

# APOS Trends in Orthodontics

Original Article

## Orthodontic treatment in National Dental Centre of Singapore: Trends toward higher proportion of adult patients

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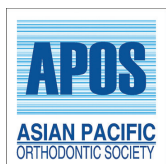
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### ABSTRACT

**Background:** Adult patients used to be daunted with the prospect of having fixed appliances to correct malocclusions. However, this has gradually changed and recent literature reported an increasing trend in adults receiving orthodontic treatment. To date, there has been no information regarding the trend of adult orthodontic patients in Singapore.

**Objective:** The objective of this study was to determine the changes in the proportion of adult patients seeking orthodontic treatment at the National Dental Centre Singapore (NDCS) from 2011 to 2017.

**Materials and Methods:** The study sample consists of all patients who commenced active orthodontic treatment from 2011 to 2017 at the NDCS. The data collected were analyzed for the number, gender, and proportion of adult orthodontic patients treated annually from 2011 to 2017. Linear-by-linear association test was used to test for any significant linear trend in proportion of adult orthodontic patients over the 7 years. Pearson's Chi-squared test was used to test for any significant gender differences.

**Results:** There was a significant increasing linear trend ( $p = 0.001$ ) in the proportion of adult orthodontic patients from 2011 to 2017. No significant difference ( $p = 0.770$ ) between the proportions of male and female adults undergoing orthodontic treatment was found. The ages of adults undergoing orthodontic treatment ranged from 21 to 73 years old and majority (48.61%) of them was in the 21–25 years old age range.

**Conclusion:** There is a rising trend in adults seeking orthodontic treatment at the NDCS from 2011 to 2017. No statistically significant gender difference was observed in this rising trend.

**Keywords:** Trend, Adult, Orthodontics

### INTRODUCTION

Adult patients used to be daunted with the prospect of having fixed appliances to straighten teeth and correct malocclusions. A retrospective survey of 358 local Chinese adult orthodontic patients showed several cross-cultural differences existing in the attitudes of our Asian patients compared to those reported in Caucasians. Embarrassment rather than fear was cited as the major factor deterring patients with orthodontic need from seeking treatment. Wearing braces among adults in Singapore was not widely accepted compared to those in Western countries.<sup>[1]</sup>

However, in the past few decades, the proportion of adults seeking orthodontic treatment had been on the rise.<sup>[2-4]</sup> Adults are seeking orthodontic treatment at historic levels based on their

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perceived esthetic needs.<sup>[5]</sup> Statistics from the United States reveal that the median percentage of adult case starts had risen from 15.4% of all cases in 1981 to 24% in 2014.<sup>[6]</sup>

Innovations in fixed appliances such as a decrease in metallic bracket size, widespread use of esthetic brackets, lingual brackets, and clear aligners have made orthodontics an option for adults with malocclusions.

Adult patients may have distinctive characteristics that require specific treatment approaches. A multidisciplinary team may be needed to maximize treatment outcomes by combining orthodontic, restorative, and periodontic treatment principles.<sup>[7]</sup> By having a clear perspective of our local adult orthodontic patient profile, we can then appropriately provide relevant information, appropriate advice, and allocate manpower and expertise accordingly for the increasing number of adults seeking orthodontic treatment.

Till date, there has been no study on adult orthodontic trends conducted in the local context. Hence, the aim of this retrospective study was to determine the changes in the proportion of adult patients seeking orthodontic treatment at the National Dental Centre Singapore (NDCS) from 2011 to 2017.

## MATERIALS AND METHODS

This was a single-center retrospective cohort study, carried out in the Department of Orthodontics at the NDCS. Our study was approved by the SingHealth Centralised Institutional Review Board (CIRB Ref: 2016/2191) and was in accordance to the ethical standards that were stipulated. All available records of adult patients treated from January 1, 2011, to December 31, 2017, were examined and included in our data collection. Adults were defined as those who are aged 21 years and above.

Participants recruited for this study were adult patients, who underwent or have completed orthodontic treatment. The following subjects were excluded from the study: (1) Patients who underwent consultation sessions only without orthodontic treatment, (2) patients without pre-treatment records, and (3) patients who did not have orthodontic appliances placed.

Acquisition of data was done from the NDCS Electronic Dental Records System. Data on the number and proportion of adult orthodontic patients and clinical variables such as date of birth, gender, and age at the start of treatment were collected. Treatment start date was defined by the day the patient's orthodontic treatment plan was finalized with a package fee subsequently charged. This date was then compared against the date of birth to determine the age at the start of treatment.

## Statistical analysis

Descriptive statistics were used to summarize the demographic information of the patients included in this study.

The proportion of adult orthodontic patients was plotted against the year that the respective patient began treatment in NDCS from 2011 to 2017 as a line graph to visualize the trends across time. For a comparison between different variables, Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. Released 2017) program was used to carry out Chi-square tests and linear-by-linear association tests. Significance level was set at  $p < 0.05$ .

## RESULTS

### Demographics

Of 10,536 orthodontic patient records that were available from 2011 to 2017, 2144 were adult orthodontic patients. 85 cases were excluded from the study as they did not fulfill the inclusion criteria. In addition, 14 patients did not give consent to participate in the study, resulting in a total of 2045 forming the sample size for our analysis. Of this sample of adult patients, 901 were male and 1144 were female. The age of our subjects ranged from 21 to 73 years old and majority (48.6%) of them were in the 21–25 years old age range, followed by 22.7% in the 25–29 years old age range [Figure 1].

### Trend in adult orthodontic patients

Figure 2 shows the number of adult orthodontic patients seeking treatment from 2011 to 2017. The number of adult orthodontic patients that sought treatment at the NDCS from 2011 to 2017 had generally been increasing from 244 adults in 2011 to 375 adults in 2017 [Figure 2]. The proportion of adult patients also increased steadily from 0.18 in 2011 to 0.21 in 2017 [Figure 3]. Using linear-by-linear association test, a statistically significant change ( $p = 0.001$ ) in the proportion of adults from 2011 to 2017 was found. There was an increasing trend of proportion of adult patients when compared to non-adult patients. Pearson's Chi-squared test showed that there was no statistically significant change in gender distribution ( $p = 0.770$ ) among adult patients seeking treatment from 2011 to 2017.

## DISCUSSION

Our study corroborated with the rising trend in adults seeking orthodontic treatment observed in the past few decades.<sup>[2-4]</sup> There was a significant increase in the proportion of adult orthodontic patients at the NDCS from 2011 to 2017 ( $p = 0.001$ ).

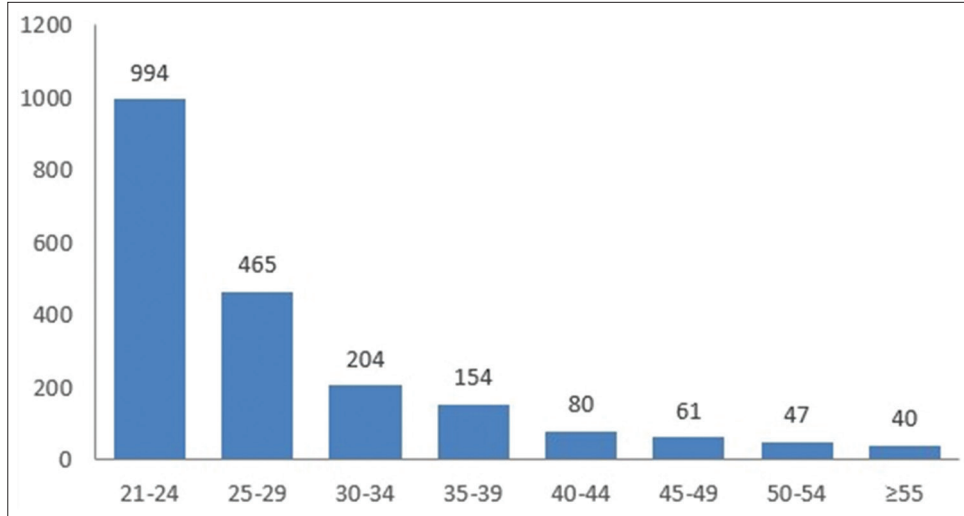


Figure 1: A total number of patients in various age groups from 2011 to 2017.

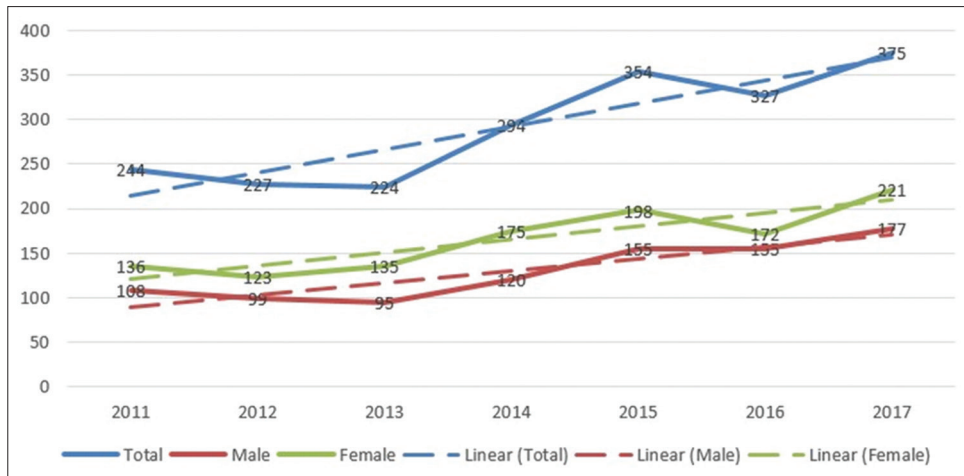


Figure 2: Line graph showing trend of adult orthodontic patients from 2011 to 2017.

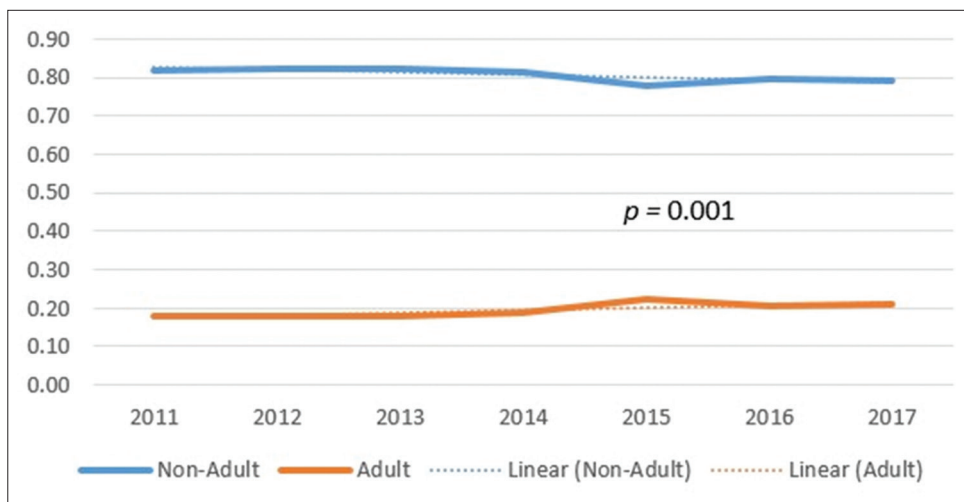


Figure 3: Line graph showing a statistically significant increase in trend of adult patients when compared to non-adult patients.

With the success of preventive dentistry, more patients are retaining their teeth into adulthood and more attention is being given to the orthodontic treatment needs of adults who were not given the opportunity to receive orthodontic treatment when they were younger.<sup>[8]</sup> Some of the reasons cited for the increasing trend in adults seeking orthodontic treatment are higher esthetic demand by adult patients,<sup>[9-11]</sup> improved technology and new innovations in treatment techniques,<sup>[11-13]</sup> and increased awareness and accessibility to orthodontic treatment.<sup>[14,15]</sup>

### Dentofacial esthetic concern

Patients are now more conscious about their facial esthetics, with greater emphasis on the “perfect smile.”<sup>[10]</sup> When surveyed on their motivations for pursuing orthodontic treatment, considerably more patients cited esthetics over functional considerations.<sup>[11]</sup> The motivating factors for adults seeking orthodontic treatment lay primarily in the enhancement of dentofacial esthetics and its accompanying improvement in self-confidence.<sup>[1,16,17]</sup>

### Technological advances

Recent technological advances have seen the advent of esthetic treatment options. Innovations in the esthetics of orthodontic appliances may play a major role for acceptability of treatment in adult patients.<sup>[9]</sup> Adults were more interested with treatment when more esthetic orthodontic appliances such as esthetic brackets, lingual systems, and aligners were used.<sup>[11]</sup> Adults’ concerns regarding the appearance of orthodontic appliances were quoted by orthodontists as being the most commonly deterring factor.<sup>[18]</sup>

Kim found that women (52.2%) had a significantly higher interest in receiving orthodontic treatment than did men (42.6%).<sup>[5]</sup> A study done in the UK also showed that females accounted for majority of the adult orthodontic population.<sup>[18]</sup> However, in our study, we found that there was no significant difference in the proportion of males and female adults seeking orthodontic treatment. Some of the reasons could be because the males in Singapore are enlisted into National Service with the Singapore Armed Forces at the age of 18–21 years old. During National Service, it could be difficult for male patients to go for regular orthodontic treatment due to their training schedule. Hence, many of them may choose to finish their National Service before seeking orthodontic treatment. The majority of our adult patients also belong to the 21–25 years old age range which concurs with this postulation. Another reason could also be because most of the females in Singapore had already undergone orthodontic treatment in their adolescent age. The robust school dental service in Singapore actively refers school-going children with malocclusion for orthodontic

treatment, and females who are more esthetic conscious would have already completed orthodontic treatment before adulthood. One other postulation could also be due to the higher proportion of patients with Class III malocclusion in our local population compared with the Caucasian population.<sup>[19]</sup> Since skeletal growth ceases later in males than females, males with skeletal Class III malocclusion may have their treatment delayed till a later stage than females.<sup>[20,21]</sup>

The majority (48.61%) of our adult orthodontic patients ranged from 21 to 25 years of age. This is similar to an earlier study done in Singapore which showed that 80% of the respondents belonged to the 18–27 years old age group.<sup>[1]</sup> The typical age of adults treated in the UK was also reported to be 26–35 years old.<sup>[18]</sup> This finding could be attributed to young adults starting work in this age group and attaining the financial means for orthodontic treatment when they were previously limited by their finances as students. They may also be more conscious of their appearance as they step into the workforce and interact with fellow colleagues.

### Clinical significance and future directions

Our study confirms the increasing trend in adult orthodontic patients. Since adult orthodontic patients have specific treatment needs and dental characteristics that differ greatly from that of children or adolescents,<sup>[7]</sup> identifying the trends allows orthodontists to be better equipped with the necessary skills and information to provide appropriate and tailored treatment plans for this group of patients. Key industry players can also be better informed about adult trends and develop materials that match the specific needs of adult patients, making orthodontic treatment a much more convenient and palatable choice for adults.

Future studies can be conducted to identify the trend of adult patients opting for esthetic appliances as well as the common presenting malocclusion in adult patients. Long-term follow-up studies can also be conducted to see if the rising trend continues.

### CONCLUSION

There is a statistically significant increasing trend of adults seeking orthodontic treatment at the NDCS from 2011 to 2017. No statistically significant gender difference was noted in the proportion of male and female adults seeking orthodontic treatment. Majority (48.61%) of adult orthodontic patients was at the age of 21–25 years old.

### Declaration of patient consent

Patient’s consent not required as patients identity is not disclosed or compromised.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Lew KK. Attitudes and perceptions of adults towards orthodontic treatment in an Asian community. *Community Dent Oral Epidemiol* 1993;21:31-5.
2. Khan RS, Horrocks EN. A study of adult orthodontic patients and their treatment. *Br J Orthod* 1991;18:183-94.
3. Natrass C, Sandy JR. Adult orthodontics a review. *Br J Orthod* 1995;22:331-7.
4. Zachrisson BU. Global trends and paradigm shifts in clinical orthodontics. *World J Orthod* 2005;6:3-7.
5. Kim Y. Study on the perception of orthodontic treatment according to age: A questionnaire survey. *Korean J Orthod* 2017; 47:215-21.
6. Keim RG, Gottlieb EL, Vogels DS, Vogels PB. Study of orthodontic diagnosis and treatment procedures, Part 1: Results and trends. *J Clin Orthod* 2014;48:607-30.
7. Kalia S, Melsen B. Interdisciplinary approaches to adult orthodontic care. *J Orthod* 2001;28:191-6.
8. Muir JC, Wareing MG, McDonald AJ. Orthodontic treatment for adults. *N Z Dent J* 1986;81:143-6.
9. Feu D, Catharino F, Duplat CB, Capelli JJ. Esthetic perception and economic value of orthodontic appliances by lay Brazilian adults. *Dent Press J Orthod* 2012;17:102-14.
10. Patel D, Mehta F, Mehta N. Aesthetic orthodontics: An overview. *Orthod J Nepal* 2015;4:38-43.
11. Singh P. Adult orthodontic patients in primary care and their motivation for seeking treatment. *Orthod Update* 2016;9: 69-72.
12. Bräscher AK, Zuran D, Feldmann RE Jr, Benrath J. Patient survey on invisalign® treatment compared the smartTrack® material to the previous aligner material. *J Orofac Orthop* 2016; 77:432-8.
13. Uribe F, Padala S, Allareddy V, Nanda R. Patients', parents', and orthodontists' perceptions of the need for and costs of additional procedures to reduce treatment time. *Am J Orthod Dentofacial Orthop* 2014;145:S65-73.
14. Kravitz ND, Bowman SJ. A paradigm shift in orthodontic marketing. *Semin Orthod* 2016;22:297-300.
15. Vicéns J, Russo A. Comparative use of invisalign by orthodontists and general practitioners. *Angle Orthod* 2010;80: 425-34.
16. Breece GL, Nieberg LG. Motivations for adult orthodontic treatment. *J Clin Orthod* 1986;20:166-71.
17. Riedmann T, Berg R. Retrospective evaluation of the outcome of orthodontic treatment in adults. *J Orofac Orthop* 1999;60:108-23.
18. Cedro MK, Moles DR, Hodges SJ. Adult orthodontics who's doing what? *J Orthod* 2010;37:107-17.
19. Lew KK, Foong WC, Loh E. Malocclusion prevalence in an ethnic Chinese population. *Aust Dent J* 1993;38:442-9.
20. Hägg U, Taranger J. Maturation indicators and the pubertal growth spurt. *Am J Orthod* 1982;82:299-309.
21. Buschang PH, Tanguay R, Demirjian A, LaPalme L, Goldstein H. Pubertal growth of the cephalometric point gnathion: Multilevel models for boys and girls. *Am J Phys Anthropol* 1988;77:347-54.

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