

## An evaluation of willingness to pay for orthodontic treatments in patients of Shiraz Dental School Clinic

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Estimation of need and demand for orthodontic treatment is important for both health professionals and health policymakers. Need assessment is traditionally done using experts' opinions; however, patient-centered evaluation can provide a bigger picture of patient's esthetic and psychological needs. The willingness to pay (WTP) technique is a potentially valid tool for assessing the patient views on their needs and for market research in healthcare. The aim of this study was to evaluate the need and demand for orthodontic treatment with a patient-centered approach using economic analysis.

**METHODS:** A cross-sectional study was designed. Two hundred people attending Shiraz Dental School Clinic were interviewed. Their views on the importance and costs of orthodontic treatments and the maximum amount that they would pay for such treatments were obtained along with their demographic and socioeconomic factors. Their WTP was used to elicit values for orthodontic treatment using contingent valuation method (CVM) and econometric techniques.

**RESULTS:** The response rate was 95%. Although 53.5% of respondents felt they needed orthodontic treatment, only 33.7% had expressed their need, and just 17.5% had actually gone for such treatment. The main reason for not taking the treatment was its cost (56.5%). More than 60% of respondents viewed orthodontics as only a luxury treatment and 70% considered beauty and elegant smile as the most, or one of the most, benefit(s) of orthodontic treatments. WTP results showed that orthodontic services have high demand elasticity. Assuming fixed monthly income of 8 million Rials, 61% of subjects were ready to pay 20 million Rials for a course of orthodontic treatment.

**CONCLUSIONS:** The result showed that esthetics and high cost of treatment were respectively the most intriguing and the main inhibiting factors for getting orthodontic treatment. Economic evaluation showed a high elastic estimation for orthodontic treatment.

**KEYWORDS:** Willingness to Pay, Orthodontics, Shiraz

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There has been a change in awareness and in demand for orthodontic treatment. More people decide for themselves if they need to go under such treatment. The normative needs expressed by professionals are no longer absolute.<sup>1</sup> Traditional occlusal indices like Index of Orthodontic Treatment Need (IOTN)<sup>2</sup> define orthodontic treatment need from a clinician's point of view, but often no consideration is given to the concepts of perceptual, functional, and social needs.<sup>3</sup>

Several studies have investigated the relationship between objective orthodontic treatment need and subjective patient and parent perceptions of malocclusion.<sup>3-7</sup>

Whilst people seem mostly aware of their malocclusion traits, they do not perceive a need for treatment to the same extent as a dentist or an orthodontist.<sup>4</sup> On the other hand, people's view of the standards for oral and facial esthetic differ from time to time, from society to society, and also from person to person in the same time and society based

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on their daily needs.

Recently, there has been increasing interest in relating occlusal indices to individual perceptions of orthodontic treatment need and quality of life.<sup>5-8</sup> Several factors interact to make an individual feel the need for orthodontic treatment. For instance, Ingervall and Hedegard<sup>9</sup> stated that awareness and desire to receive orthodontic treatment might vary with age. Shaw<sup>10</sup> also stated that decrease in satisfaction with dental appearance is associated with age. This may be because of the psychological changes in teenagers to become more socially acceptable especially in physical attractiveness. Therefore, the desire for orthodontic treatment to enhance attractiveness is higher in this age group.

The nature of orthodontic treatment, being time consuming and costly, makes it even more complicated for people to decide to go for such treatment. Even when the need for orthodontic treatment exists, barriers such as high costs, long duration of treatment, fear due to ignorance, or unavailability of a trusted specialist might prevent an individual to express that need.<sup>11</sup> An analysis of these barriers is essential in planning orthodontic health services.

Economic evaluation is defined as "the comparative analysis of alternative courses of action in terms of their costs and consequences".<sup>12</sup> There are a variety of methods for the economic evaluation of needs for health care services. A method that is enjoying renewed interest is cost-benefit analysis (CBA), in which, health benefits are valued in monetary terms based on welfare economic theory.<sup>13</sup> As pointed out by Mishan<sup>14</sup> and explained by Gafni<sup>15</sup>, the practical extension of this theory is the estimation of individual's maximum willingness to pay (WTP) to secure implementation of a program. WTP methods have recently gained popularity in dental literature and are used for economic analysis of different procedures from dental checkups<sup>16</sup> to dentin regeneration<sup>17</sup> and

orthognathic surgery.<sup>18</sup> Contingent evaluation methods are also becoming widespread and are used in different areas of health care services such as dentistry.<sup>19,20</sup>

No clear evidence existed on the needs felt by lay people's, and demand related to costs of orthodontic treatment in an Iranian population. Therefore, this study was designed to evaluate the attitude of patients attending Shiraz Dental School Clinic, as a sample of Shiraz population, towards orthodontic treatment and the economic analysis of demand for such treatment.

## Methods

A cross-sectional analytic study was conducted using a self-made questionnaire. The questionnaire was designed in three sections including questions on demographic factors, attitude towards orthodontic treatments, and willingness to pay for such services. The validity of questions was assessed and approved by three specialists in orthodontics. Readability of questions was examined by an expert in linguistic sciences. Changes were made to the questions and some words and phrases were replaced by simpler ones to be appropriate for subjects with less literacy. In the next step, twenty seven patients of Shiraz Dental School Specialist Clinic were asked to fill the questionnaire twice, one month apart, to assess its reliability. Necessary changes were made and the final draft of the questionnaire was prepared in two pages and 21 questions.

The first section of the questionnaire was allocated to questions on subjects' demographic factors. These questions included sex, marital status, age (categories of ten-year-periods), highest educational level in the family (four categories of less than high school, high school graduate, degree, and higher education), and family's monthly income (three categories of less than 5m Rials, between 5m and 10m Rials, and more than 10m Rials). In the next section, subjects were asked about their own experience of orthodontic treatment (if any),

their need for orthodontic treatment, and their view on positive and negative aspects (pros and cons) of such treatments. Two questions were also asked about subjects' history of use of other cosmetic treatments and services.

The third section of the questionnaire was designed to get information on the subjects' willingness to pay for orthodontic treatments. Fictional monthly income and routine living costs were given, and then questions were made based on that scenario. The subjects were asked about the maximum amount they would pay for orthodontic treatment, if needed, if their family income was 8 million Rials per month, 1) when they had to pay all the costs by themselves, and 2) when the insurance companies would pay two third of the costs. They were then asked if they would go for a general dental practitioner instead of an orthodontist if it was cheaper, and that how much should be the difference for them to be persuaded to do so. Some of the questions of this section were designed as open questions, so that the subjects could express their views without the possible effects of given choices.

Patients who attended Shiraz Dental School Specialist Clinic (regardless of their reason for attendance, or the ward they were going to) in a specific period of time in 2010, and were between 15 to 54 years old were invited to the study. They were told about the aim of the study and how the collected information would be dealt with. They were assured about their privacy, the confidentiality of their answers, and that the questionnaires would be kept with no name, or tag on them. Any questions they had was answered with patience. Subjects were only entered into the study if they understood the explanations, eagerly agreed to participate, and had at least 8 years of formal education. The data collection was continued until 200 subjects were invited to the study.

All questionnaires were filled by two interviewers. The interviewers who were two nurses, working at dental clinic, were fully

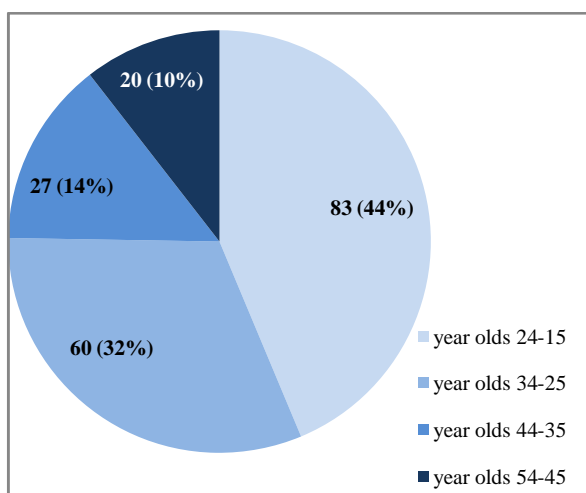
rationalized about the importance of the study and the importance of trying to get honest answers. They were taught about the correct method of explaining to and questioning the subjects, and had attended several sessions of calibration. SPSS (Version 17) was used for data entry and analysis. The collected data were assessed using descriptive measurements first. Next, the relationship between the respondents' demographic and socio-economic factors, and their attitude towards such treatments was analyzed using chi square; and the relation between mentioned variables and willingness to pay for orthodontic treatment was analyzed using ANOVA and t-test. At the end a demand elasticity curve was created based on the subjects' responses to increase and decrease the costs of orthodontic treatments by using contingent valuation method (CVM) considering their willingness to pay at each cost level.

## Results

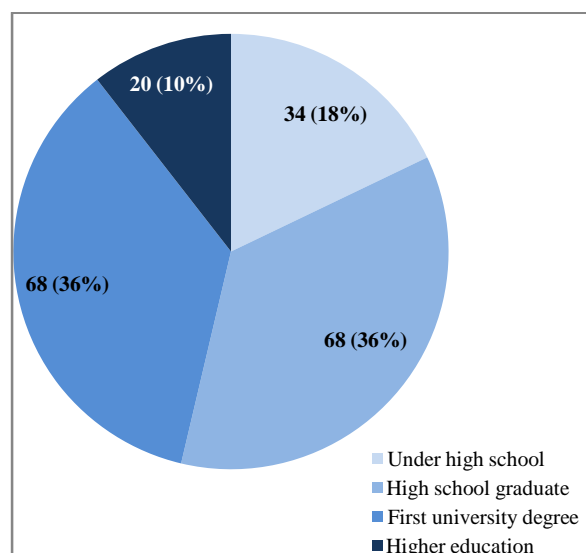
Among those two hundred people who were invited to the study 190 (95%) had answered the questions and were used in data analysis. Eight people did not participate in the study. Two other people were excluded from the study for having too many unanswered questions or "I don't know" answers.

One hundred and thirty two (69.5%) of the participants were female and fifty eight (30.5%) were male. This proportion was not unexpected as usually the number of female patients attending the Shiraz Dental School Specialist Clinic is significantly higher than males. Also, ninety eight subjects (51.6%) were single. Most of the subjects (43.7%) were in the 15 to 24 years old age group. The number of subjects in age groups decreased as age increased (Figure 1). The subjects' educational level is shown in figure 2. It should be considered that those in the youngest age group were too young to have higher education or degree.

About half of the participants (92 people) said their family income was less than 5



**Figure 1.** Frequency and proportion of participants in each age group



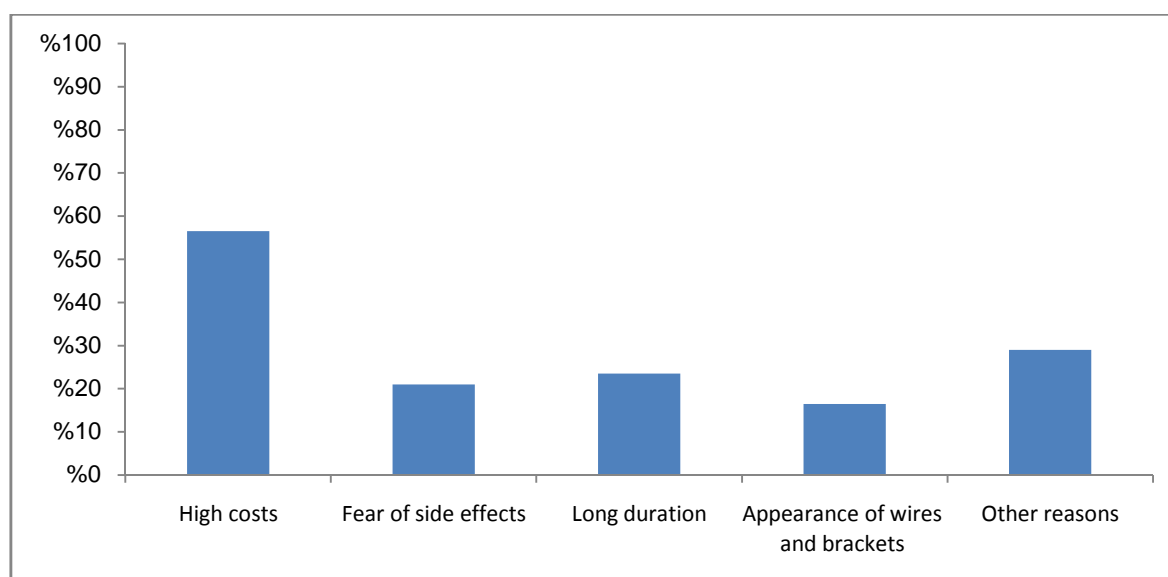
**Figure 2.** Frequency and proportion of participants in each educational level

million Rials per month. Only one sixth of them (32 people) had an income of more than 10 million Rials per month. More than half of the participants (53.5%) had felt the need for orthodontic treatment; sixty four (33.7%) had been to a general dental practitioner or an orthodontist to consult about dental malocclusion or irregularity; and thirty three of them (17.4% of all participants) had gone under orthodontic treatment. Fifty other subjects had the experience of orthodontic treatment in one of their close relatives. Out of those subjects who had felt the need for orthodontic treatment but had not done it,

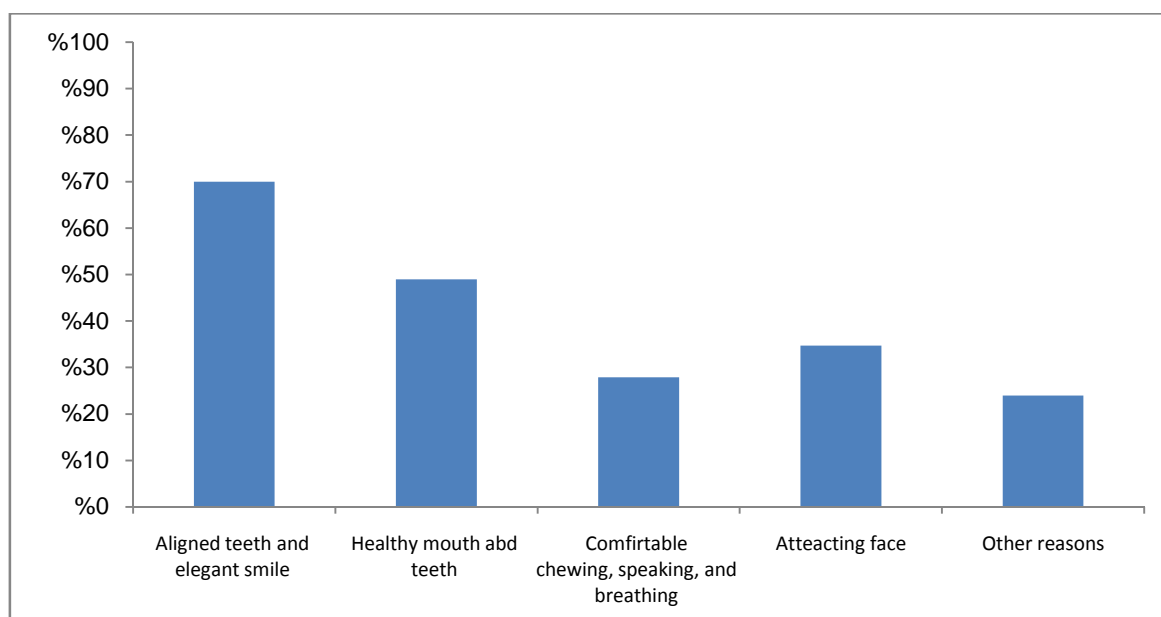
56.5% chose the high cost of orthodontic treatment as the only, or one of the main reasons not to go for it (Figure 3). 5.5% of all subjects had the history of undergoing other esthetic surgical treatments such as rhinoplasty; and 40% of female subjects were using hair and skin cosmetic services on a regular basis.

Answering the question if orthodontics is a necessary medical treatment or a luxury esthetic practice, 63.2% said it was a luxury esthetic practice, 16.3% said it was a necessary medical treatment, and 20.5% mentioned both were possible. Looking at orthodontic treatment as a necessary treatment had no significant relation with an experience of orthodontic treatment in themselves ( $P = 0.439$ ), or in close relatives ( $P = 0.645$ ), or an experience of other cosmetic surgeries ( $P = 0.296$ ). From the benefits given in the questionnaire for orthodontic treatments, "getting aligned teeth and elegant smile" was chosen more than others, with 27.4% choosing only this option and 42.6% choosing it as one of possible benefits (Figure 4).

With a fictional fixed monthly income of 8 million Rials, 61% of subjects were ready to pay 20 million Rials for a course of orthodontic treatment, if they needed it. This group said they would pay, in case of increase in orthodontics costs with no increase in their income, a maximum of 20 to 90 million Rials (in average  $35 \pm 19$  million Rials) for orthodontic treatment. The attitude of the participants about the maximum amount of money they would pay for orthodontic treatment had no significant relationship with their experience of orthodontic treatment ( $P = 0.676$ ), or their felt need for such a treatment ( $P = 0.768$ ). However, the maximum willingness to pay for orthodontic treatment was significantly related to the family's real monthly income ( $P = 0.013$ ). Those with a family income of more than 10 million Rials per month had higher maximum willingness to pay (42 million Rials in average) than those who had an income of 5 to 10 million Rials (31 million



**Figure 3.** Reasons for not doing orthodontic treatment in those who had felt they needed such a treatment



**Figure 4.** Participants view on what orthodontic treatments can provide for patients

Rials in average and both groups expressed a higher willingness to pay than those with a family income of less than 5 million Rials (28 million Rials in average). There was also a significant association between the maximum willingness to pay for orthodontic treatments and educational level ( $P = 0.028$ ), showing that those with higher education were willing to pay relatively more for the treatment.

Those who thought 20 million Rials is more than what a family with an 8 million

Rials monthly income can pay for the orthodontic treatment of one family member, mentioned that the minimum income for the family to be able to pay for such services was between 10 to 70 million Rials per month (mean =  $19 \pm 11$ ). This variable, also, had no significant relationship with previous experience of orthodontic treatment ( $P = 0.271$ ) or felt need for such a treatment ( $P = 0.558$ ). Moreover, the minimum necessary monthly income cited by these

subjects was not significantly related to their real family income either ( $P = 0.078$ ).

The number of subjects who were willing to pay 20 million Rials for orthodontic treatment increased to 79.3%, in case two third of the cost was covered by their insurance. This increase was statistically significant ( $P < 0.001$ ). The number of subjects who preferred to go to a general dental practitioner for orthodontic treatment rather than a specialist, in case it was cheaper, was twenty eight people out of all the participants (14.7%) and 14 people among those who were not willing to pay 20 million Rials (17.5%).

The demand elasticity curve for orthodontic treatments (Figure 5) was created based on the change in the percentage of subjects willing to pay, by each 5 million Rials change in the cost of a course of orthodontic treatment. Both the answers they gave for the treatment provided by a general dental practitioner and an orthodontist were taken into account when producing this curve.

## Discussion

The majority of patients surveyed in our study were females. The same was reported in many previously published studies on orthodontic patients such as in Malaysia University Hospital where the majority of respondents were also female.<sup>21</sup> These may be a reflection of the fact that the standards of aesthetic and beauty are more dominant in orthodontics and are more appreciated by females.<sup>22-24</sup>

There was a direct relationship between the education level and the willingness to pay for orthodontic treatment. We may say that more educated people feel the importance of self-improvement including esthetics. Furthermore, more educated people usually have better economic status and are more likely to be able to afford such costly treatments.

In this study the perceived need felt by a person was used as an indicator for the real orthodontic treatment demand. Assessing the need felt for orthodontic treatment is

nowadays preferred over assessing the normative need that is obtained by clinical examination.<sup>1,7</sup> More than half of the subjects stated that they feel they need to receive orthodontic treatment. Other recent studies in Fars province, Iran, confirmed that the major factor in demanding orthodontic treatment is the felt need for orthodontic treatment which rises from dissatisfaction from dental appearance.<sup>25,26</sup>

Our results showed that attaining straight teeth to improve dental appearance was undoubtedly the most important motivating factor for seeking orthodontic treatment. About 70% of the subjects thought the major benefit of orthodontic treatment was to straighten the teeth and enhancing beautiful smile. This was consistent with the findings of Lew's study<sup>27</sup> whereby enhancing dental appearance was quoted to be the most important motivating factor for orthodontic treatment amongst Singaporean patients. A number of other studies also demonstrated the same result.<sup>11,21,22,26</sup> Of course, there have been studies (in specific countries like Australia) that found that functional aspects (such as difficulty in chewing or speaking) were more important than aesthetic aspects (such as crowding) in the determination of the importance of orthodontic treatment to the lay people.<sup>28</sup> Cultural differences may also have an impact on how people think about the orthodontic treatment and must be regarded in interpretations.

Although the results of the present study revealed that more than half of the subjects would like to receive orthodontic treatment, only 17.4% of them actually demanded the treatment. About 56% were unable to enjoy the benefits of treatment due to the financial costs involved. The minimum cost of orthodontic treatment in Shiraz dental school clinic over an approximately 24 month's period is 15,000,000 Rials (which is much lower than the cost charged at private offices). This represents a monthly expenditure of 750,000 Rials. With about half of the participants stating that their family

income was less than 5 million Rials per month, this would be equivalent to at least 15% of their monthly income. So it was not surprising that many of those in lower income families did not demand the treatment, although they felt the need for it. In a study by Hosseinzadeh Nik et al.<sup>26</sup> it was also noted that the demand for orthodontic treatment was significantly higher in the families with higher income. Studies in other countries such as Marques et al. in Brazil,<sup>11</sup> Tickle et al. in the UK<sup>29</sup> and Birkeland et al. in Norway<sup>30</sup> also supported this finding.

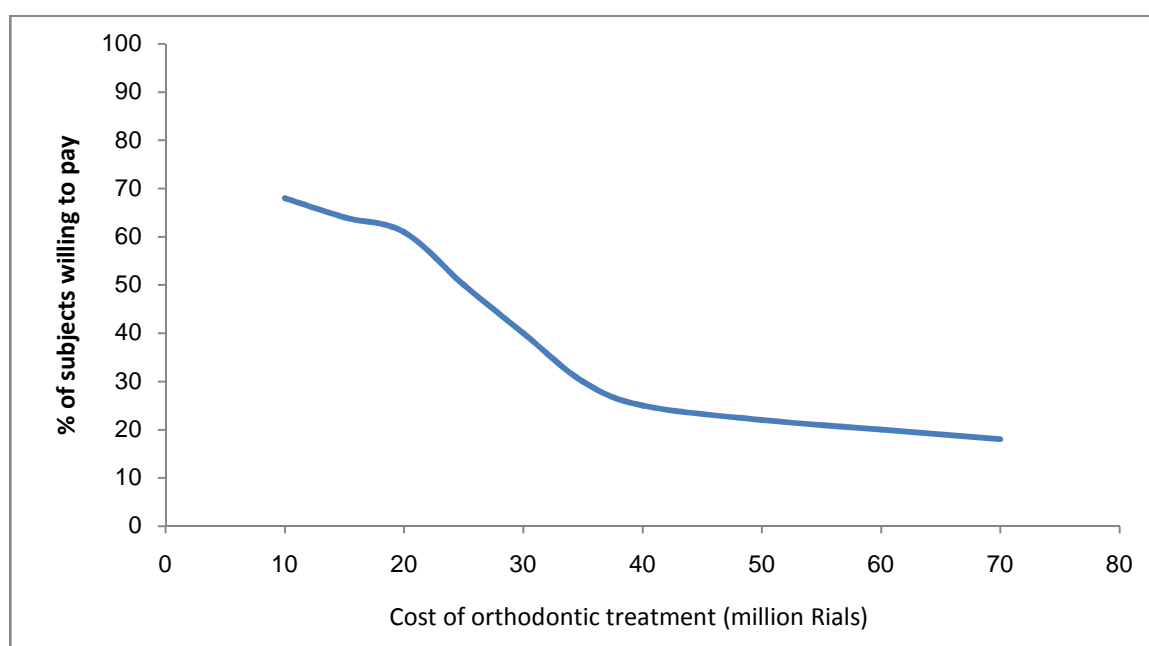
The WTP technique used in this study is now a widely accepted tool for the appraisal of health care and this is reflected by the increasing number of articles in this area in the medical literature.<sup>16-19</sup> This method is widely used in planning health care services in developed countries. Although it is less used in developing countries, economic studies support the value of WTP method in those countries as it seems to mimic the actual health market behavior.<sup>31,32</sup>

WTP results showed that orthodontic services have high demand elasticity. In other words, by increasing the price of orthodontic treatment, the demand for it decreases

proportionally (this proportion is called elasticity of demand). In economics, such level of elastic behavior is usually seen with luxury goods, whereas necessities are always inelastic behavior which means the demand does not decrease much with increasing price.<sup>33</sup> So according to WTP data and in economic terms, orthodontic treatment is considered a luxury service. This is in line to what respondents stated generally about the necessity of such treatment when 63.2% looked at it only as a luxury esthetic practice.

It was interesting that although the total proportion of subjects willing to pay for orthodontic treatment increased to 66.1% by adding the option of going to a general dental practitioner with lower costs, most of those who were not willing to pay 20 million Rials for orthodontic treatment, were not happy to pay for it even at markedly lower costs. This is clearly shown in demand elasticity figure (Figure 5).

If provision of the orthodontic treatment to the population who desire it for esthetic reasons is a goal for our health care services (this may need more discussion elsewhere), then the big obstacle to take is reducing the cost of such treatment. As the results of the



**Figure 5.** The demand elasticity curve for orthodontic treatment based on its cost for a member of a family with 8 million Rials monthly income

current study showed, rendering the orthodontic treatments to general dental practitioners to lower the costs may not be acceptable in this population, while providing the insurance coverage for orthodontic treatment seems the best solution.

### Conclusion

Desire for orthodontic treatment was high in the study population, though most consider

it as a luxury or beauty treatment. Cost is the most limiting factor in demand for orthodontic treatment. Economic evaluation showed a high elastic estimation for orthodontic treatment. Proper insurance policies may help in rendering better orthodontic services to the Shiraz population.

### Conflict of Interest

Authors have no conflict of interest.

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