

# PATIENT'S RESPONSE TO EXTRACTIONS DURING ORTHODONTIC THERAPY.

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## Abstract

Extractions are a routinely/commonly used technique in orthodontics as a method of gaining space for correction of malocclusion. Any technique that facilitates teeth removal atraumatically and thus decreases the possibility of such a complication is welcome. The purpose of this study was to assess a patient's response to extractions during orthodontic therapy. A cross sectional study was conducted on 200 patients who underwent fixed appliance therapy who visited Saveetha dental college and hospital. Thus the population includes all patients under fixed appliance therapy above the age group of 18 years. A survey software was used to reduce sampling bias. Repeated answers or questions were avoided. All patients undergoing fixed orthodontic treatment were included in the study. Data collection was done using a self structured questionnaire consisting of 12 questions. Google forms were used to collect the data and circulate among the patients. Variables such as gender and age were also collected. Data was assessed based on these variables. The data was analysed using SPSS statistical software, descriptive and analytical statistics was done with Chi square test. After tabulation using MS Excel, the data was exported to IBM SPSS software [Version 19: IBM Corporation NY USA] for statistical analysis. Internal validity of the study was carried out by analysing all patients under fixed appliance therapy, external validity was homogenization and replication of the experiment. It was observed that patients between 10-30 years (66;66.1%) were more aware about the treatment time when compared to the age group between 30-40 years (n=42;38.9%) Pearson's Chi square value=1.561; df=1; p-value:0.212 (p>0.05), statistically not significant. It was observed that people in the age group of 18-30 years (n=72;64.3%) were more aware about the benefits of extraction during an orthodontic therapy when compared to the patient's of the age group 30-40 years (n=40;35.7%). Pearson's Chi square value=0.57; df=1; p-value:0.811 (p>0.05), statistically not significant. It was observed that it was more predominant in the age group between 18-30 years and pain (n=57;71.3%) being that common reason for avoidance of extraction. Pearson's Chi square value=4.084; df=2; p-value:0.130 (p>0.05), statistically not significant. It was observed that female (n=60;55.6%) were more aware about the benefits of extraction during an orthodontic therapy when compared to males (n=48;44.4%). Pearson's Chi square value=2.899; df=1; p-value:0.089 (p>0.05), statistically not significant. It was observed that female (n=63;56.3%) were more aware about treatment time when compared to males (n=49;43.8%). Pearson's Chi square value=3.977; df=1; p-value:0.046 (p<0.05), statistically significant. It was common in both the gender and Majority of the patient's chose pain (n=40;50%) as their reason to avoid extraction. Pearson's Chi square value=0.533; df=2; p-value:0.766 (p>0.05), statistically not significant. Within the limitations of the study it was observed that females were more aware and positive about extractions during an orthodontic therapy when compared to males. It was more predominant in the age group between 18-30 years. It was also observed that the majority of the patients had pain as the reason for avoiding extraction if indicated during an orthodontic therapy.

Awareness on extractions as a method space gaining and appropriate management might help in the attainment of ideal occlusion without the need for extensive orthodontic therapy

**KEYWORDS:** Awareness, Extractions, orthodontic therapy, patients' response.

**DOI:** 10.47750/pnr.2022.13.S04.141

## INTRODUCTION

Certain malocclusions require orthodontists to be capable of establishing a diagnosis in order to determine the best approach to treatment. The purpose of this article was to assess a patient's response to extractions during orthodontic therapy and discuss some diagnostic elements used in drawing up a treatment plan to support tooth extraction. Various

diagnostic elements have been highlighted such as Issues concerning compliance, tooth-arch discrepancy, cephalometric discrepancy and facial profile, skeletal age and anteroposterior relationships, dental asymmetry, facial pattern and pathologies. It is suggested that sound decision-making is dependent on the factors mentioned above. however, one single characteristic can, by itself, determine a treatment plan.(Santos *et al.*, 2010)

Orthodontic treatment often involves the extraction of teeth to gain space for the correction of crowding or proclined teeth/ malocclusion. Meanwhile for the patient and the general practitioners performing the procedure the principal concern is to successfully complete the procedure atraumatically, for the orthodontist there is an additional prospective to preserve the cortical plates from breaking during extraction which can lead to ridge narrowing. Fractured cortical plates can lead to narrowed out ridges that may interfere with complete closure of extraction space closure.(Eliades, 2002; Rai and Yadav, 2016) Dental extractions should never be undertaken in order to facilitate orthodontic mechanics but rather to provide the best possible treatment for the patient.(Bernstein, 1992)

Extraction, a practical form of orthodontic therapy has been accepted for many years, but there remains a controversy regarding the effect of extraction to improve esthetics as well as dentoskeletal relationship. The esthetic impact of the soft-tissue profile might play a major role in deciding on premolar extraction or non-extraction treatment, particularly in borderline patients.(Verma *et al.*, 2013)

The various advantages of extractions are stability, less protrusive facial appearance, controllable outcomes, less gingival recession. These studies highlight the importance of creating awareness on the need/importance of extraction for a proper/successful orthodontic therapy, numerous high quality articles have been published in this domain over the past 3 years. With this inspiration we planned to pursue research on patients response to extractions during orthodontic therapy.(Khosravanifard *et al.*, 2011; Kumar *et al.*, 2011; Felicita, Shanthasundari and Chandrasekar, 2012; Dinesh and Saravana Dinesh, 2013; Jain, 2014; Kamisetty, 2015; Krishnan, Pandian and Kumar S, 2015; Rubika, Sumathi Felicita and Sivambiga, 2015; Viswanath *et al.*, 2015; Sivamurthy and Sundari, 2016; Felicita and Sumathi Felicita, 2017a, 2017b, 2018; Samantha, 2017; Vikram and Raj Vikram, 2017)

Even though these resources often promote expansion and space gain in the arches, extractions remain included in orthodontic plans that seek to improve facial appearance and achieve stable results. Dental extractions for orthodontic purposes are still well indicated in certain cases.(Eliades, Bradley and Brantley, 2017) Our team has extensive knowledge and research experience that has translate into high quality publications(Neelakantan *et al.*, 2011; Felicita, Chandrasekar and Shanthasundari, 2012; Jain, Kumar and Manjula, 2014; Kamisetty *et al.*, 2015; Lakshmi *et al.*, 2015; Keerthana and Thenmozhi, 2016; Mootha *et al.*, 2016; Kumar, 2017; Azeem and Sureshbabu, 2018; Chen *et al.*, 2019) Now the growing trend in this area motivated us to pursue this project

Thus, the aim of the study was to assess a patient's response to extractions during orthodontic therapy.

## **MATERIALS AND METHODS**

### **Study design and setting**

The study setting was a university setup, held at Saveetha dental College and Hospital. A cross sectional study was conducted on 200 patients who underwent fixed appliance therapy who visited Saveetha dental college and hospital. Thus the population includes all patients under fixed appliance therapy. The advantage of this study was that the study population belonged to the same ethnic group and was conducted to create awareness regarding the field of study. However, the drawback of this study was patient participation, only patients who were ready to cooperate were included in the study. The internal validity of the study was carried out by analysing all patients under fixed appliance therapy. The external validity was homogenization and replication of the experiment.

### **Data collection**

A survey software was used to reduce sampling bias. Repeated answers or questions were avoided. All patients undergoing fixed orthodontic treatment were included in the study. Data collection was done using a self structured questionnaire consisting of 12 questions. Google forms were used to collect the data and circulate among the patients. Variables such as gender and age were also collected. Data was assessed based on these variables. File charts were used to represent each variable. Questions were based on patient experience, opinion and whether it is useful. Data analysis done using SPSS by IBM.

### Statistical Analysis

After tabulation using MS Excel, the data was exported to IBM SPSS software [Version 19: IBM Corporation NY USA] for statistical analysis. Descriptive statistics was done to assess the responses given by the patients. The dependent variable was all the patients undergoing fixed appliance therapy. The independent variable was age and gender.

### Ethical Approval

The ethical approval for the retrospective study was obtained from the institutional ethics board. (SDC/SIHEC/2020/DIASDATA/0619-0320.)

## RESULTS

A total of 200 patients who reported to Department of Orthodontics, Saveetha Dental college were involved in the study. Out of which majority of belonged to 18-30 years of age group. (n=130;65%) when compared to 30-40 years of age group (n=70;35%) [Figure 1] It was observed that gender distribution was common in the present study. (n=100;50%) [Figure 2] It was observed that patient's wanted to get orthodontic therapy done to improve their appearance of teeth (n=100;50%) when compared to other reasons such as Improved smile (n=50;25%) and better self confidence (n=50;25%). [Figure 3] Majority of the patient's had aesthetic reason (n=120;60%) as one of the reason for undergoing orthodontic therapy when compared to other reasons such as Functional reasons (n=80;40%). [Figure 4] It was observed that majority of patients were aware about extractions during an orthodontic therapy (n=116;58%) when compared to patients who were not aware about extractions. (n=84;42%). [Figure 5]. It was observed that majority of the patient's were aware about the benefits of extraction (n=112;56%) and about (n=88;44%) were not aware about the benefits of extraction in orthodontic therapy. [Figure 6] It was observed that majority of patients were aware about the duration of treatment (n=108;54%) and about (n=92;46%) were not sure about the treatment time. [Figure 7] It was observed that majority of the patient's were aware that extraction would provide a better alignment (n=116;58%) and about (n=84;42%) of patient's were not aware that indicated extractions would provide a better alignment. [Figure 8] It was observed that majority of the patient's weren't willing for extraction during an orthodontic therapy (n=110;55%) and only (n=90;45%) of patient's were willing for extractions if indicated during an orthodontic therapy. [Figure 9] It was observed that majority of the patient's were not sure/maybe (n=76;38%) on undergoing orthodontic therapy if extractions were indicated and about (n=64;32%) were not willing to undergo orthodontic therapy if extractions were indicated and (n=60;30%) were willing for orthodontic therapy if extractions were were indicated. [Figure 10] It was observed that majority of the patient's had pain (n=80;40%) as one of the reasons for not willing for extractions when compared to other reasons such as fear (n=60;30%) and financial reasons (n=60;30%). [Figure 11] It was observed that majority of the patient's were aware about expansion (n=114;57%) as an alternative option other than extraction when compared to proximal stripping (n=86;43%). [Figure 12] It was observed that patients between 10-30 years (66;66.1%) were more aware about the treatment time when compared to the age group between 30-40 years (n=42;38.9%) Pearson's Chi square value=1.561; df=1; p-value:0.212 (p>0.05), statistically not significant) [Figure 13] It was observed that people in the age group of 18-30 years (n=72;64.3%) were more aware about the benefits of extraction during an orthodontic therapy when compared to the patient's of the age group 30-40 years (n=40;35.7%). Pearson's Chi square value=0.57; df=1; p-value:0.811 (p>0.05), statistically not significant). [Figure 14] It was observed that it was more predominant in the age group between 18-30 years and pain (n=57;71.3%) being that common reason for avoidance of extraction. Pearson's Chi square value=4.084; df=2; p-value:0.130 (p>0.05), statistically not significant) [Figure 15] It was observed that female (n=60;55.6%) were more aware about the benefits of extraction during an orthodontic therapy when compared to males (n=48;44.4%). Pearson's Chi square value=2.899; df=1; p-value:0.089 (p>0.05), statistically not significant) [Figure 16] It was observed that female (n=63;56.3%) were more aware about treatment time when compared to males (n=49;43.8%). Pearson's Chi square value=3.977; df=1; p-value:0.046 (p<0.05), statistically significant) [Figure 17] It was common in both the gender and Majority of the patient's chose pain (n=40;50%) as their reason to avoid extraction. Pearson's Chi square value=0.533; df=2; p-value:0.766 (p>0.05), statistically not significant) [Figure 18]

## DISCUSSION

The confounding variable of fear of first extraction could not be eliminated no matter which protocol was followed and could only be hoped to have influenced the result of this study to the minimal. (Murphy *et al.*, 2009)

The decision to extract the premolar was based on the fact that how to resolve the tooth size-arch length discrepancy and assessing the final pre-determined position of the mandibular incisors without appreciable expansion of the lower

arch. The maxillary incisors were supposed to be positioned in a proper relationship with the mandibular incisors. (Stephens *et al.*, 2005) the soft-tissue convexities was straighter in extraction groups more than in the non-extraction groups; the upper and lower lips were more retrusive in the extraction groups as compared to non-extraction groups. (Mise *et al.*, 2011)

Few studies in the literature have evaluated periods longer than 20 years in order to study the frequency of dental extractions for orthodontic purposes. The present study found a reduction in the number of cases treated with extractions from 1980 to 2011. Changes in esthetic standards over time and an increasing variety of resources available to the orthodontist to treat a malocclusion, such as expander systems, distalizers devices, functional and orthopedic appliances, temporary anchorage devices and an increased frequency of interproximal reduction can be pointed out as the primary reasons for the decrease in the number of extractions in orthodontic treatment. (Jackson *et al.*, 2017) One of the treatment options to create space for solving this tooth size-arch length discrepancy is tooth extraction, which allows the remaining teeth to be moved into perfect alignment. Although the tooth misalignment problem occurs within the anterior esthetic zone, these anterior teeth should not be removed because of their specific shapes and esthetic impact. Thus, orthodontists typically choose to extract the first or second premolar because of their lower impact on esthetics and masticatory function compared to anterior teeth and molars. (Shearn and Woods, 2000)

When second premolars are extracted, the posterior teeth could be expected to move more forward than after a first premolar extraction, leaving inadequate remaining space for the relief of crowding and the retraction of anterior teeth. This is the reason why, in the past, orthodontists almost always chose to extract the first premolars and keep the second premolars, even though the second premolars might be in far worse condition than the first premolar. (Konstantonis, Anthopoulou and Makou, 2013) Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Mathew *et al.*, 2020). We hope this study adds to this rich legacy.

Any decision regarding the need for extraction of teeth during orthodontic therapy is not only dependent on the presence or absence of space in the dental arches. Other issues should be evaluated in order to achieve proper malocclusion correction, maintenance or improvement of facial aesthetics and result stability

## CONCLUSION

Within the limitations of the study it was observed that females were more aware and positive about extractions during an orthodontic therapy when compared to males. It was more predominant in the age group between 18-30 years. It was also observed that the majority of the patients had cited pain as the reason for avoiding extraction if indicated during an orthodontic therapy.

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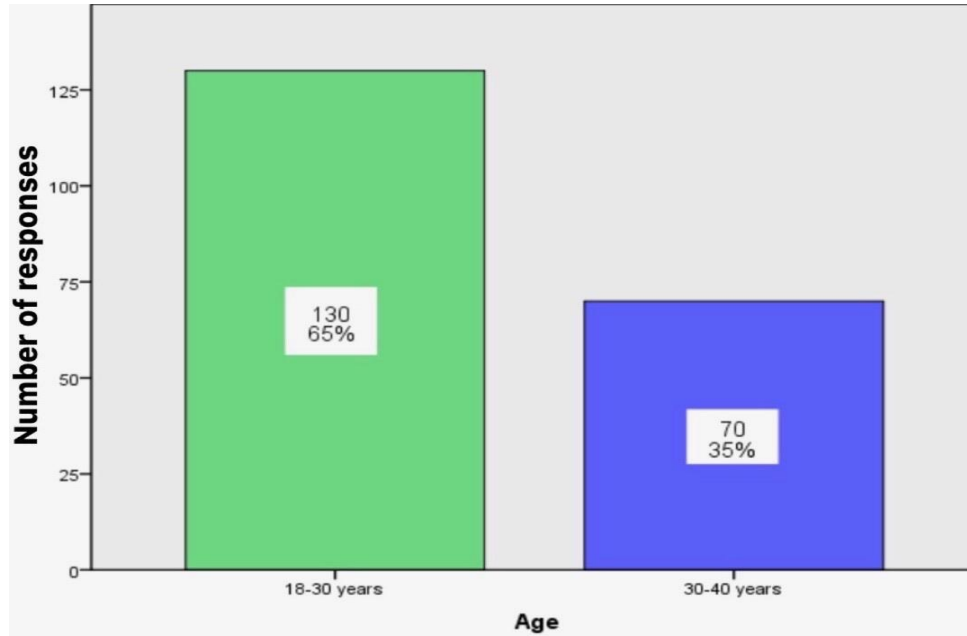


Figure 1: Bar graph depicts the frequency distribution of the age group of patients who came for orthodontic therapy. The X axis represents the age group and the Y axis represents number of responses. Green colour represents 18-30 years of age group and blue colour represents 30-40 years of age group. It was observed that the majority of the patients belonged to 18-30 years of age group (Green).

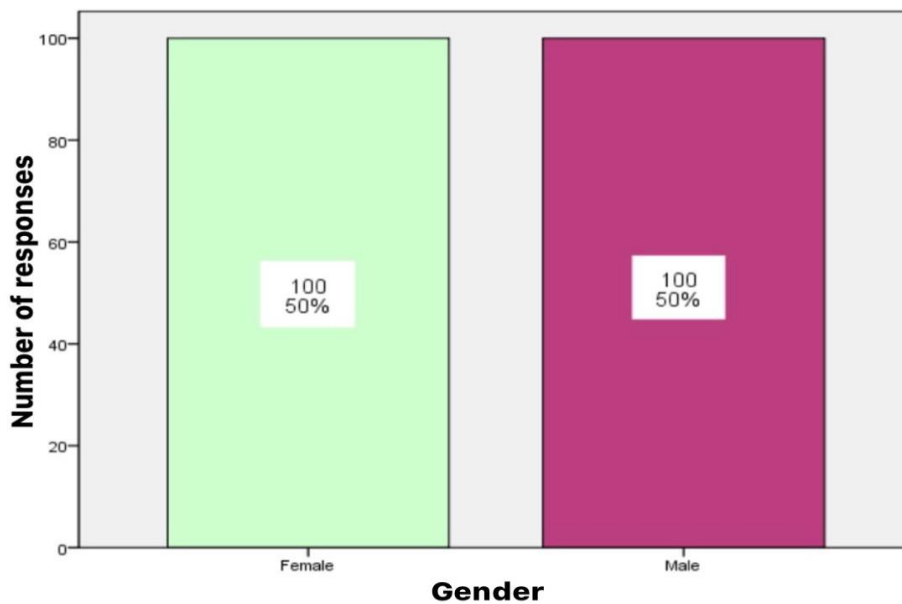


Figure 2: Bar graph depicts the frequency distribution of gender of patients who came for orthodontic therapy. The X axis represents gender and the Y axis represents number of responses. Green colour represents female and pink colour represents Male. It was observed that gender distribution was common in the present study.

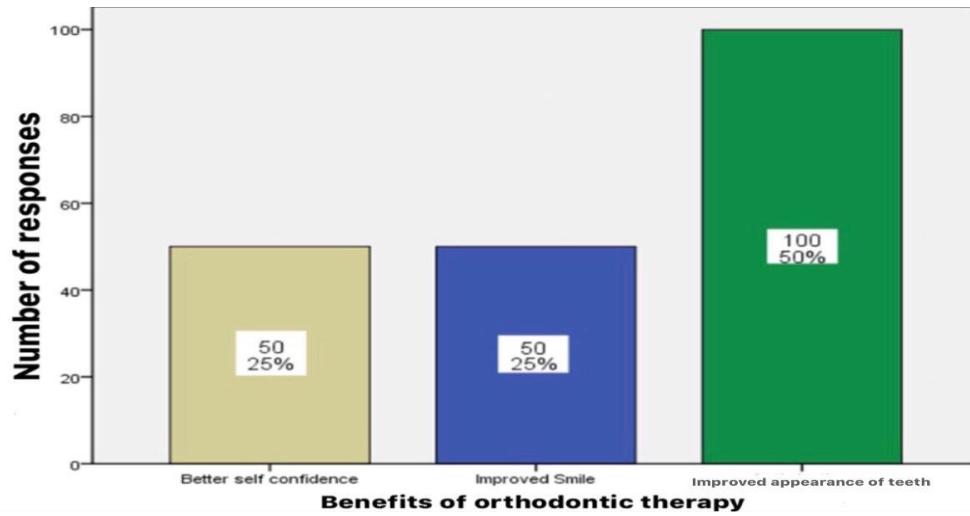


Figure 3: Bar graph depicts the responses to the question regarding the awareness about the benefits of orthodontic therapy. The X axis represents benefits of orthodontic therapy and the Y axis represents number of responses .Beige colour represents better self confidence,blue colour represents improved smile and green colour represents improved appearance of teeth. Majority of the patient’s wanted to benefit from orthodontic therapy by improving the appearance of their teeth (Green).

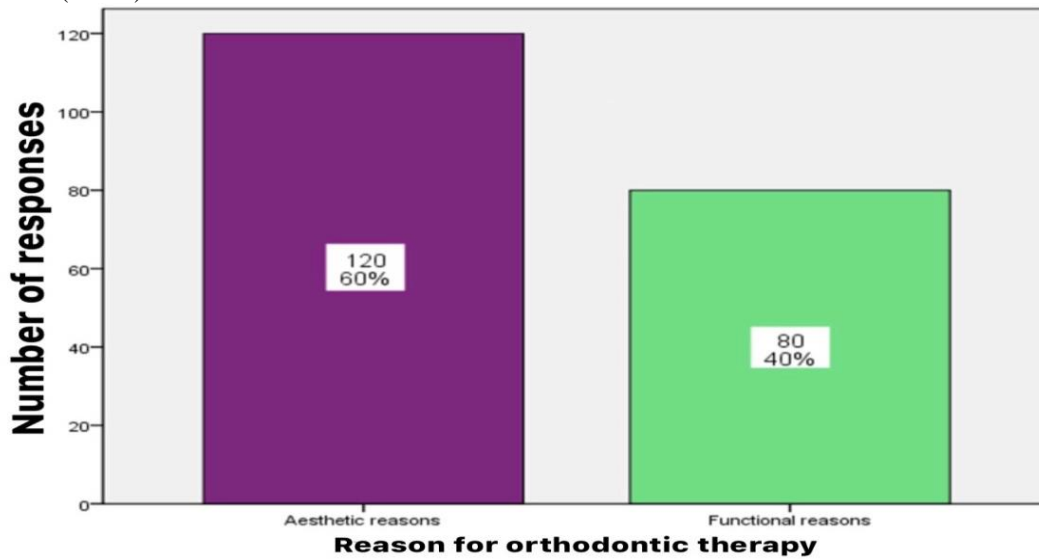


Figure 4: Bar graph depicts the frequency distribution of responses to the question regarding the reasons for undergoing orthodontic therapy. The X axis represents reasons for orthodontic therapy.The Y axis represents the number of responses. Purple colour represents aesthetic reasons and green colour represents functional reasons.Majority of the patient’s wanted to get orthodontic therapy done for aesthetic reasons(Purple).

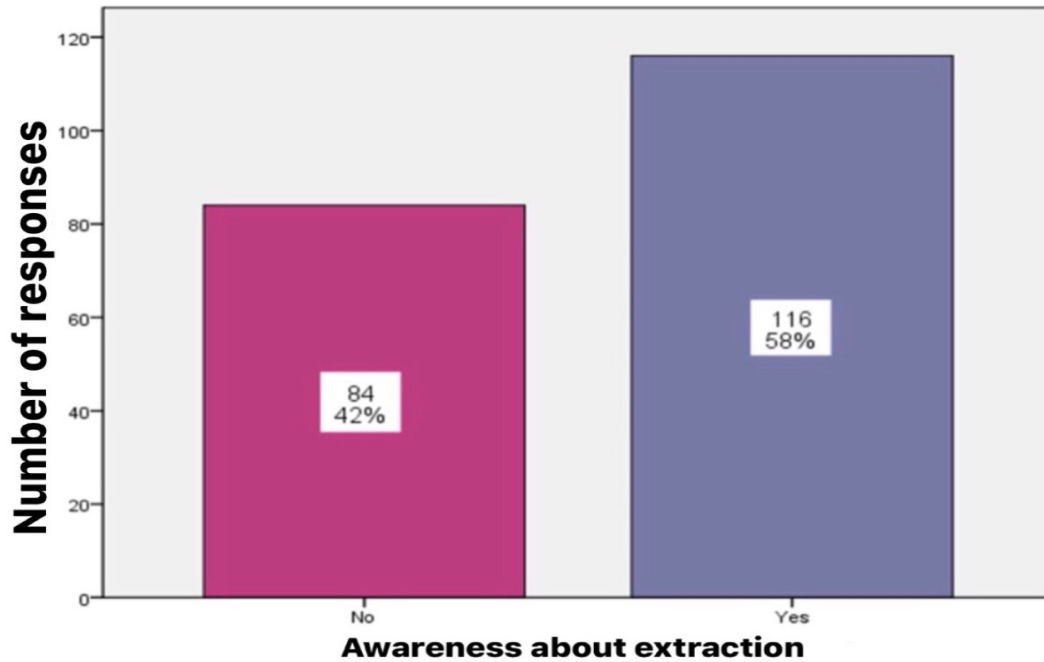


Figure 5:Bar graph depicts the frequency distribution of responses on awareness regarding extraction during orthodontic therapy.The X axis represents awareness about extraction and the Y axis represents number of responses. Violet colour represents ‘Yes’ and pink colour represents ‘No’. Majority of the patient’s were aware about extraction as an option during orthodontic therapy (violet ).

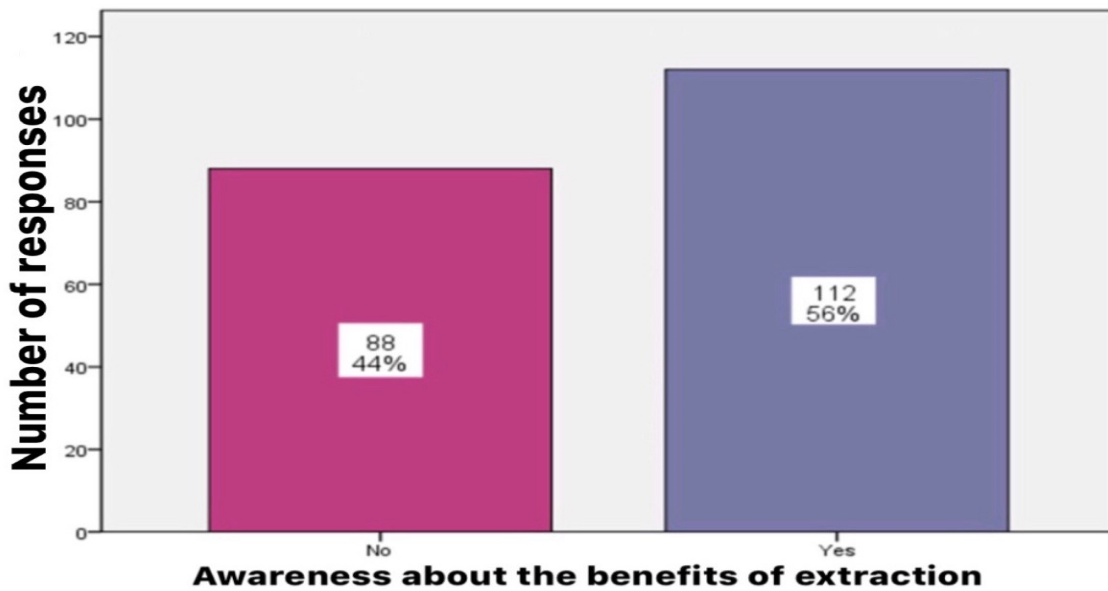


Figure 6:Bar graph depicts the frequency distribution of responses regarding awareness about the benefits of extractions while undergoing orthodontic therapy.The X axis represents awareness about the benefits of extraction and the Y axis represents number of responses.Violet colour represents ‘Yes’ and Pink colour represents ‘No’. Majority of the patient’s were aware about the benefits of extraction(Violet) during orthodontic therapy.

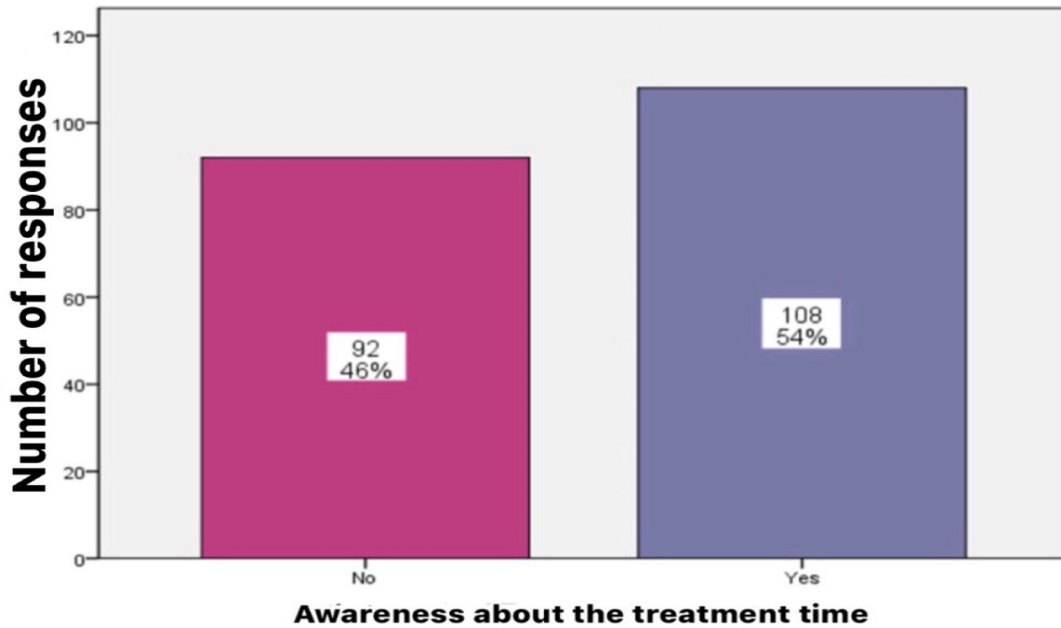


Figure 7: Bar graph depicts the frequency of responses regarding the prolonged treatment duration during orthodontic therapy with extraction. X axis represents awareness about the treatment duration. Y axis represents the number of responses. Violet colour represents 'Yes' and Pink represents 'No'.Majority of the patient’s were aware about the treatment duration(Violet) could be prolonged with extraction.

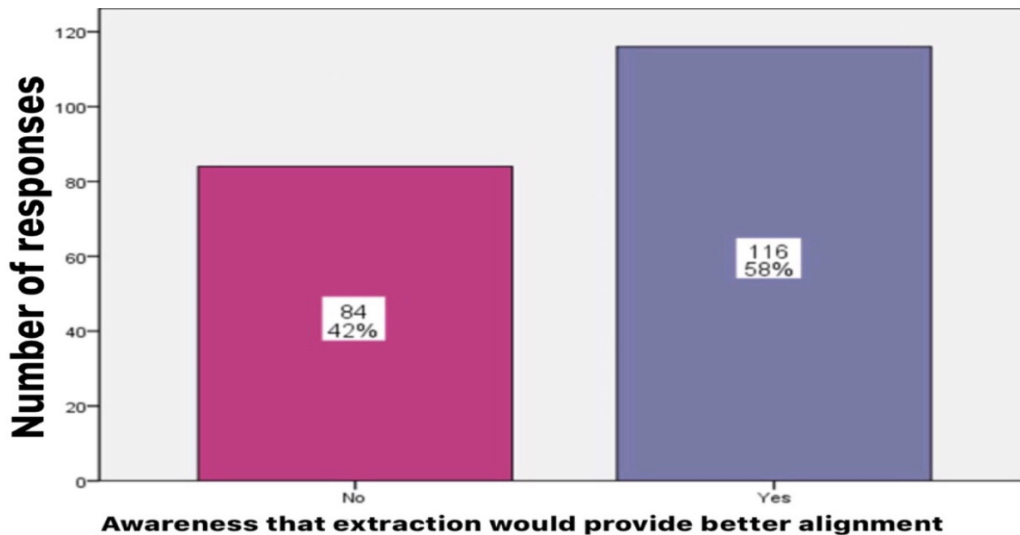


Figure 8:Bar graph depicts the frequency of responses regarding the awareness that extraction would result in better alignment compared to non extraction. X axis represents awareness about benefits of extraction for better alignment. Y axis represents the number of responses. Violet represents 'Yes' and Pink represents 'No'. Majority of the patient’s were aware about the benefits of extraction for a better alignment(Violet).

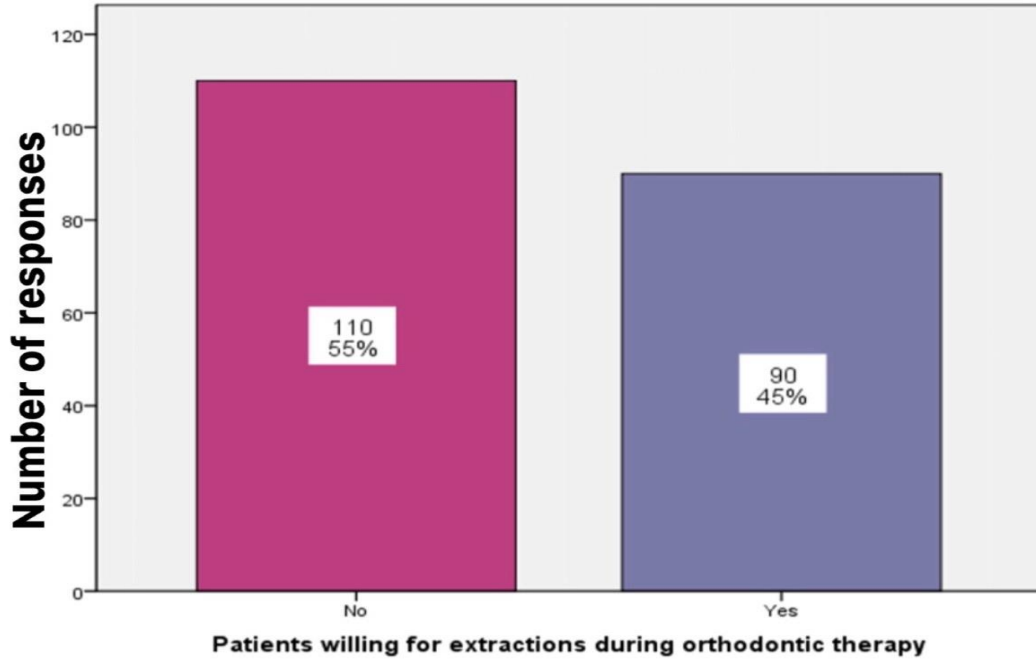


Figure 9:Bar graph depicts the frequency distribution of patients willing for extractions.The X axis represents patients willing for extractions and the Y axis represents number of responses .Violet colour represents ‘Yes’ and pink colour represents ‘No’. Majority of the patient’s were not willing for extraction during the orthodontic therapy (Pink).

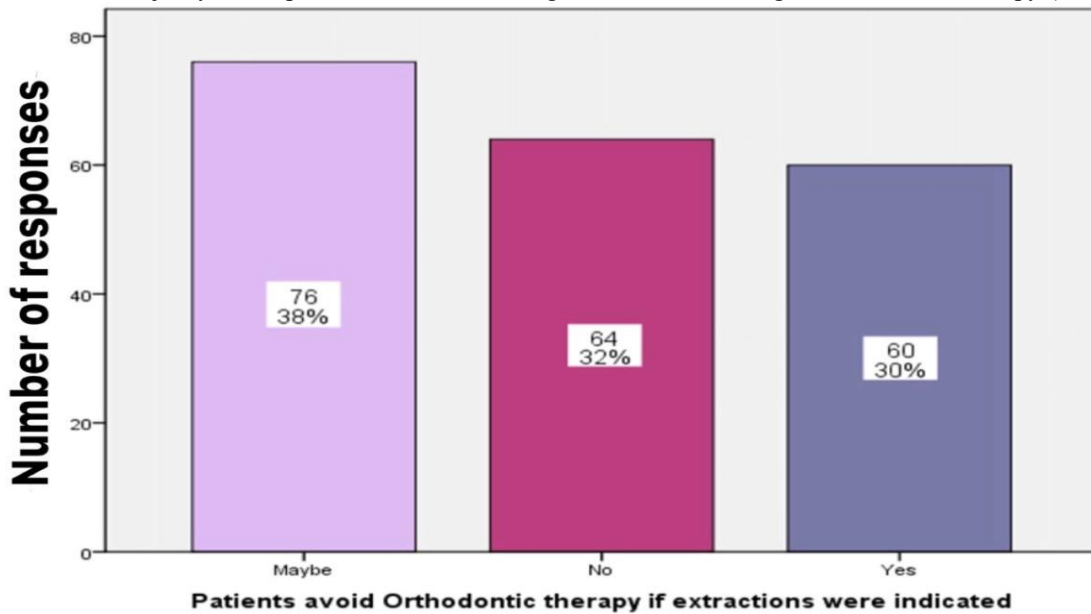


Figure 10:Bar graph depicts the frequency of patient’s avoiding orthodontic therapy if extractions were indicated.The X axis represents patients avoiding orthodontic therapy if extractions were required and the Y axis represents number of responses. Violet colour represents ‘Yes’ and pink colour represents ‘No’ and Purple represents ‘maybe’.Majority of the patient’s chose maybe (Purple) as an option of undergoing orthodontic therapy if extractions were indicated.

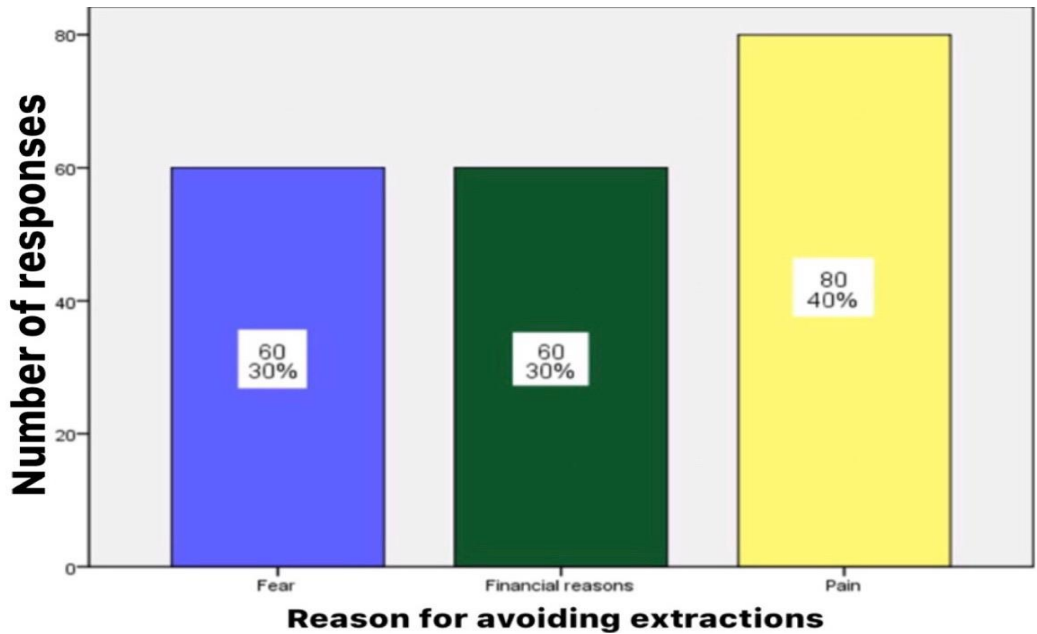


Figure 11:Bar graph depicts the frequency of responses regarding reasons for avoiding extractions. The X axis represents the patient's reasons for avoiding extractions and the Y axis represents the number of responses. Blue colour represents Fear, Green colour represents Financial reasons and yellow colour represents pain. Majority of the patient’s chose pain(yellow) as the reason for avoiding extractions.

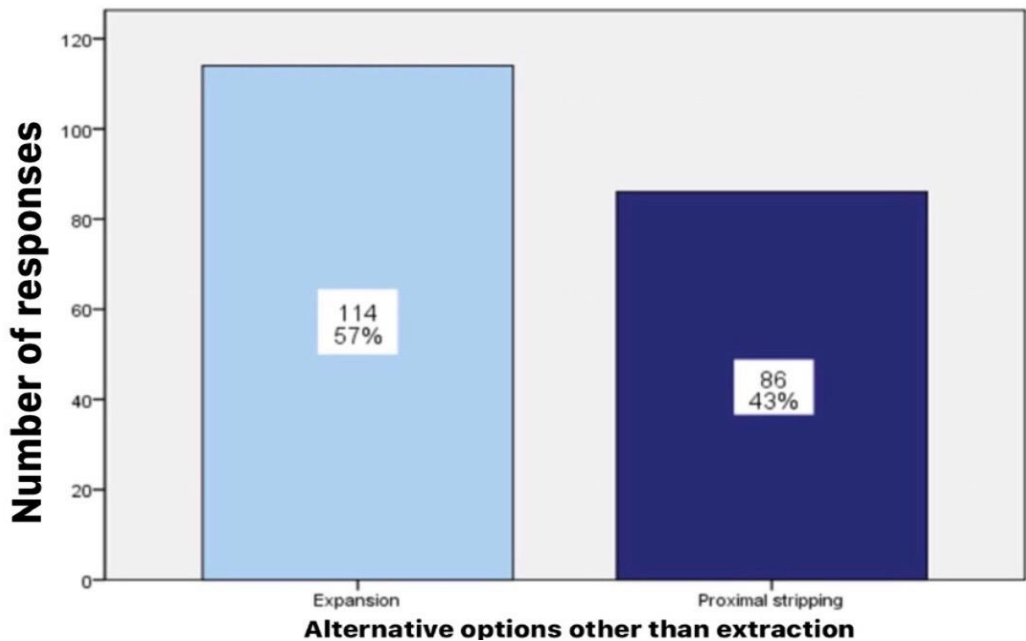
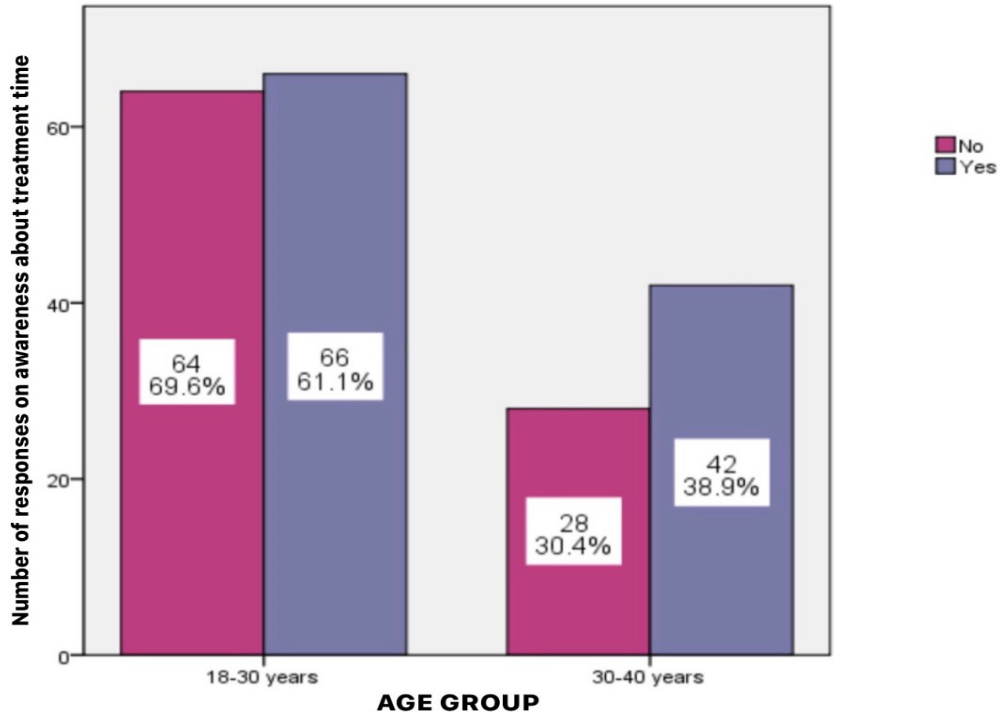
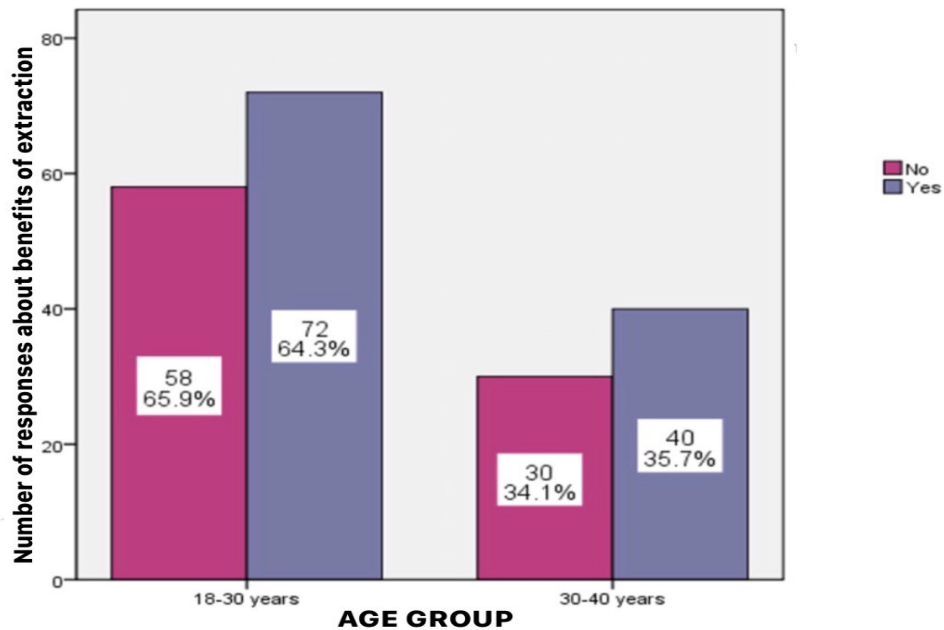


Figure 12:Bar graph depicts the responses to the patient’s choosing alternative options during orthodontic therapy other than extraction.The X axis represents alternative options other than extraction and the Y axis represents number of responses.Light Blue colour represents Expansion and dark blue colour represents proximal stripping. Majority of the patient’s chose expansion(Light Blue) as an alternative option other than extraction.

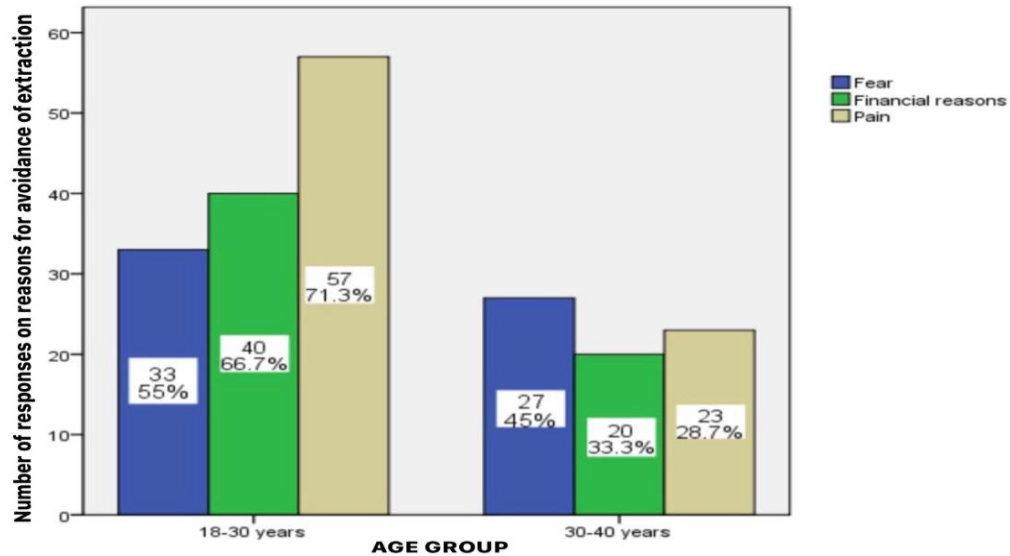


**Figure 13:**Bar graph depicts the association between age group and number of responses on awareness regarding prolonged treatment time if appropriate measures like extraction or any other alternative options are not considered. The X axis represents the age group and the Y axis represents the number of responses on awareness about treatment time. Violet colour represents ‘Yes’ and pink colour represents ‘No’.It was observed that patients between 10-30 years were more aware about the prolonged treatment time(Violet). Pearson’s Chi square value=1.561; df=1; p-value:0.212 ( $p>0.05$ ),statistically not significant)

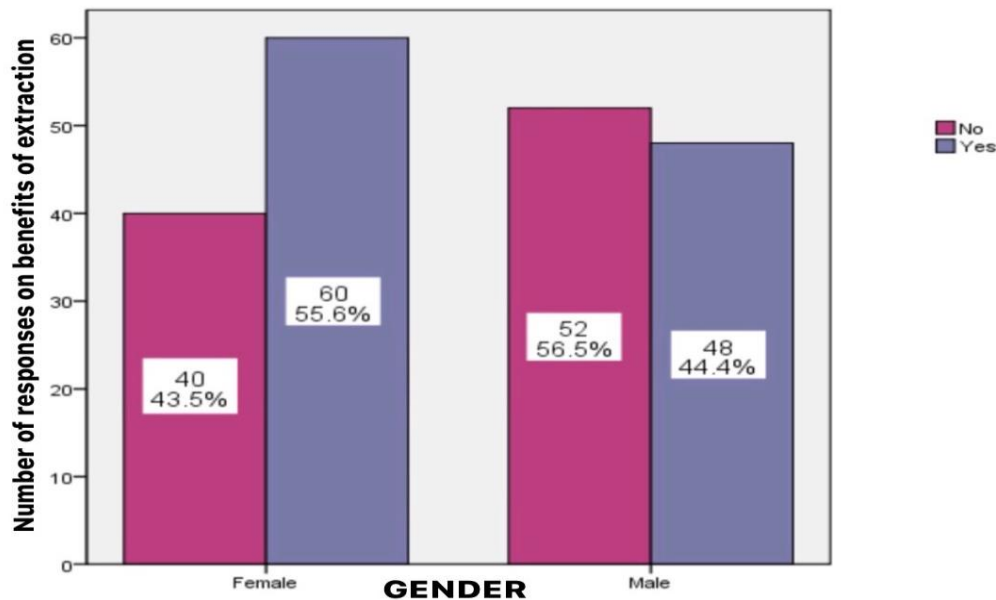


**Figure 14:**Bar graph depicts the association between age group and number of responses about benefits of extraction.The X axis represents Age group and the Y axis represents number of responses about benefits of extraction.Pink colour represents ‘No’ and Violet colour represents ‘Yes’.It was observed that people in the age group

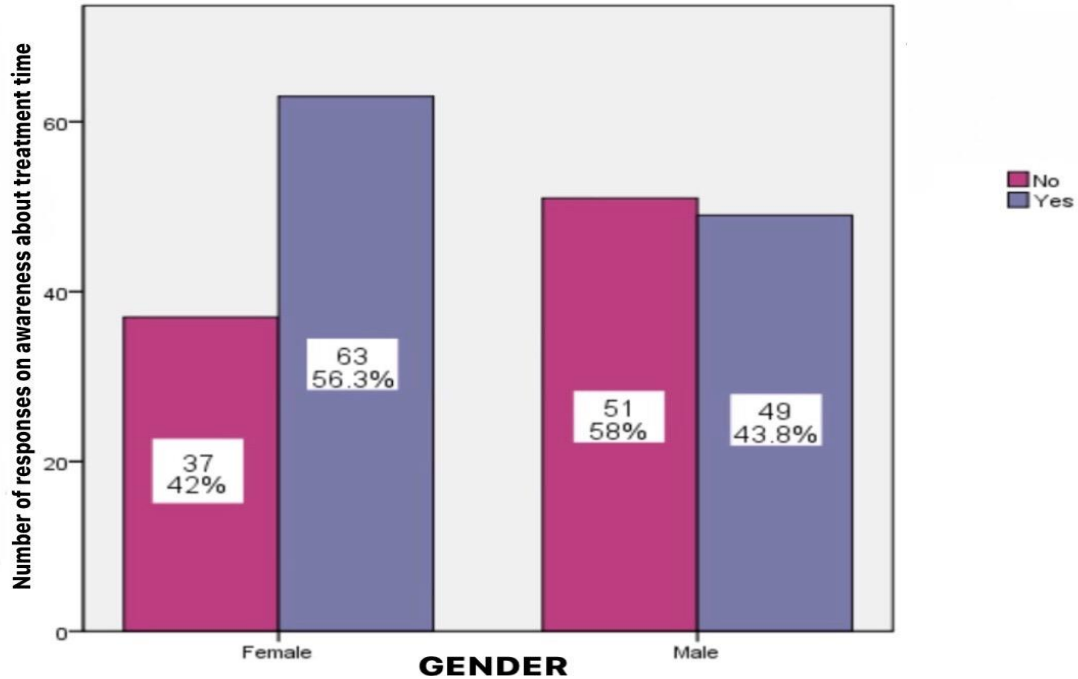
of 18-30 years(Violet) were more aware about the benefits of extraction during an orthodontic therapy. Pearson’s Chi square value=0.57; df=1; p-value:0.811 ( $p > 0.05$ ),statistically not significant)



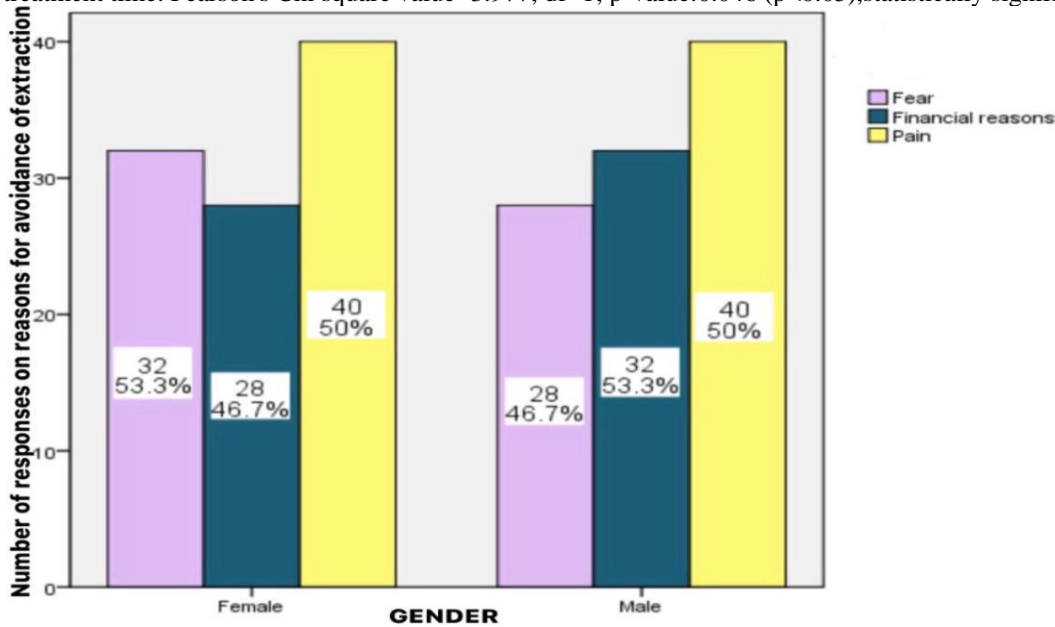
**Figure 15:** Bar graph depicts the association between age group and number of responses on reasons for avoidance of extraction. The X axis represents the age group and the Y axis represents the number of responses on reasons for avoidance of extraction. Blue colour represents Fear, Green colour represents Financial reasons and Beige colour represents pain. It was observed that it was more predominant in the age group between 18-30 years and pain(Beige) being that common reason for avoidance of extraction. Pearson’s Chi square value=4.084; df=2; p-value:0.130 ( $p > 0.05$ ),statistically not significant)



**Figure 16:** Bar graph depicts the association between gender and number of responses on benefits of extraction. The X axis represents gender and the Y axis represents number of responses on benefits of extraction. Pink colour represents ‘No’ and violet colour represents ‘Yes’. It was observed that female(Violet) were more aware about the benefits of extraction during an orthodontic therapy. Pearson’s Chi square value=2.899; df=1; p-value:0.089 ( $p > 0.05$ ),statistically not significant)



**Figure 17:** Bar graph depicts the association between gender and number of responses on awareness about prolonged treatment time if appropriate measures like extraction or any other alternative options are not considered. The X axis represents gender and the Y axis represents number of responses on awareness about treatment time. Pink colour represents ‘No’ and violet colour represents ‘Yes’. It was observed that female (Violet) were more aware about prolonged treatment time. Pearson’s Chi square value=3.977; df=1; p-value:0.046 (p<0.05), statistically significant)



**Figure 18:** Bar graph depicts the association between gender and number of responses on reasons for avoidance of extraction. The X axis represents gender and the Y axis represents number of responses on reasons for avoidance of extraction. Yellow colour represents Pain, Purple colour represents Fear and blue colour represents Financial reasons. It was common in both the gender and majority of the patient’s chose pain (yellow) as their reason to avoid extraction. Pearson’s Chi square value=0.533; df=2; p-value:0.766 (p>0.05), statistically not significant)