

Assessing the Dental Treatment Needs of Female Patients at the Dental College, Riyadh, Saudi Arabia

Eman Mohammed AlHamdan

King Saud University College of Dentistry, Riyadh, Saudi Arabia

Abstract

Aims: To assess the treatment need among Saudi female patients attending for dental treatment at the College of Dentistry, King Saud University, Riyadh. **Methods:** The sample included all female patients referred to the Comprehensive Dental Course for treatment by 5th year students at the College of Dentistry, King Saud University during the academic year 2014-2015. Patients were clinically examined and different dental treatment needs were assessed and documented. **Results:** A total of 264 patients were examined and 81 were referred mostly to post graduate and undergraduate courses the reason for referral was significantly because of either simplicity or difficulty of the case. Almost 76% of the patients needed restorative treatment, 74.5% needed periodontal treatment, and 71% needed endodontic treatment. Seventy percent of the patients needed fixed prosthetic treatment while 52% of the patients needed removable partial dentures; in addition more than half of the patients (57%) needed teeth extraction. Caries was found to be the main reason for extraction, restorative and endodontic treatments. In Fixed prosthodontic treatment need, crowns were found to be more needed than fixed partial dentures however among removable dentures, conventional partial dentures was the most needed. **Conclusion:** The study revealed a considerable amount of treatment need, and as caries was found to be the main reason for extraction, restorative and endodontic treatments; efforts should be directed towards more dental educational programs. This can be done through community services programs conducted by the dental school, the main target of these services should be improving oral hygiene and implementing preventive measures to reduce dental caries and periodontal disease.

Keywords:

Treatment needs, dental caries, Periodontal disease, Dental restoration, Endodontic Treatment, Prosthetic treatment

Introduction

Need in health care is generally recognized as the capacity to benefit the community, if the health needs are identified then an effective intervention would be available to meet these needs for improvement of health [1]. There are many definitions of need; however the definition that is most often quoted is the taxonomy proposed by Bradshaw [2] which identifies four categories of need; Normative need, which tends to be professionally defined by an expert as requiring some action. Felt need, it is equated with what people want. Expressed need or demand; it is the felt need that is converted into action by seeking care. Comparative need; it is assessed by comparing care received by different people with similar characteristics. One simplified objective approach to assessing treatment need is to estimate the percent of people in need for a specific treatment [3], the method of assessment is usually employed through clinical examination where clinicians use professional norms to assess needs in any given situation [4].

In health care planning, it is essential to identify and quantify the needs of the target population, as this is the primary step in the development and planning of programs [5]. In addition, the concept of treatment need is central to effective planning, provision and evaluation of the institution's health services to provide information about the care required by the service users.

On a nationwide basis, estimating treatment need may be helpful to develop sufficient facilities and to calculate resources, fees and educational capacities [6].

Most recent studies have been performed to assess dental treatment needs in specific populations such as elderly [7],

children [8,9], mentally and physically challenged [8,10,11], and the medically compromised [12,13]. Treatment need was also assessed for different specialties such as periodontics [12], orthodontics [9,14], and prosthodontics [15].

In Saudi Arabia, limited number of studies has assessed the treatment need [16,17], however, most studies focused on a certain group or a certain need [18-22]. The aim of this study is to assess the treatment need among Saudi female patients treated in the Comprehensive Dental Course by senior dental students at the College of Dentistry, King Saud University, Riyadh.

Material and Methods

The sample included all female patients referred to the Comprehensive Dental Course for treatment. The Course is designed to treat adult patients who need complete dental treatment in all dental specialties namely; Maxillofacial Surgery, Periodontics, Endodontics, Restorative and Prosthetic dental treatments with exception to orthodontic treatment. The course is given to the final year (5th year) students at the College of Dentistry, King Saud University. The data were collected during the academic year 2014-2015.

The number of the fifth-year student is 41 students; each one should complete treating five comprehensive cases in order to PASS the course. Accordingly, all patients referred to the Comprehensive Dental Course were included and examined by a single examiner (Prosthodontist). The examination was conducted in a dental clinic under artificial light using a mouth mirror and an explorer, a periodontal probe, gauze and compressed air. If the case was suitable to be treated by the student, then a treatment plan was constructed and discussed with five specialists in the following specialties (Surgery, Periodontics, Endodontics, Operative, and Prosthodontics) then approved. A special form was designed and used to collect the data. It consisted of nine sections; seven sections were assigned for each dental specialty

namely; Surgery, Periodontics, Endodontics, Operative, Fixed Prosthodontics, Removable Prosthodontics and Oral Medicine. In each specialty, the area and/or teeth, type and reason for the selected treatment was documented wherever applicable.

The need and reason for crown lengthening and orthodontic consultation were included in a separate section. The last section was dedicated to referral, if the case was not suitable for the course, the reason and destination of referral was documented.

Each patient was clinically examined; in addition panoramic and full mouth x-ray was taken. The treatment needs were evaluated for each patient; then the treatment plan was constructed and approved by specialists each in his/her specialty.

The need for dental treatment was categorized in the following manner:

- **Surgical:** teeth and remaining roots needing extraction were outlined then the reason for extraction was determined. Reasons for tooth extraction were categorized to be due to caries, periodontal, endodontic or prosthetic cause.
- **Periodontal:** plaque and bleeding indices, probing depth and attachment loss were assessed, and a diagnosis was obtained according to the AAP 1999 classification [23].
- **Restorative:** presence and location of caries were determined using clinical and radiographic examination. Then the need for a new restoration, replacement of an old one, correction and/or replacement of an overhang was recorded. In addition tooth fracture, the need for polishing and finishing of old restoration was also determined.
- **Endodontic:** teeth examination was done using cold test, electric pulp tester, and radiographic assessment; teeth needing endodontic treatment, retreatment or elective endodontic treatment was recorded.
- **Prosthodontic:** Missing teeth were determined then their replacement with an implant or a fixed partial denture (FPD) was planned. Teeth that need fixed restorations such as crowns, post and cores were recorded; the need of removable dentures was also documented.
- Teeth that need crown lengthening with their respective cause were recorded.
- Oral lesions and any other needed consultations were also recorded.

If the case was not suitable for the fifth year student, the case was referred to the suitable level, and the reason for referral was documented.

Data were entered and analyzed using SPSS Pc+ version 21.0 statistical software. Descriptive statistics (frequencies and percentages) were used to describe the categorical study and outcome variables. Pearson's Chi-square test was used to compare the distribution and comparison of the categories of study variables. A p-value of <0.05 was used to report the statistical significance of results.

Results

A total of 246 female patients were examined, and their dental treatment need was determined, however, only 165 were treated in the Comprehensive Dental Course while 81 were referred.

Patients' age ranged between 14 to 76 years old with a mean age of 42 years old, 75% (184) of the patients were Saudi while only 15.5% (38) were non-Saudis.

More than half of the patients (57%) needed teeth extraction and it was found to be significantly more in the posterior teeth 78.7% (85) than in the anterior teeth 21.3% (23) ($P<0.05$). Almost Seventy-six percent of the patients needed restorative treatment and there was no significant difference between posterior (90.5%) and anterior (78.6%) areas, 74.5% needed periodontal treatment, 71% needed endodontic treatment that was found to be significantly more in the posterior teeth 66.19% (280) than in the anterior teeth 33.8% (143) ($P<0.05$). Seventy percent of the patients needed fixed prosthetic treatment, which was found to be significantly more in the posterior area (64.7%) than in anterior area (40.5%) ($P<0.05$). Only 52% of the patients needed removable partial denture treatment (*Figure 1*).

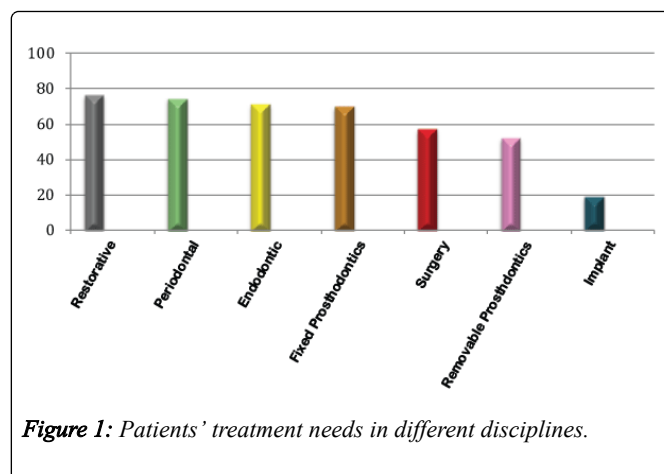


Figure 1: Patients' treatment needs in different disciplines.

When examining the reasons for the different treatments needed by the patients, it was found that the main reason for tooth extraction was caries (57.5%), which was statistically significantly higher ($P<0.05$) than other reasons for extraction such as; prosthetic (21.7%), periodontal (15.6%) and endodontic (5.2%) (*Figure 2*).

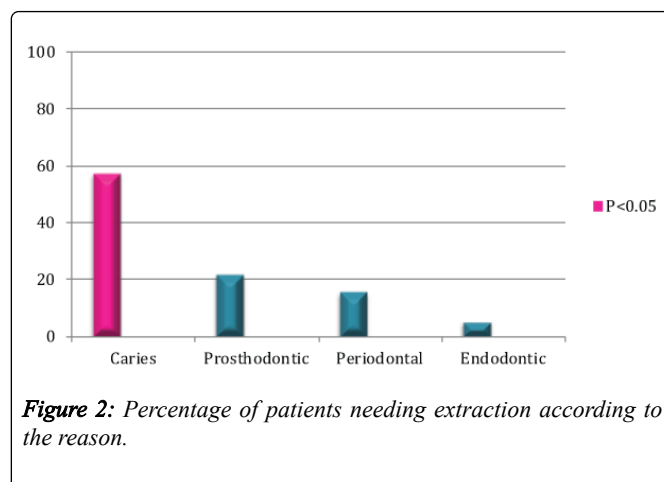


Figure 2: Percentage of patients needing extraction according to the reason.

The majority of the patients needed periodontal treatment (74.5%), however cases needing scaling only were more (66.3%) than cases that need root planning in addition to scaling (12.2%) and only (21.5%) of the cases were cases for re-evaluation of previously treated periodontal cases and this was found to be statistically significant $P < 0.05$ (Figure 3).

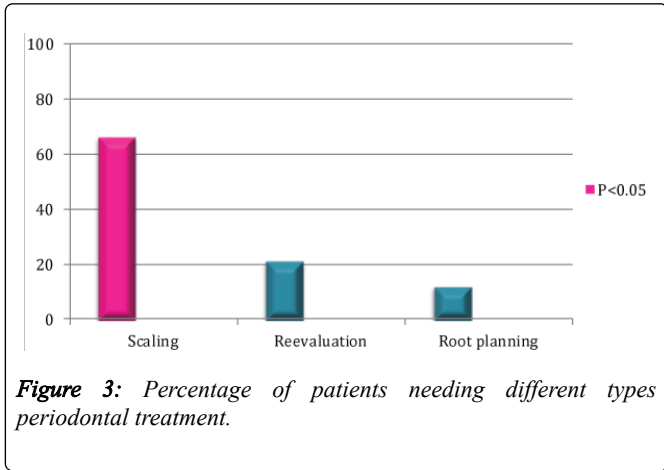


Figure 3: Percentage of patients needing different types periodontal treatment.

Around 71% of patients needed endodontic treatment, the two main reasons for endodontic treatment were retreatment and caries (44.6% and 44%), which was found to be statistically significantly higher than elective endodontic treatment that counted for 11.4% only (Figure 4).

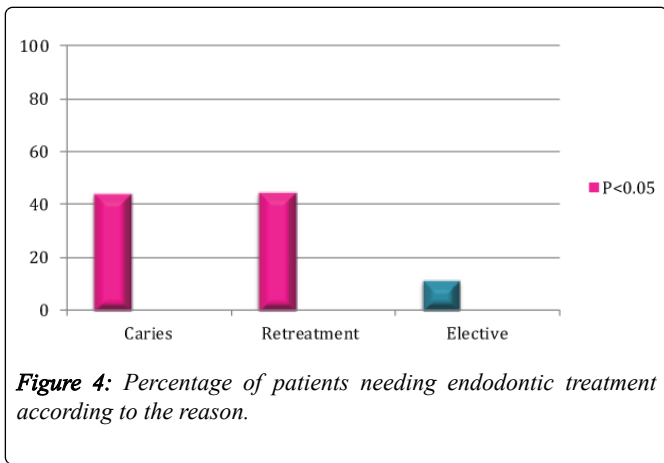


Figure 4: Percentage of patients needing endodontic treatment according to the reason.

A high percentage of patients (76.4%) needed restorative treatment and the restorations were mainly due to occlusal and/or smooth surface caries (86.2%) and to a lesser extent to root caries (13.8%) ($P < 0.05$) (Figure 5).

Seventy-one patients (43%) needed remake of restorations, which was significantly a result of recurrent caries (83.1%), while overhangs and defective restoration counted for 12.7% and 4.2% respectively (Figure 6).

Seventy percent of the patients needed fixed prosthetic treatment. Out of these patients, 83% needed crowns; the need for metal ceramic crowns (64.6%) was significantly higher $P < 0.05$ than all-ceramic crowns (33.4%). On the other hand 40.5% needed FPDs, similarly the need of metal ceramic FPDs (89.4%) was significantly higher than all-ceramic (10.6%) $P < 0.05$.

Post and cores comprised around 70% of patients' prosthetic needs; there was no significant difference between the need for cast (51.6%) and fiber (48.4%) post and cores.

Only 19% of patients needed treatment with implants (Table 1).

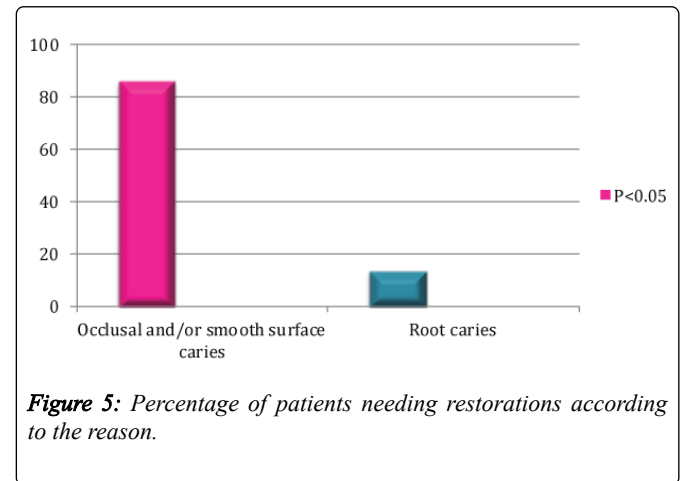


Figure 5: Percentage of patients needing restorations according to the reason.

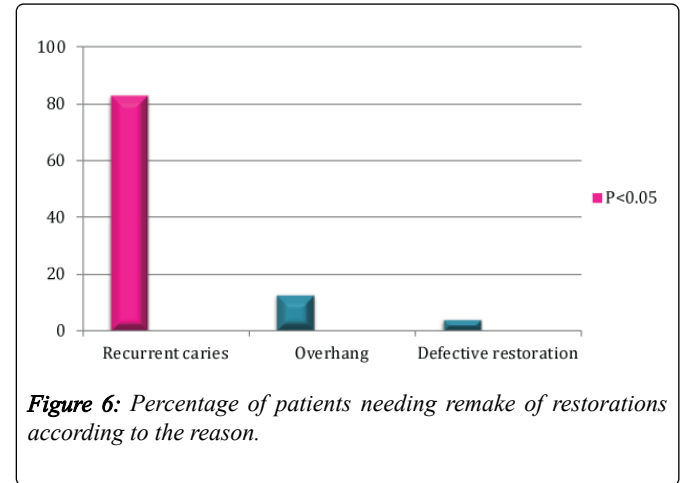
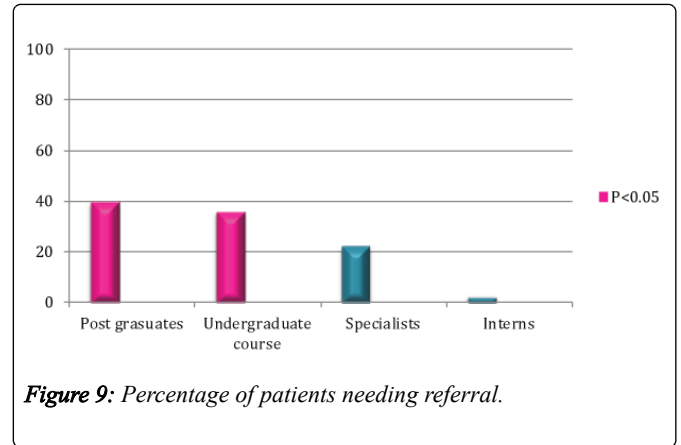
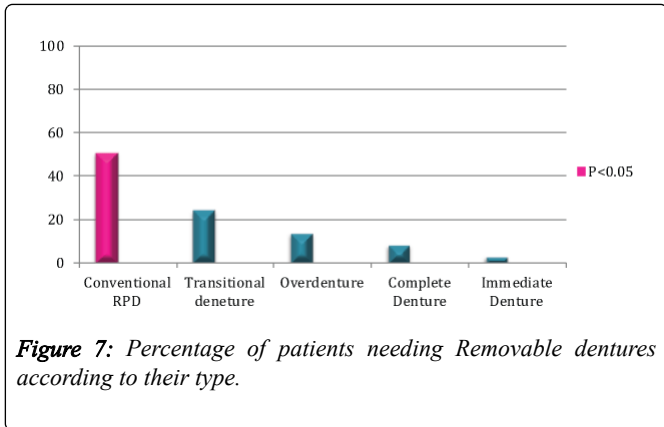


Figure 6: Percentage of patients needing remake of restorations according to the reason.

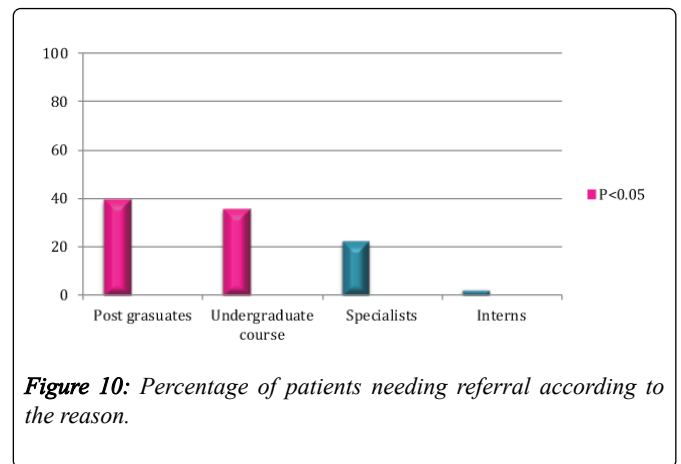
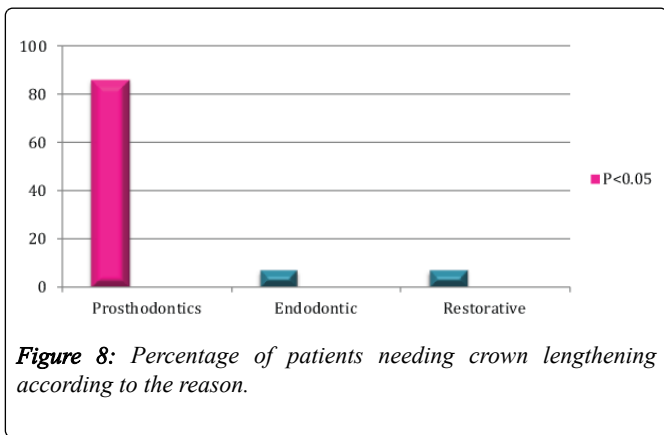
Table 1: Number and percentage of patients needing different types of fixed prosthetic treatment.

Type of Fixed Prosthodontic Treatment	Material	N (percent.)	Total
Crowns	Metal-ceramic	62 (64.6%)*	96
	All-ceramic	34 (33.4%)	
FPD	Metal-ceramic	42(89.4%)*	47
	All-ceramic	5 (10.6%)	
Post and cores	Cast	49 (51.6%)	95
	Fiber	46 (48.4%)	

The need for removable dentures was found to be 52.1%, in this category the need for conventional partial dentures (50.8%) was found to be significantly higher than other form of treatment $P < 0.05$ such as transitional partial dentures (24.2%), over-dentures (13.7%), complete dentures (8.3%) and immediate dentures (3%), moreover there was no statistical difference between the need for denture replacement in a single (53.5%) or in both arches (46.5%) (Figure 7).



Seventeen percent of patients needed crown lengthening mostly due to prosthetic reasons (86.2%) which was found to be significantly higher $P<0.05$ than other reasons such as restorative (6.9%) and endodontic (6.9%) (Figure 8).



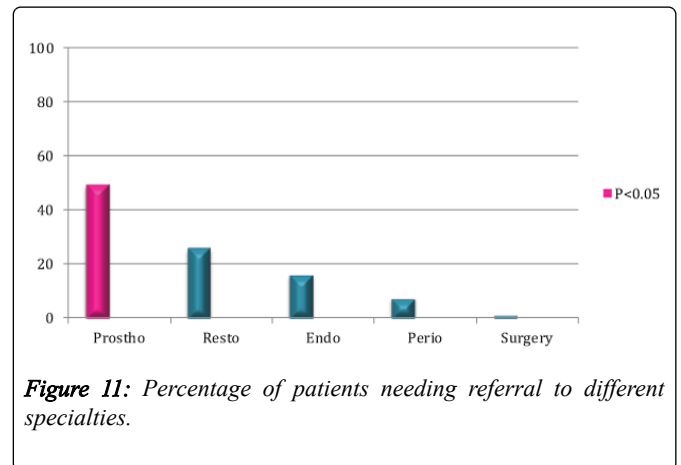
Only 4.2% of patients needed oral medicine care; the reason was mostly aphthous ulcer, followed by oral candidiasis, recurrent herpes simplex, and traumatic ulcer.

The need for Orthodontic consultation for the cases comprised only 6.1% of patients, reasons were variable including; occlusal interference, cross bite, impacted canines, open bite, partial tooth eruption, protruded maxilla, severe spacing and space reestablishment.

Almost 33% of patients cases were referred, the referral was mostly to postgraduate (39.5%) and undergraduate students' courses (35.8%) which was found to be statistically significant $P<0.05$ compared to referrals to specialists and dental interns that comprised (22.2%) and (2.5%) of total referral (Figure 9).

The highest percentage of referrals were either because the cases were simple (33.8%) or difficult (29.6%), and this was found to be statistically significant $P<0.05$, other referral reasons were; limited interarch space (19.8%) occlusion problem (14.8%), patient refusal of treatment plan (3.8%) or need for orthodontic treatment (2.5%) (Figure 10).

Almost 50% of the referred cases were to Prosthodontic treatment, which was found to be statistically significantly higher than others namely Restorative (26%), Endodontics (16%), Periodontics (7.4%) and Surgery (1.2%) (Figure 11).



Discussion

This study assessed the patients' dental treatment needs in the female section of King Saud University Dental School, Riyadh. The subjects were patients in the comprehensive undergraduate course that is given to 5th year dental students; this course was chosen because students treat comprehensive cases with different specialties in each case.

The total number of screened patients was 246; however 165 were treated while 81 patients were referred.

Fifth-year dental students are supposed to treat certain cases in a certain time duration, therefore, cases that exceed their abilities or have a complex dental problem are mostly referred to postgraduate dental students and/or specialists, on the other hand if the case is not comprehensive it was referred to 3rd or 4th year undergraduate dental students. Any case that needs

orthodontic treatment is not seen by undergraduate students at all and is referred to an orthodontist and intern to finish the needed restorative treatment before they start the orthodontic treatment. It was found that almost half of the referrals were to prosthodontists since they are usually the ones dealing with difficult cases and cases with limited inter-arch space and problematic occlusion.

Results of this study showed that majority of patients needed restorative treatment (76.4%) followed by periodontal treatment (74.5%), this is in agreement with many previous studies done in different communities [24-26] as well as in the same community [16,17] however the percentage of restorative treatment need in the later local studies (82.9% and 100%) were higher than the reported here, this could be due to inclusion of the endodontic treatment need among the restorative need in those studies.

In the present study caries and recurrent caries were the reason for the needed restorations, restorations remake and endodontic treatment. This result coincides with the reported studies that caries is a significant dental problem in the Saudi population and that the Saudi Arabian adolescents and adults have a high caries rate [27].

Great variation exists regarding causes of tooth extraction in different countries. Caries was found to be the main cause of tooth extraction with a range of 39%-70% in many countries [28-35]. Similarly, it was found in the present study that caries is the main reason for tooth extraction (57.5%). This results agrees with previous studies that have been done in Saudi Arabia [36,37] as well as with other studies carried out in several countries [38-40]. However, prosthetic purposes was found to be the second main reason for extraction (21.7%) in this study, in contrast to many previous studies where periodontal disease, orthodontic purposes [37,41] or endodontic reasons [42] were found to be the second main reason for extraction. Extractions for prosthetic reasons varied from 2% in India to 34% in Sweden [43]. It was also reported that extraction due to periodontal disease was more frequent in males [44-46] while extraction due to caries was more frequent in females [46] and since all subjects of the present study are females, this might explain caries being the main reason for extraction.

According to the present study teeth extraction was more in posterior teeth. This result is in agreement with the study by Lesolang et al. [47] where they reported that the upper and lower molars and posterior teeth of both jaws were the more frequently extracted teeth [34,35].

In regards to the incidence of apical periodontitis, it was previously reported [48] that it is significantly higher in posterior than anterior teeth, which is in good agreement with the results of this study.

A high Prosthetic need was found in this study (70% for fixed and 52% for removable), similar results was reported by Ashri [16] (62.6% for fixed and 57.5% for removable) however in an another study done by Al-Fawaz [17] where she reported a higher percentage of both fixed (85%) and removable (69.3%) treatment needs. As her study was published in 1999 where there was very limited request of implants by the patients at that time, this could explain the

difference between the two studies as the use of dental implants now is more requested by the patients.

Conventional partial denture was the most needed treatment modality among patients needing teeth replacement (50.8%) while complete dentures' need accounted for 8.3% only; similar findings were reported in Riyadh by Ashri [16].

In addition, a study in Al Ahsa [49] reported almost the same percentage for partial denture need (45%); however the need for complete denture was found to be higher than the present study (25%). The low percentage of complete denture need might be due to the presence of over-denture category in this study that counted for almost 14% of total removable denture need; in many studies, this category is considered among complete denture need.

Fixed restorations were more needed in the posterior rather than anterior areas. This could be explained by the reported results in this study where endodontic treatment and extraction were found to be more in the posterior area.

Among fixed prosthetics need, crowns were the most needed (83%) type of treatment; this result tends to support the findings of Ashri [16].

Metal ceramic crowns and FPDs were needed more than all ceramic, many factors might have led the clinicians to decide using metal ceramic restorations more than all ceramic, this includes their strength especially in the posterior region where occlusal load is heavier, and function is more needed than aesthetics, especially that fixed restorations were more needed in the posterior rather than anterior areas in this study. Another factor is its conservative tooth preparation; in addition, all-ceramic restorations are contraindicated in patients with poor oral hygiene, deep bites, and bruxism.

Although there is a considerable amount of missing teeth, the implant need was found to be 19% only, this might be due to the long duration of waiting list and payment needed for implant treatment. The patients either do not have the time to wait for their turn in implant fixture placement or they cannot afford to pay for the implant, so they choose to go for fixed or removable partial dentures, or because the case is not suitable for implant treatment due to limited space or amount of bone.

Literature review has shown that the main purpose of the post is to retain the core [50], and it was found in this study that the need for posts (70%) was as high as endodontic treatment need (70.1%). One explanation could be the high percentage of caries reported in the current study, which led to teeth extraction, endodontic treatment, and restorations. This could indicate that the amount of tooth structure left after caries excavation was not enough; accordingly reinforcement of tooth structure by using post and core was required for these teeth.

Crown lengthening is usually needed in some clinical situations where the conditions are unfavorable for successful restorative procedures, this may include tooth fracture or to permit clamp placement for absolute isolation in the operating field during endodontic treatment, or for prosthetic purposes to preserve the biological width of the tooth and prevent future periodontal disease, and since caries was found to be the main needed treatment it is expected to be accompanied

by some sort of tooth destruction that dictates crown lengthening procedure before proceeding to fixed preparation, in addition, the need of post retained cores would indicate the amount of tooth destruction and also adds to the need for crown lengthening. Crown preparation by contrast to regular restorative procedures involves placing the finish line, at least, 1mm beyond the margin of the core material to produce ferrule effect; hence, this might explain the high need for crown lengthening due to prosthetic purposes compared to restorative and endodontic reasons.

Generally speaking, when comparing the treatment need of the present study to previous studies on a similar sample, we can observe that the need is slightly less. This observation could reflect improved oral health awareness and education in the society, however a considerable amount of restorative and periodontal care is still needed, which indicates that either the awareness is toward seeking the treatment rather than prevention and maintenance, or that there is no awareness at all, and the patients are seeking treatment to restore function or esthetic only not for the long term maintenance. Therefore, efforts of oral health planners should be directed towards increasing the population's awareness and education level about dental disease, preventive, maintenance and oral hygiene measure should be emphasized.

Assessment of the treatment need in any institution is important since the extracted data could be used to decide the resources and manpower required to meet these needs [51,52] and this is especially necessary for institutions like the Dental College in King Saud University which is concerned with total patients' oral health rather than treating the complaint only.

In conclusion, the study revealed a considerable amount of treatment need, and as caries was found to be the main reason for extraction, restorative, and endodontic treatments; efforts should be directed towards more dental educational programs. This can be done through community services programs conducted by the dental school, the main target of these services should be improving oral hygiene and implementing preventive measures to reduce dental caries and periodontal disease.

Limitations

Subjects were females only from one major city, which has higher economic status and better levels of health care services than other cities.

Extrapolation of these results to the general Saudi population must be done with caution since subjects do not represent a random sample of the Saudi population it represents individuals seeking inexpensive dental treatment.

Acknowledgement

The author would like to express the deepest appreciation to Professor Nahid Ashri, Department of Periodontics and Community Dentistry, College of Dentistry, King Saud University for her support in executing this study and her advice in writing the manuscript.

References

1. Wright JR, Williams JR, Wilkinson. Development and importance of health needs assessment. *Clinical Research Ed.*, 1998. **316**: 1310-1313.
2. Bradshaw JA. Taxonomy of social need. Problems and Progress in Medical Care, ed. G. McLachlan. 1972, London: *Oxford University Press*. 69-82.
3. Aleksejuniene J, Brukiene V. An Assessment of Dental Treatment Need: An Overview of Available Methods and Suggestions for a New, Comparative Summative Index. *Journal of Public Health Dentistry*. 2009. **69**: 24-28.
4. Holst DA, Schuller J, Grytten. Future treatment needs in children, adults and the elderly. *Community Dentistry and Oral Epidemiology*. 1997. **25**: 113-118.
5. Timmreck TC. Planning, program development, and evaluation: A handbook for health promotion, aging, and health services. 2003: *Jones and Bartlett Learning*.
6. Hülsmann M, Hammerstein-Loxten H. Estimated endodontic treatment need and perceived endodontic treatment performed after 1 year. *Endodontic Practice Today*. 2014. **8**: 145.
7. Johnson IG, Morgan MZ, Monaghan NP, Karki AJ. Does dental disease presence equate to treatment need among care home residents? *Journal of Dentistry*. 2014. **42**: 929-937.
8. Al-Maweri S, Al-Sufyani G. Dental caries and treatment needs of Yemeni children with down syndrome. *Dental Research Journal*. 2014. **11**: 631.
9. Hassan AH, Hassan MHA, Linjawi AI. Association of orthodontic treatment needs and oral health-related quality of life in Saudi children seeking orthodontic treatment. *Patient Preference and Adherence*. 2014. **8**: 1571-1579.
10. Rada RE. Treatment needs and adverse events related to dental treatment under general anesthesia for individuals with autism. *Intellectual and Developmental Disabilities*. 2013. **51**: 246-252.
11. Chen CY, Chen YW, Tsai TP, Shih WY. Oral health status of children with special health care needs receiving dental treatment under general anesthesia at the dental clinic of Taipei Veterans General Hospital in Taiwan. *Journal of the Chinese Medical Association*. 2014. **77**: 198-202.
12. Arheiam A, Omar S. Dental caries experience and periodontal treatment needs of 10- to 15-year old children with type 1 diabetes mellitus. *International Dental Journal*. 2014. **64**: 150-154.
13. Rungsiyanont S, Vacharotayangul P, Lam-Ubol A, Ananworanich J, Phanuphak P. Perceived dental needs and attitudes toward dental treatments in HIV-infected Thais. *AIDS Care*. 2012. **24**: 1584-1590.
14. Herkrath FJ, Rebelo MA, Herkrath AP, Vettore MV. Comparison of Normative Methods and the Sociodental Approach to Assessing Orthodontic Treatment Needs in 12-year-old Schoolchildren. *Oral Health and Preventive Dentistry*. 2013. **11**: 211.
15. Roncalli AG, Tsakos G, Sheiham A, Georgia Costa de Souza, Richard G Watt. Social determinants of dental treatment needs in Brazilian adults. *BMC Public Health*. 2014. 14.
16. Ashri N. Assessment of dental treatment needs among Saudi female patients in the dental school clinic, Riyadh. *Saudi Dental Journal*. 1999. **11**: 104-108.
17. Al-Fawaz, A. Needs and demands for dental treatment among Saudi female patients in the dental school in Riyadh. *Saudi Dental Journal*. 1999. **11**: 120-123.
18. Hassan AH. Orthodontic treatment needs in the western region of Saudi Arabia: a research report. *Head and Face Medicine*. 2006. 2.
19. Farsi JMA. Dental visit patterns and periodontal treatment needs among Saudi students. *Eastern Mediterranean Health Journal*. 2010. **16**: 801-816.
20. Khan NB. Treatment needs for dental caries in schoolchildren in Riyadh, Saudi Arabia. A follow up study of the oral health survey. *Saudi Medical Journal*. 2003. **24**: 1081-1086.

21. Al-Ghannam, N.A., et al., Al-Ghannam NA, Al-Shammery AR, Wyne AH, Khan NB. Prosthetic dental treatment needs in Eastern [corrected] Saudi Arabia. *Saudi Medical Journal*. 2002. **23**: 975-980.
22. Brown A. Caries prevalence and treatment needs of healthy and medically compromised children at a tertiary care institution in Saudi Arabia. *East Mediterr Health Journal*. 2009. **15**: 378-386.
23. Armitage GC. Development of a classification system for periodontal diseases and conditions. *Annals of Periodontology*. 1999. **4**: 1-6.
24. Filiz Pekiner, Birsay Gumru, Mehmet Oguz Borahan, Emre Aytugarc. Evaluation of demands and needs for dental care in a sample of the Turkish population. *European Journal of Dentistry*. 2010. **4**: 143-149.
25. Razak IA, Jaafar N. Dental needs demands and patterns of service utilization in a selected Malaysian urban population. *Community Dentistry and Oral Epidemiology*. 1987. **15**: 188-191.
26. Ramraj C, Azarpazhooh A, Dempster L, Ravaghi V, Quiñonez C. Dental treatment needs in the Canadian population: analysis of a nationwide cross-sectional survey. *BMC Oral Health*. 2012. **12**.
27. Al-Shammery AR, Guile E, El-Backly M. An oral health survey of Saudi Arabia: Phase I (Riyadh). General Directorate of Research Grants Programs, King Abdulaziz City for Science and Technology. King Abdul Aziz City for Science and Technology Riyadh. 1991, Riyadh.
28. Aida J, Ando Y, Akhter R, Aoyama H, Masui M, et al. Reasons for permanent tooth extractions in Japan. *Journal Of Epidemiology / Japan Epidemiological Association*. 2006. **16**: 214-219.
29. Al-Shammari KF, Al-Ansari JM, Al-Melh MA, Al-Khabbaz AK. Reasons for tooth extraction in Kuwait. *Medical Principles and Practice: International Journal Of The Kuwait University, Health Science Centre*. 2006. **15**: 417-422.
30. Caldas AJ. Reasons for tooth extraction in a Brazilian population. *International Dental Journal*. 2000. **50**: 267-273.
31. Akhter R, Hassan NM, Aida J, Zaman KU, Morita M. Risk Indicators for Tooth Loss due to Caries and Periodontal Disease in Recipients of Free Dental Treatment in an Adult Population in Bangladesh. *Oral Health and Preventive Dentistry*. 2008. **6**: 199.
32. Richards WA, Coll J, Higgs AM. Reasons for tooth extraction in four general dental practices in South Wales. *British Dental Journal*. 2005. **198**: 275-278.
33. Spalj SPD, Juric H, Pavelic B, Bosnjak A. Reasons for extraction of permanent teeth in urban and rural populations of Croatia. *Collegium antropologicum*. 2004. **28**: 833-839.
34. Da'ameh D. Reasons for permanent tooth extraction in the North of Afghanistan. *Journal of Dentistry*. 2006. **34**: 48-51.
35. Sanya BO, Ng'ang'a PM, Ng'ang'a RN. Causes and pattern of missing permanent teeth among Kenyans. *East African medical Journal*. 2004. **81**: 322-325.
36. Jamila M F. Common causes of extraction of teeth in Saudi Arabia. *The Saudi Dental Journal*. 1992. **4**: 101-5.
37. Alesia K, Khalil HS. Reasons for and patterns relating to the extraction of permanent teeth in a subset of the Saudi population. *Clinical. Cosmetic and Investigational Dentistry*. 2013. 51-56.
38. Morita MKT, Kanegae M, Ishikawa A, Watanabe T. The reasons for extraction of permanent teeth in Japan. *Community dentistry and oral epidemiology*. 1994. **22**: 303-306.
39. Jafarian, M.E., A., Reasons for Extraction of Permanent Teeth in General Dental Practices in Tehran, Iran. *Medical Principles and Practice*. 2013. **22**: 139-44.
40. Chrysanthakopoulos NA. Reasons for extraction of permanent teeth in Greece: a five-year follow-up study. *International Dental Journal*. 2011. **61**: 19-24.
41. Wahab FA. survey of reasons for extraction of permanent teeth in Jordan. *Saudi Dental Journal*. 2001. **13**: 148-154.
42. Peşkersoy C, Tetik A, Dönmez H, Öztürk VO. Evaluation of Principal Reasons of Tooth Extractions in Turkish Population: A Retrospective Study. *Turkiye Klinikleri. Journal of Dental Sciences*. 2014. **20**: 146-152.
43. Lundqvist C. Tooth Mortality in Sweden A Statistical Survey of Tooth Loss in the Swedish Population. *Acta Odontologica Scandinavica*. 1967. **25**: 289-322.
44. Fardal OAC, Johannessen, Linden GJ. Tooth loss during maintenance following periodontal treatment in a periodontal practice in Norway. *Journal of Clinical Periodontology*. 2004. **31**: 550-555.
45. Locker DJ, Ford, Leake JL. Incidence of and risk factors for tooth loss in a population of older Canadians. *Journal of Dental Research*. 1996. **75**: 783-789.
46. Chrysanthakopoulos NA. Reasons for extraction of permanent teeth in Greece: a five-year follow-up study. *International Dental Journal*. 2011. **61**: 19-24.
47. Lesolang RR, Motloba DP, Lalloo R. Patterns and reasons for tooth extraction at the Winterveldt Clinic: 1998-2002. *South African dental Journal*. 2009. **64**: 214-215.
48. Mukhaimer RE, Hussein, Orafi I. Prevalence of apical periodontitis and quality of root canal treatment in an adult Palestinian sub-population. *The Saudi Dental Journal*. 2012. **24**: 149-155.
49. Al-Ghannam NA, Al-Shammery AR, Wyne AH, Khan NB. Prosthetic dental treatment needs in Eastern [corrected] Saudi Arabia. *Saudi Medical Journal*. 2002. **23**: 975-980.
50. Schwartz RS, Robbins JW. Post placement and restoration of endodontically treated teeth: a literature review. *Journal of Endodontics*. 2004. **30**: 289-301.
51. Ekanayake LC, Weerasekare, Ekanayake N. Needs and demands for dental care in patients attending the University Dental Hospital in Sri Lanka. *International Dental Journal*. 2001. **51**: 67-72.
52. Robinson PGP, Nadanovsky, Sheiham A. Can questionnaires replace clinical surveys to assess dental treatment needs of adults? *Journal of Public Health Dentistry*. 1998. **58**: 250-253.