

A New Approach to Cost-Benefit Analysis of Orthodontic Treatment in Young Females

SUMMARY

Background/Aim: This article examines the purpose, significance and broader impact of orthodontic treatment, emphasizing its preventative and corrective roles in maintaining optimal oral health. It highlights how occlusion influences an individual's daily life, self-esteem and social interactions, illustrating that orthodontic therapy extends beyond functional improvement to encompass psychological and aesthetic benefits. The decision to undergo such orthodontic interventions is shown to depend largely on the severity and prognosis of malocclusion, patients' aesthetic expectations and their perception of the potential outcomes compared to the associated risks. The primary objective and key focus of the study is the cost-benefit relationship of various orthodontic interventions. **Material and Methods:** Through comparative analysis, the article evaluates the financial implications of different orthodontic approaches and treatment methods, examining how costs vary internationally based on healthcare systems and regulatory frameworks. It specifically contrasts the expenses and advantages of commonly used appliances, including fixed metal braces, fixed ceramic braces and removable clear aligners. **Results:** The findings reveal that while conventional metal braces remain the most affordable option, aesthetically superior alternatives, are increasingly preferred particularly among young female patients. This preference is attributed to the growing social emphasis on facial appearance and confidence, with numerous clinical studies indicating that patients, especially younger females, prioritize discreet and visually appealing treatment options, even at higher costs. This research underscores the psychological satisfaction and enhanced self-image associated with improved facial and dental aesthetics during and after the completion of orthodontic therapy which often outweigh the financial considerations. **Conclusion:** This article assesses that the overall benefits of orthodontic treatment, especially for young female patients, consistently surpass the financial investment required. The introduction of nearly invisible appliances has further strengthened this trend, providing an effective balance between functionality, comfort and aesthetics, thereby reinforcing the integral role of orthodontic interventions in promoting both oral health and psychological well-being.

Keywords: malocclusion, orthodontic appliances, cost-benefit analysis, female

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Introduction

Orthodontics is a specialized field of dentistry dedicated to guide facial growth, development of the

dentition and occlusion, while addressing problems related to malalignment and malocclusion. It involves the diagnosis, prevention, interception and correction of occlusal and dentofacial abnormalities. Additionally, such

interventions of orthodontic therapy help in oral health maintenance by minimizing the risks of dental diseases, including caries and periodontal diseases. Despite the fact that malocclusion is not a disease itself, it can negatively influence the quality of life of an individual, either functionally due to physical inconvenience to carry out everyday tasks or emotionally as their self-image affects their confidence in social interactions.¹

The decision to initiate orthodontic treatment depends on the anticipated health benefits that will be provided, its prognosis for achieving the treatment objectives, the potential side effects and risks, as well as the overall financial cost. Nowadays, there is a progressively increasing tendency for patients to seek orthodontic treatment, as there are various appliance choices that are less noticeable.² As a consequence, higher prevalence of orthodontic treatment cases in the population results in such interventions becoming more socially acceptable.¹

One of the most significant benefits of orthodontic therapy is the improvement of oral function, including more efficient incising and mastication. Additional advantages include enhanced speech and better preservation of oral hygiene, since proper tooth alignment facilitates easier and more effective brushing. Even though oral function issues are basically the most crucial problem, as they are directly linked to overall state of health, the improvement in oral and facial aesthetic appearance is what brings most patients to the dental office, which is particularly true for young females.^{2,3} Improved aesthetics positively influence psychological well-being and confidence of the individual, as the enhanced facial attractiveness and dental symmetry affect social perceptions, interactions and career prospects, shaping how individuals are viewed within society.¹

Studies indicate that younger females, particularly those of higher socioeconomic status, are more inclined and willing to pursue such treatments, as women are more concerned about the aesthetic results.² The notable predominance of female participants in orthodontic treatments has been consistently reported in numerous studies, including those by Goje D., Rubby et al., which concluded that aesthetic factors significantly shape treatment-seeking behavior among females. Moreover, female patients are generally found to hold higher expectations regarding the outcomes of their orthodontic treatment compared to males.⁴

This article focuses on the comparison of different orthodontic treatment approaches using cost-benefit analysis framework. This method is employed to evaluate the advantages, significance and overall financial implications of various orthodontic interventions. Commonly used orthodontic appliances are analyzed in relation to patients' needs, expectations and perceptions, which tend to be more demanding in younger female patients.

Methods

The method used in this research is known as cost-benefit analysis (CBA) and as its name suggests, it is used to compare the benefits and costs of different treatments options. CBA aids to analyze which therapeutic paths to pursue and which ones to avoid, depending on the advantages and disadvantages of each orthodontic treatment appliance. Even though this method of analysis is not always flawless and may present challenges in achieving complete accuracy comparing various options to each other, it provides a valuable approach for evaluating and contrasting different orthodontic alternatives. Cost analysis considers direct financial expenses of the orthodontic treatment appliances and indirect costs including the treatment duration and visits. Benefit analysis, on the other hand, encompasses gains such as improved mastication, psychological boost associated with improved dental aesthetics and facial harmony. Each patient has individual desires and expectations of their orthodontic treatment journey and their economic feasibility varies, but different treatment options available as well as the evaluation of cost-benefit analysis ensures that selected orthodontic interventions provide optimal efficiency and patient satisfaction relative to their financial and practical demands. Furthermore, this analysis acts as a reference point for guidance for a better and more suitable treatment decision.

Cost-Benefit Analysis regarding orthodontic treatment

a. Cost analysis

The overall cost of an orthodontic treatment encompasses multiple components. Primarily, the direct financial expenses for the patient include the cost of treatment materials, pharmaceuticals, clinical staff time devoted to the orthodontic process, transportation and additional out-of-pocket expenditures. Indirect costs must also be considered, such as reduced financial earnings, missed responsibilities and activities of the patients due to the required frequent dental visits. Furthermore, intangible costs arise from factors such as anxiety, discomfort and impact on the patient's quality of life during the treatment period. Finally, there are additional patient-related costs according to the means of transport to the clinic, waiting and chair time of each appointment and the total treatment duration, which are generally more complicated to count.⁵

Economic evaluation has become a widely accepted method for assessing health care services. Various approaches are currently employed, including cost-effectiveness, cost-benefit and cost-utility analysis.⁶ Assessing cost-benefit analysis involves weighing the financial resources invested against the treatment's benefits.

The financial expenses of orthodontic treatment and rehabilitation for young females varies significantly, depending on the severity of the case, the patient's age, the appliances used and whether additional prosthetic, periodontal or surgical dental procedures are required to achieve the treatment goals

Whereas in some countries orthodontic treatment has to be paid for exclusively by patients, other countries have developed indices, such as IOTN (Index Of Treatment Need), to evaluate the need for orthodontic treatment, in which individuals with extreme malocclusions have the costs for therapy covered by the general health system.⁷ Orthodontic services across Europe are financed and organized in different ways, generally falling into three main models. In the first one, the national health care system provides complete financial coverage for orthodontic treatment, which is delivered in public clinics. This system can be found in countries such as Sweden, Denmark and Great Britain. In the second model, which is applied in Germany, the orthodontic treatment is fully funded either by the national health care systems or private insurance companies, but the majority of the treatments are performed by privately practicing orthodontists. In the third model, the state partially funds orthodontic treatment, with the level of subsidy depending on the severity of malocclusion. The treatment, in this case, is mainly provided by orthodontists in private practice and it is found in France, Switzerland and Norway. In Norway, the National Insurance Administration, reimburses all or part of the cost of treatment for patients under 18 years of age depending on the severity of malocclusion, with priority given according to specific criteria of need.⁸ In some countries, such as Finland, public dental services offer a free of charge orthodontic treatment to patients up to the age of 18.⁹

b. Benefit analysis

According to statistical results of a study in Brazil, most orthodontic cases reported higher self-esteem and better quality of life, which included relief of bruxism symptoms, reduced headache cases caused by dental origin, improved speaking and eating, even before the end of their treatment. Many individuals among those struggling with social acceptance noticed an improvement, as a result of their enhanced facial appearance and smile.² However, another finding suggests that improvements in dental aesthetics may not be sufficient or necessary for life satisfaction, meaning that orthodontic treatments may not result in substantially better self-esteem.¹⁰

A study in Spain showed that an orthodontic treatment provides a long-lasting improvement in the oral hygiene to most patients, as those who have been treated orthodontically usually display a better plaque control and healthier gingivitis scores compared to individuals who have not undergone such procedures. This conclusion

is probably a result of the combination between the regular dental visits during the treatment period and the orthodontist's emphasis on frequent and proper preservation of good oral care.¹¹ The dental education and encouragement from the dental staff is what keeps the patient motivated and aware of the importance of oral hygiene maintenance even after the end of the orthodontic treatment.¹²

The orthodontic treatment financially benefits the patient by reducing the need for additional future complex dental procedures, as fixing the malocclusion reduces the risk and susceptibility to trauma, in cases of prominent incisors, dental caries and periodontal diseases.^{1,12,13}

Cost-Benefit Analysis:

Health economic evaluation is a methodology used to compare health benefits and financial costs of alternative interventions and sheds light on whether certain treatments are worthwhile.^{6,16}

There are two main types of appliances used in orthodontic treatments, fixed and removable appliances. The fixed type of appliances is categorized into the widely used metal braces, the more aesthetically acceptable ceramic braces, and the lingual braces, which are not very popular due to their high cost, technical difficulty, as well as patient's hygiene and comfort issues. Clear aligners are another effective option, which are ideal in case the patient prioritizes their looks. (Table 1)

Table 1: Cost-benefit analysis: comparison between benefits and financial costs of different orthodontic treatment methods. 17

Appliance type	Appliance subtype	Benefits	COSTS
Fixed appliances	Metal Braces	a. does not rely on patient's compliance	1.500-2.300€*
		b. highly effective for complex malocclusions	
		c. precise tooth movement	
Removable appliances	Ceramic Braces	a. all benefits of metal braces	1.800-2.500€*
		b. better aesthetics	
		a. easier to maintain proper oral hygiene	
b. best aesthetics (nearly invisible)			
	Clear Aligners	c. less dental visits needed	

* The treatment cost varies significantly among different countries, the prices written above are the ranges of orthodontic treatment costs across multiple private clinics of Europe.

According to the Table 1, there are various orthodontic treatment options to choose from, such as fixed and removable appliances. Conventional metal braces are highly effective and relatively affordable compared to more aesthetically pleasing alternatives. On

the other hand, clear aligners offer enhanced aesthetics and allow easier oral hygiene maintenance at a higher financial cost. Ceramic braces can be considered an intermediate option of treatment cost and benefits, providing the high precision of the fixed appliance, while keeping a relatively good aesthetic appearance. Young females, specifically individuals of higher socio-economic status evaluate financial expenses in comparison with the demands and expectations of orthodontic therapy, which may be achieved using cost-benefit analysis. Even though the financial cost remains an important factor, facial and dental appearance becomes a more crucial concern, causing the new dental innovations to focus mostly on invisible appliances and highly aesthetic alternatives.^{1,17}

In more complex cases, which may include additional appliances, such as extraoral appliances or cases that need an orthognathic intervention, the final cost will be significantly increased, as a result of additional expenses. Additionally, financial costs alter slightly depending on the type of retainer chosen, from the orthodontist, to avoid a possible relapse. Retainers can be either fixed, removable or a combination of both.¹⁷

Results & Discussion

Various factors affect patient's perceptions of the affordability of different orthodontic options and guide them towards their final choices. A study indicated that monthly income, level of patients' education as well as the overall financial cost significantly shape their opinions regarding different orthodontic procedures.¹⁸ Additionally, increasing aesthetic awareness in society along with the availability of advanced and highly aesthetic appliances provides patients with the opportunity to maintain a more appealing appearance throughout the course of their orthodontic treatment.¹⁹

Generally, patients prefer transparent or invisible orthodontic appliances, as they are considered to be more attractive. A study composed of approximately 55% females, shows that except for an aesthetic outcome, patients prefer appliances that are less visible and the majority of them are willing to increase expenditure for a more pleasant treatment journey.²⁰ Statistical results showed that young female participants viewed clear aligners and lingual braces as more attractive in comparison to other orthodontic appliances. The most attractive and preferred type of appliances were found to be lingual braces slightly overcoming clear aligners. Despite high aesthetical appearance during the treatment duration by using any of the preferred options above, valuing the patient's comfort levels changes the acceptability of lingual braces. According to a study, Swedish adult patients were unwilling to follow an orthodontic treatment plan with metal braces.²⁰ In the

United States, clear aligners and lingual braces were considered to be the most socially acceptable choices, due to them being nearly invisible.²⁰ Younger patients are more concerned about the new aesthetic alternative methods of treatment in the orthodontic field, so they tend to choose such devices.²¹ Orthodontic clear aligners are considered to be a method of choice among both developed and developing countries. According to a research in India, about 90% of the participants preferred clear aligner therapy over the conventional one and expressed a willingness to recommend this type of therapy to their friends and family members.²²

Various factors affect the selection of orthodontic treatment method, except for the aesthetic appearance, such as comfort level, hygiene maintenance ease, frequency of dental visits needed as well as the overall financial expenses. Even though an appealing smile is not the only concern of individuals when it comes to choosing treatment method, nowadays, there is a significant emphasis in the aesthetic appearance of younger females. Females have now the advantage to have a more socially appealing look even during their orthodontic treatment journey as there are aesthetically pleasing alternatives to choose from that are being widely used and are available in most dental clinics. Patients are more willing to undergo an orthodontic intervention, as there are nearly invisible appliances to choose from and the benefits of the treatment overcome the financial costs.

Conclusions

Orthodontic cases should be evaluated according to the severity of the patient's condition and the necessity of treatment. It is essential to ensure that the potential benefits outweigh the possible risks, side effects and financial costs. Comparing the economic burden with the physical health and psychological benefits, provided by an orthodontic treatment, is often challenging. Each individual has unique expectations and goals, regarding treatment outcomes, which must be considered and ideally met to gain satisfaction. Younger female patients tend to prioritize achieving an aesthetically pleasing appearance over minimizing expenses. Nowadays, there are various options of orthodontic treatment methods to keep the financial expenses low, while at the same time providing the patient with a decent appearance during and after the treatment.

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