefore, correct eating habits are of great signifi-cance for the preservation of oral health. It is dispensable to have a balanced diet, rinse the mouth after meals, and stop eating before sleep. Meanwhile, parental synchronous empowerment inter-vention is crucial, which ensures the long-term implementation of the patient's oral hygiene maintenance. Mobilize the function of parents in supervision and guidance, strictly control pa-tients' diet and rectify their incorrect oral care behaviors to ensure the validity of patients' oral care approaches. In addition, regular follow-up examinations and further consolidating oral health edu-cation during the re-examination process have achieved remarkable results in the therapy of pu-berty gingivitis. During Haidong Mao (2015)' s research, as patients in the control group were treat-ed for 3 or 6 months, the patient's gingival index (GI), plaque index (PLI), and sulcus bleeding index (SBI) had all reached the level at the initial diagnosis (before treatment), while the indexes of the patients in the experimental group who received oral hygiene education remained low after 6 months of treatment. This indicates that oral health education and health guidance have a positive effect on the treatment and maintenance of the therapeutic effect of puberty gingivitis.

Oral Hygiene Education and Psychological State

Adolescence, also known as puberty, is the transitional period from childhood to adulthood. Gen-erally, during this stage (ages 12 to 18), physical development accelerates significantly, and it is con-sidered by orthodontists as the best

age for orthodontic therapy. At this time, all aspects of teen-agers' bodies develop rapidly and gradually mature, their self-awareness, which refers to an indi-vidual's recognition and apprehension of their own physical and mental conditions, emotions, thoughts, behaviors, as well as the relationships with others and the surrounding environment, also intensifies. Nevertheless, the progression of their psychology, although also improving speedi-ly, is relatively slower than the physiological development. The levels of physical development and psychological maturity are not synchronized, which may cause a series of psychological crises. Some scholars call this period the "second rebellious period". Facing various crises, teenagers' bod-ies and minds often have difficulty adjusting effectively, causing miscellaneous contradictions and conflicts in mental state. The main manifestations are the pursuit of maturity beyond their age, the desire to break away from parents and other adults, and simultaneously, the appetite for adult-like trust and respect from parents, schools and society (Wei, 2010). Furthermore, the personality characteristics, thinking patterns, cognitive abilities and social experiences of the adolescent group all reveal childishness. Their ways of thinking still have great superficiality and one-sidedness. The capability and level of logical thought are in the transitional period from empirical to theoretical. In terms of personality characteristics, they lack the willpower to withstand pressure and overcome difficulties while stable and profound emotional experiences haven' t appear yet. Additionally, ad-olescents are deficient in social experience because of their age. Adolescents occupy the largest proportion of malocclusion patients. They are in a sensitive period both physically and mentally. In conjunction with the abnormalities of the dentition and facial appearance caused by adolescent malocclusion and the influence of wearing orthodontic appliances, the psychology of the adoles-cent group is distinctive from that of ordinary people. Malocclusion not only affects the facial beau-ty and occlusal function of patients, but also causes certain psychological barriers to them, and even perturb the normal personality maturation of patients, ultimately affecting the OHRQoL.

Many studies on the attachment between orthodontic treatment and psychological factors of ado-lescents suggest that malocclusion not only affects the oral chewing function but also the facial aesthetics. Beautiful teeth and pleasing facial features can gain more opportunities in social com-petition. On the contrary, long-term social pressure may cause psychological disorders in those with appearance defects, affecting the formation of a good image and normal psychological devel-opment. Some domestic studies also show that the majority of orthodontic patients have a clear treatment goal, which is to align teeth and improve appearance. Only a small number of patients undergo treatment to further the chewing function. Jing Mao (2002) studied and investigated that the personality characteristics of children with malocclusion and that of normal children have nu-merous disparities. Children with deformities are often laughed at by their peers due to their phys-iological defects. Therefore, they show indifferent and fearful attitudes towards their families and society. Over time, they form a morbid personality tendency of either evasion or silence, suggest-ing that dental deformities exert a certain repercussion on the personality and psychological de-velopment of children.

Oral hygiene education combined with psychological intervention is one of efficacious method of solving this problem. Yongli Zhao et al. (2004), through a case-control study, found that the con-sciousness, initiative, self-discipline, treatment duration, and satisfaction of orthodontic treatment combined with psychotherapy were considerably better than those of the single orthodontic treatment group. Scholars Guofang Pu et al. (2023) is a typical example of adopting multiple psy-chological intervention methods. After admission, an active and enthusiastic reception is helpful to build a conversant relationship and lay the foundation for patients to maintain good compliance behavior. Implementing oral health knowledge education for patients through slideshows, videos, etc. can make up for the deficiencies of conventional oral education and enable patients to under-stand the impact of oral deformities on physical health more intuitively, arouse patients' attention to oral deformities, and thus accept and internalize educational knowledge and enhance compli-ance. By formulating a staged oral health knowledge education path, patients can receive continu-ous and standardized knowledge education content which is conducive to patients' improvement of relevant oral knowledge. After being discharged from the hospital, performing continual oral health education for patients through the social platform and sharing oral care knowledge regularly can improve patients' mastery of oral knowledge, cement patients' disease perception. Inviting patients who have succeeded in orthodontics to share their own experiences can not only arise patients' treatment confidence but also boost patients' consciousness of

spontaneously safe-guarding the oral hygiene, thus eschewing adverse events (Zhang et al., 2020; Almabadi et al., 2021). Moreover, at different stages of orthodontic treatment, taking targeted and staged psycho-logical intervention according to the patient's mental health status can potently regulate the pa-tient's negative psychological state and improve the rate of medical compliance. This research' s conclusion is similar to the research results of Juanjuan Liu et al. (2021), demonstrating that staged oral health education combined with psychological intervention is more advantageous in enhancing disease cognition and medical compliance behavior than conventional care. Because in clinical prac-tice, adolescents are the main group of orthodontics. Some patients generate feelings of boredom and anxiety due to the shortage of proper understanding of orthodontics and have low tolerance during the treatment, which influence compliance. Oral health education plays a vital role in the treatment, which can improve patients' apprehension of the disease and ensure that patients de-velop good behaviors. Plus, it can promote quick adaption to orthodontic appliance, make patients appreciate the changes in teeth and build up confidence, thereby improving the oral health-related quality of life of patients (Pu et al., 2023)

In addition, the effectiveness of oral hygiene education is not only reflected in the orthodontic process, adolescents who obtain good oral habits and compliance from oral health education will have more benefits in the future. Min Chen et al. (2008) conducted tests with the Children's Self-esteem Scale on adolescent patients with malocclusion who received orthodontic treatment re-spectively at two stages: before orthodontic treatment and more than one year after the comple-tion of orthodontic treatment. It was suggested that orthodontic treatment can not only change the teeth and appearance of adolescent patients with malocclusion, but also help improve the pa-tients' self-awareness level, and thereby increase the patients' self-esteem level. As a result, pa-tients' oral health-related quality of life increase, since patients' satisfaction and societal well-being arise.

Conclusions

In conclusion, since adolescent patients are at a special physiological and psychological stage, the probability of complications such as enamel demineralization, puberty gingivitis, discomfort, and changes in psychological state during orthodontic treatment increases which triggers a decline in oral health-related quality of life (OHRQoL). Oral hygiene education can enrich patients' oral health care knowledge and assist them in developing proper oral hygiene habits, which helps optimize their oral hygiene condition. Consequently, the occurrence of complications can be reduced while their psychological health can be upgraded, thus ensure their oral health-related quality of life. Therefore, medical workers should apply and perpetuate the mode of oral health education ac-tively, combine traditional oral health education with psychological intervention and the utilization of social platforms, in order to provide mollifying orthodontic experience for patients.

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