A 5 YEAR REVIEW OF PAEDIATRIC MAXILLOFACIAL & ORAL SURGERY PROCEDURES PERFORMED AT THE WITS ORAL HEALTH CENTRE

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To be submitted in fulfilment of the degree:

Master of Science in Dentistry (MSc Dent)

In the field of Maxillofacial & Oral Surgery

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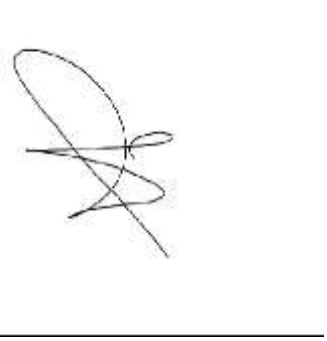
Declaration

I, Muhammed Vally, declare that this dissertation report is my own, unaided work. It is being submitted for the Degree: Master of science in dentistry, in the field of maxillofacial and oral surgery, at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.



Signature

23rd day March of 2021 in Johannesburg.

Dedication

In dedication to my wife and mother who have given me unwavering support through all my academic pursuits.

Presentations

This research topic was presented at the 50th Scientific Meeting of the International association for dental research held by the Sefako Makgatho health sciences university in Pretoria on the 12th and 13th of November 2020.

Abstract

Aim: To review paediatric maxillofacial and oral surgery procedures performed at the Wits Oral Health Centre (WOHC) over a 5-year-period.

Materials and Methods: This was a retrospective record review study at WOHC, University of the Witwatersrand, Johannesburg. Records of paediatric patients who had undergone treatment from 2013 to 2017 were included in the study. Data collected included the age of patients, gender, distribution of procedures and type of treatment. Data was analyzed and results presented as frequencies and percentages.

Results: A total of 694 paediatric patients were treated during the study period. There were more males (54.2%) than females (45.8%), and the majority of patients were in the 11-17-year age category. Oral surgery, diagnosis and treatment of pathological conditions and trauma were the most common procedures at 34%, 29% and 20.5% respectively. There was a statistical significance between the number of surgical procedures carried out under general anaesthetic and that under local anaesthetic ($p < 0.001$). The removal of third molars was more common than other oral surgical procedures. A high occurrence of paediatric trauma was observed in males aged between 11-17 years. Mandibular fractures, followed by dentoalveolar fractures, were the most common fracture types. The most commonly diagnosed pathological conditions were odontogenic cysts (23.15%), benign odontogenic tumours (22.31%) and fibro-osseous lesions (19.02%). Mucous extravasation cyst was the most common salivary gland lesion.

Conclusion:

Most maxillofacial and oral surgical procedures in paediatric patients were performed in the 11-17-year category. The removal of impacted 3rd molars was the most common surgical procedure and the management of ameloblastomas appears to be the most common odontogenic tumour in this age group. Future studies are required to provide insight into the reasons, patterns and distribution of paediatric maxillofacial and oral surgery. Results from such studies, especially prospective ones, will form the basis for design of educational campaigns and preventive strategies aimed particularly at the 11-17-year age group.

Acknowledgements

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Table of contents

List of figures

List of tables

Chapter 1

1.1 Introduction and literature review

The field of maxillofacial and oral surgery (MFOS) is overlapped by various specialities including plastic and reconstructive surgery, neurosurgery, otorhinolaryngology, and paediatric surgery. The extent of each individual speciality is governed by the respective departments at the training institution.[1] Internationally there is ongoing debate about standardizing the training of maxillofacial and oral surgeons. Depending on the country, region and training institution, some faculties are more au fait with certain procedures (such as subspecialties in oncologic and reconstructive procedures and facial aesthetics) whereas other departments would prefer to take on an interdisciplinary approach to managing such cases.[2]

Paediatric maxillofacial and oral surgery, though not officially recognized as a subspecialty of maxillofacial and oral surgery, is an ever-increasing field with regard to clinical management, surgical focus and postgraduate experience. Paediatric patients pose a unique challenge with regard to treatment as they display notable differences in anatomy, physiology, response to trauma and disease, behaviour management and compliance.[3] When managing paediatric patients, growth always plays an important role in determining the treatment of choice.[4]

There remains a large variance in exposure to the scope of paediatric maxillofacial and oral surgery, primarily determined by the areas of expertise and competence in each region or country. First world countries tend to have a more limited exposure to disease as they have better education and awareness about health problems, increased affordability and accessibility to primary health care.[4]

Another determinant of the exposure to the various fields of maxillofacial and oral surgery is the level of postgraduate training received. Due to the nature of maxillofacial and oral surgery, there are multiple other disciplines, which overlap with the scope of practice.[5]

Individual universities may opt to train registrars with a larger scope of practice, especially those who have incorporated the medical degree into their training. Registrars trained in both undergraduate medical and dental disciplines may be more qualified to treat diseases extending beyond the oral regions and are more likely to pursue an expanded scope of practice.[6]

In general, 78% of paediatrics in Sub-Saharan Africa live past the age of 15 compared to 98.9% in first world countries.[7] This statistic indicates the lack of adequate healthcare in third world countries.

Trauma forms a major branch of maxillofacial and oral surgery around the world. Due to their cranial-mass-to-body ratio, children are uniquely susceptible to maxillofacial trauma.[8] The cause and presentation of trauma varies between each region of the world. First world countries, except USA, display an inclination towards motor vehicle accidents being the primary cause of maxillofacial trauma as compared to third world countries where the predominant cause is interpersonal violence.[9] In general males are more prone to trauma than females in both first and third world countries.[9]

The distribution of maxillofacial injuries in the upper 3rd of the face was more prevalent in younger children whereas middle and lower 3rd injuries were most commonly found in older children.[10] The younger children are, the better their healing outcome due to their unique remodelling ability.[10] Trauma, as with other fields, also takes on a multidisciplinary approach.

In general, registrar training in the various sub-specialities is achieved through rotations.[11] This increases clinical competence and relative knowledge of the associated discipline.[11]

Diagnosis and treatment of maxillofacial and oral pathological conditions comprises a vast sector of paediatric MFOS and is the most contested between the various specialities as the largest overlap is found in this field.[12] Due to the vastness of diseases affecting the head and neck region, a multidisciplinary approach is often taken, exacting from each speciality the field they are most comfortable with, to provide an all-encompassing approach to the treatment. This however, is not always the situation.[12,13]

A study conducted in 2005, at Sheffield dental school in the United Kingdom, assessed specimens sent for laboratory analysis from children under the age of 17 years. These specimens contributed only 8.2% of the total number of specimens sent for laboratory analysis for the period 1973 to 2002. They noted that the most common maxillofacial and oral pathological condition was tooth related (22.1%). The second most common was salivary gland lesions (19.1%) followed by mucosal lesions (12.1%). Periapical lesions in the form of granulomas, abscesses and cysts made up 13% of the specimens. Tumours only comprised 4.3% of the specimens with benign non-odontogenic tumours contributing 61%, odontogenic tumours 23% and malignant tumours 16%. Male to female distribution was 1.01:1.[14]

Oncological management remains a debatable subject regarding who should be the treating surgeon. Certain departments deem it more suitable for a dually qualified maxillofacial surgeon to be treating the patient or the procedure be completed in a multidisciplinary approach.[2]

Squamous cell carcinoma is the most prevalent cancer of the head and neck region (>90%), accounting for 4-5% of all cancer cases.[2,14] It is, however, extremely rare in the paediatric population.[2] Recently there has been a change from the past with an increase in incidence of squamous cell carcinoma without the common predisposing factors such as smoking and alcohol.[15]

Temporomandibular joint disorders (TMD) is a subject of increasing interest in the field of paediatrics. It was originally thought that it only affects adult patients but recent evidence seems to suggest that patients present with signs and symptoms of TMD early in life and increase over time.[16,17] There is now an increase in reports of TMD in children, with females affected more than males.[16] The aetiology of TMD was initially thought to be an acquired abnormality but a study done by Allori et al (2010) on children under the age of 18 revealed that congenital causes were as likely to cause TMD as acquired. The study evaluated records over a 32-year period, 1976-2008.[18] The majority of cases presented with skeletal abnormalities as the cause of TMD (74%), while only 26% was caused by soft-tissue abnormalities.[18]

Orthognathic surgery in the paediatric population is generally undertaken to correct jaw-relationship discrepancies and improve function. Surgery is indicated in patients once they are 99% skeletally mature. For females the age being 15 years and for males 16 and a half years old.[19] A miniscule amount of orthognathic surgery is performed for other purposes. There are cases in which Le Fort I osteotomies are done to access the nasal cavity for removal of large tumours and bilateral sagittal split osteotomy techniques being employed to increase the size of the airway in the oropharyngeal region.[20] An extremely rare yet effective use of the technique was employed to access the ventral cervical spine by neuro surgeons.[20,21]

The spectrum of disease in paediatric surgery is rapidly changing with an increased incidence of trauma worldwide.[22] The World Health Organization (WHO) report, published in 2008, with correspondence from United Nations Children's Fund (UNICEF) determined that by the year 2020, childhood trauma would be the number one disease globally.[22] In 3rd world countries the burden of disease is much higher due to a general lack of resources in the public sector, the high cost of healthcare in the private sector and a majority of the population with inadequate information and knowledge about seeking help with regard to medical problems.[22]

The scope of treatment for paediatric MFOS is vast and in some instances may be broadened to include craniofacial surgery, which focuses on the management of patients requiring reconstructive treatments due to trauma or congenital abnormalities. This subdivision includes cleft lip and/or cleft palate, micrognathia, hemifacial microsomia, craniosynostosis, Crouzon's syndrome, Treacher Collins syndrome and others[5]

Craniofacial surgeries to correct craniofacial syndromes most often require training by fellowship as the field is intricate and not usually covered at a basic postgraduate level.[5] This field can be managed by plastic and reconstructive surgeons, neurosurgeons and maxillofacial surgeons (with post-basic training).[5,6]

There exists sufficient literature on the various aspects of paediatric maxillofacial and oral surgery but there is no published literature to indicate the distribution of procedures within the field. Against this background, this retrospective study was undertaken to evaluate the distribution and types of paediatric maxillofacial and oral surgery procedures undertaken at Wits Oral Health Centre.

This study may provide insight into the common paediatric maxillofacial and oral surgical procedures performed at Chris Hani Baragwanath and Charlotte Maxeke Johannesburg academic hospitals. Understanding the distribution of these surgical procedures will allow oral health practitioners to adequately manage and educate the public. By identifying the areas that are preventable or are manageable conservatively with early intervention, the focus areas about public education and awareness campaigns can be determined.

Chapter 2: Methods

2.1 Aims

This study aimed to review paediatric maxillofacial and oral surgery procedures performed at the Wits oral health centre (WOHC) over a 5-year period.

2.2 Objectives

1. To identify the common paediatric maxillofacial and oral surgery procedures undertaken at the Wits Oral Health centre.
2. To record the age and gender distribution of the patients' records.

2.3 Study design

This was a retrospective record review study, done at Chris Hani Baragwanath (CHBAH) and Charlotte Maxeke Johannesburg Academic hospitals (CMJAH), including all MFOS paediatric patients' records during the period of January 2013 to December 2017.

2.4 Population sample

All records of paediatric patients (younger than 18 years) who had presented for treatment to the maxillofacial and oral surgery departments, between 2013 and 2017, at the Chris Hani Baragwanath Academic and Charlotte Maxeke Academic hospitals were included in the study.

2.5 Inclusion criteria

1. Records of patients under the age of 18.
2. Records of patients having presented for maxillofacial and oral surgery treatment.
3. Records of patients referred for treatment to other departments after presenting to the maxillofacial and oral surgery unit.

2.6 Exclusion criteria

1. Patient records with inadequate information.

2.7 Ethical considerations

1. Ethical clearance was obtained from the Human research ethics committee.

2. Permission to access clinical records was obtained from the CEOs of CHBAH and CMJAH.

2.8 Data collection

All data was obtained from the surgical logbooks of both the out-patient department and the theatre at CHBAH and CMJAH.

The demographic information collected included age, gender, procedures recorded and treatment modality.

Data was compiled and assessed in years and then the entire 5-year period was analysed.

2.9 Statistical considerations

Sample size

Our sample amounted to 694 patients. This quantity was sufficient for this study as the minimum required sample size was 264 patients based on a study completed at the Sheffield dental school in 2005. Using a confidence interval level of 95% with an Alpha value of 5% and a marginal error value of 5%.[14]

2.10 Data analysis

Demographic details were summarized descriptively by frequency tables and graphs. The tables and graphs provided adequate information to achieve the objectives. We were able to audit the procedures performed in paediatric maxillofacial and oral surgery by comparing the data with respect to each discipline.

The chi-square goodness of fit test was used to compare the observed distribution to an expected distribution, in a situation where we had two or more categories in a discrete data. The Chi-Square test of Independence determined whether there was an association between categorical variables.

Statistics were calculated using Statistica on a Windows operated computer.

Chapter 3

3.1 Results

The total number of paediatric patients presented to the Maxillofacial and Oral Surgery Department at the Wits oral health centre between January 2013 and December 2017 was 694. Of the 694 patients, the following distribution of patients (as shown in Figure 3.1) over the 5-year period was noted:

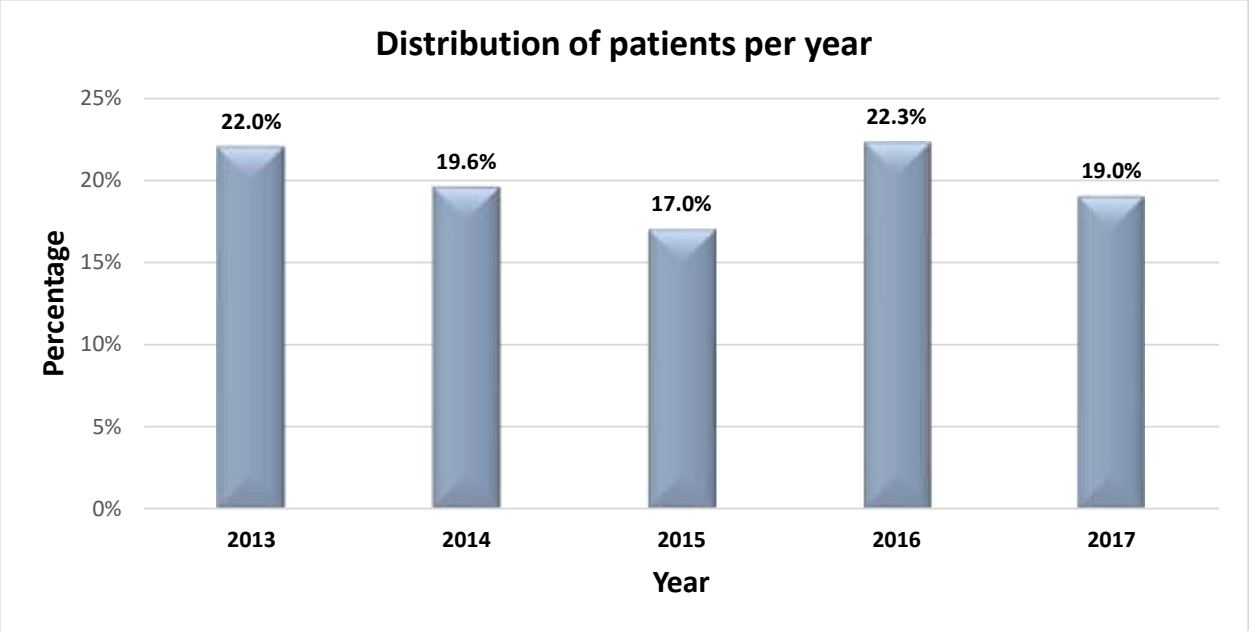

Figure 3.1. Percentage distribution of patients presenting to the MFOS department per year (2013-2017).

The highest number of paediatric patients treated in the MFOS department was in 2016 followed by 2013 with only a minor variance of 0.3% and the lowest number seen was in 2015 (Figure 3.1).

Table 3.1. A comparison of the total number of cases seen per field of MFOS over the 5-year period.

Discipline	Frequency	Percentage (%)	Cumulative %
Oral surgery	234	33.72	33.72
Pathological conditions	199	28.67	62.39
Trauma	142	20.46	82.85
Infection & Sepsis	57	8.21	91.06
Craniofacial surgery	35	5.04	96.10
Orthognathic surgery	13	1.87	97.97
TMJ disorders	8	1.15	99.12
Oncological treatment	4	0.58	99.71
Implant surgery	2	0.29	100
Total	**694**	**100**	

The most frequented procedures of paediatric MFOS during the 5-year period was oral surgery amounting to 33.72% of patients (Table 3.1). Diagnosis and treatment of pathological conditions made up 28.67%, trauma 20.46%, sepsis 8.21%, craniofacial surgery 5.04%, orthognathic surgery 1.87% and temporomandibular joint disorder management 1.15%. Oncological treatment and implant surgery were the least performed procedures with only four and two cases respectively.

The annual breakdown chart shows that oral surgery was the most common procedure undertaken in 2013 to 2015, whilst pathological-related procedures were the most prevalent surgical procedures in 2016 and 2017(Figure 3.2).

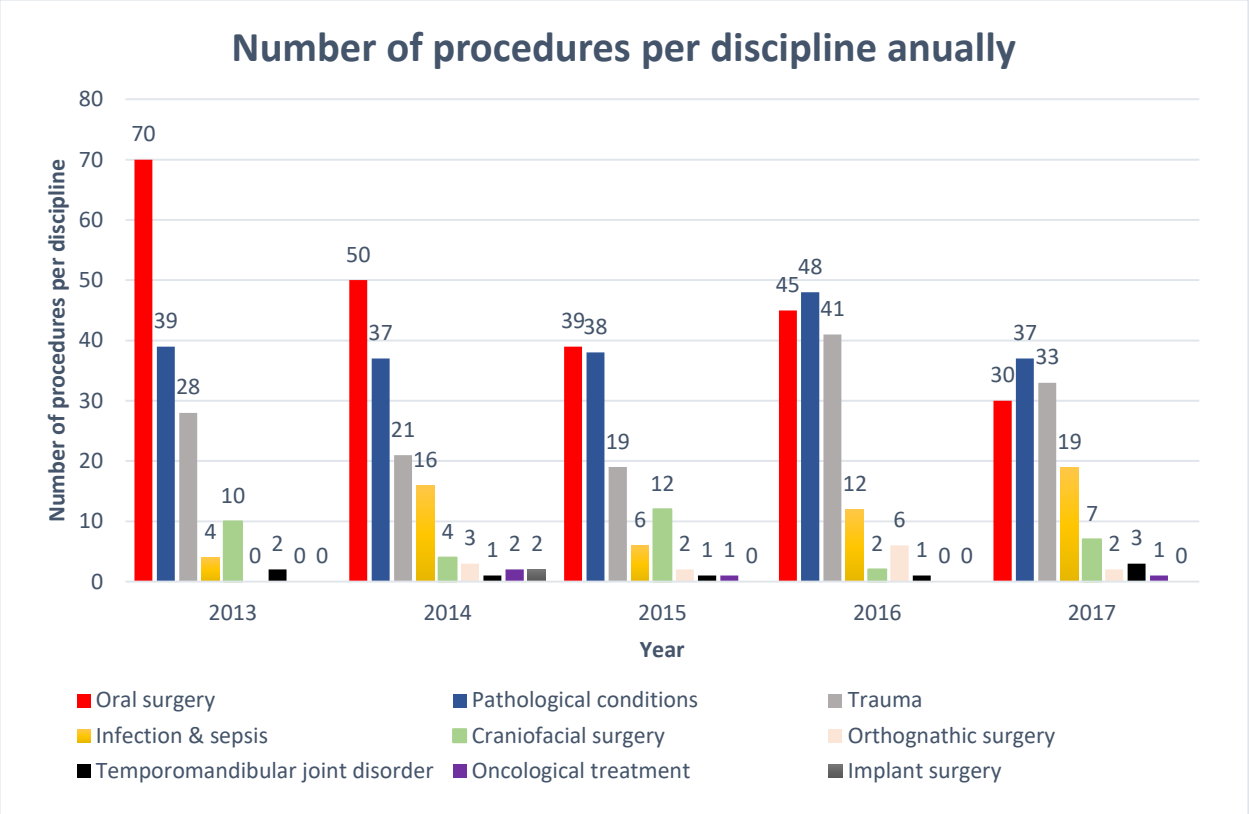

Figure 3.2. The distribution of surgical procedures carried out each year.

Table 3.2: Gender distribution over the 5 years.

Gender	Male		Female		Row total
Year	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**	
2013	79	51.63	74	48.37	153
2014	75	55.15	61	44.85	136
2015	58	49.15	60	50.85	118
2016	82	52.90	73	47.10	155
2017	82	62.12	50	37.88	132
Total	**376**		**318**		**694**

The majority of patients were males making up 54.18% (376) whilst female patients accounted for 45.82% (318) of the total number of patients (Table 3.2).

A chi-square test for independence was performed to test if the number of patients over the five-year period was related to gender. Results showed that $\chi 2$ (4, N = 694) = 5.107, p-value = 0.2765, which is greater than the level of significance ($\alpha = 0.05$). We can therefore conclude that there was no significant relationship between the number of patients per year and gender

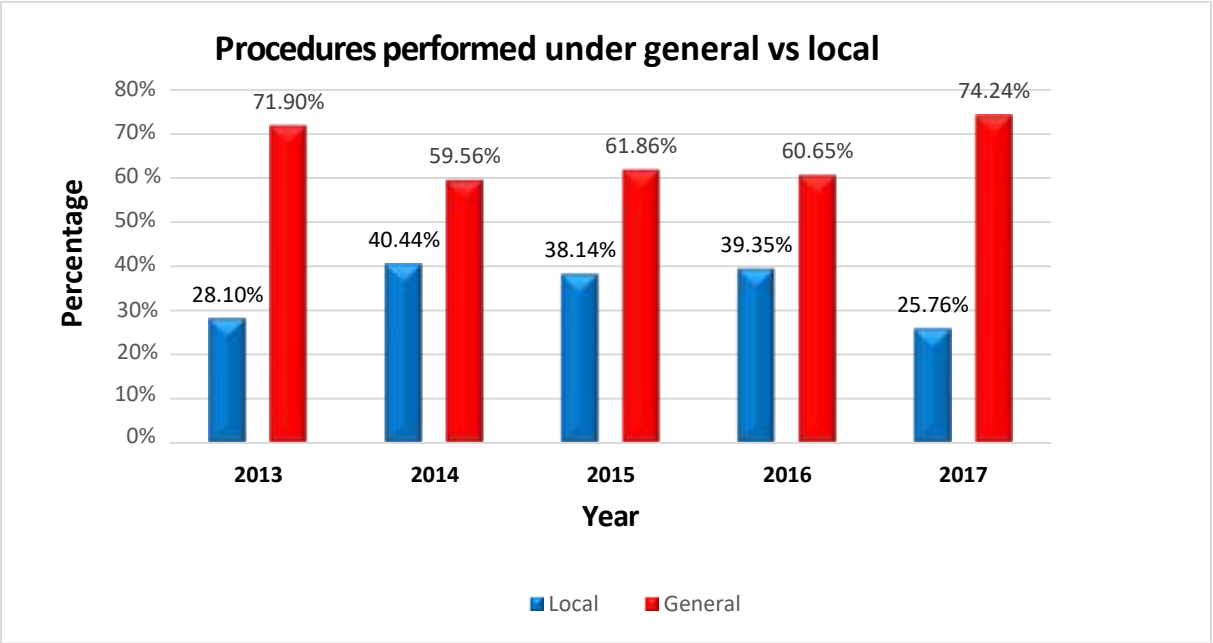

Figure 3.3. The percentage of procedures performed under general vs local anaesthetic.

The majority of the surgical procedures during the 5 years (65.56%) were carried out under general anaesthetic (Figure 3.3). The youngest patient, in this study to be treated under local anaesthetic was 5 years old and the oldest 17 years. The youngest patient to be treated under general anaesthetic was 1.6 years old and the oldest was 17 years.

A chi-square goodness of fit test for equal expected frequencies showed that there was a significant difference between number of surgical procedures carried out by general anaesthetic and the number of surgical procedures carried out by local anaesthetic, $\chi 2$ (1, N = 694) = 68.478, p-value < 0.001.

Table 3.3: The age group distribution for the 5-year period.

Age (years)	Frequency	Percentage (%)
0-5	64	9.22%
6-10	144	20.75%
11-17	486	70.03%
Total	**694**	**100.00%**

The mean age value was 12,53; the median age value was seven with a modal age value of 17. The standard deviation of the data set was 4.362 with a variance of 19.028. Patients aged between 11-17-years were seen the most in the department (70.03%), while patients aged between 0-5-years only accounted for 9.08% of patients (Table 3.3)

Type of procedures

3.1.1 Oral Surgery

Oral surgery was the most common surgical procedure, contributing 234 (33.72%) cases over the 5-year period. Oral surgery included minor oral surgery procedures such as simple dental extractions, surgical extractions, treatment of alveolar osteitis, orthodontic exposure of impacted teeth and soft tissue surgery. Removal of impacted teeth (151 patients) contributed to the majority of oral surgery procedures at 64.53%. Fifty-three (22.65%) of the procedures were dental extractions, 18 (7.69%) were treatment of alveolar osteitis and the remaining 12 procedures (5.13%) were soft tissue procedures, which included release of ankyloglossia and frenectomy. Interdisciplinary referrals by orthodontists for procedures such as removal or exposure of impacted teeth accounted for 14,96% of oral surgical procedures.

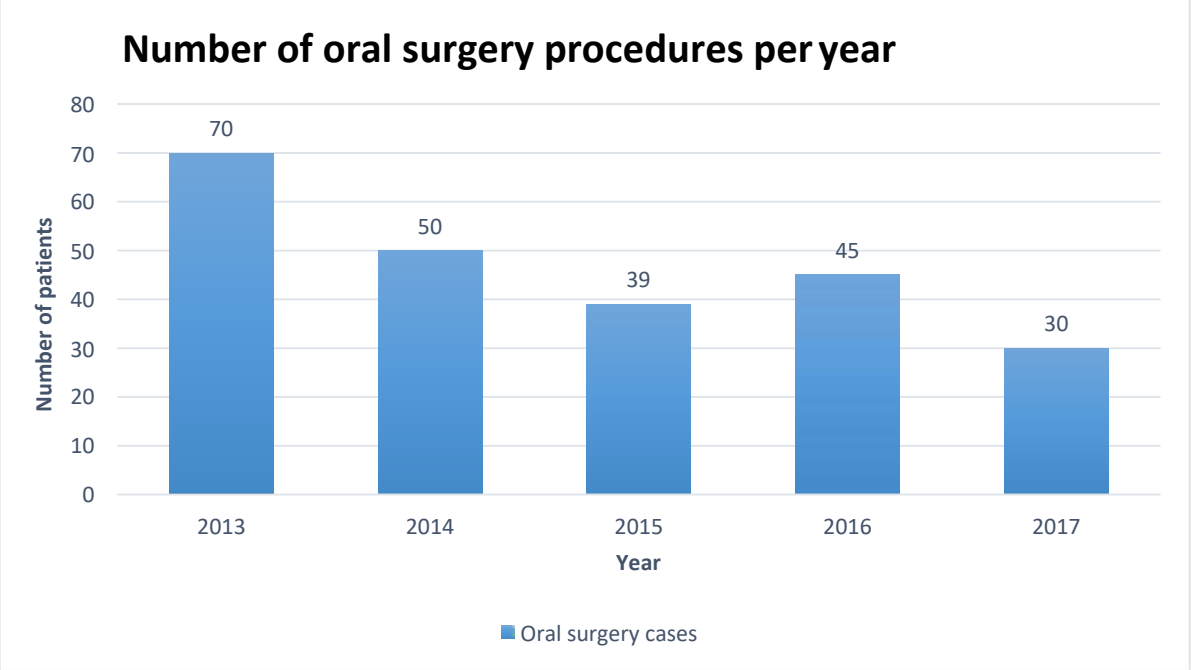

Figure 3.4. The number of oral surgical procedures per year.

Figure 3.4 indicates a decrease in the number of oral surgical procedures over the five-year period A chi- square goodness of fit test for equal expected frequencies shows that there is a significant difference between annual number of oral surgical procedures over the five- year period, $\chi 2$ (4, N = 694) = 19.12, p-value = 0.0007445.

3.1.2 Diagnosis and treatment of maxillofacial and oral pathological conditions

Maxillofacial and oral pathological conditions were the second most common presentation to the department with 199 cases over 5 years. Of the total number of cases, 121 were biopsies (incisional biopsies accounted for 84 of the biopsies and excisional biopsies accounted for the remaining 37) and surgical management of lesions of the jaw made up 78 cases.

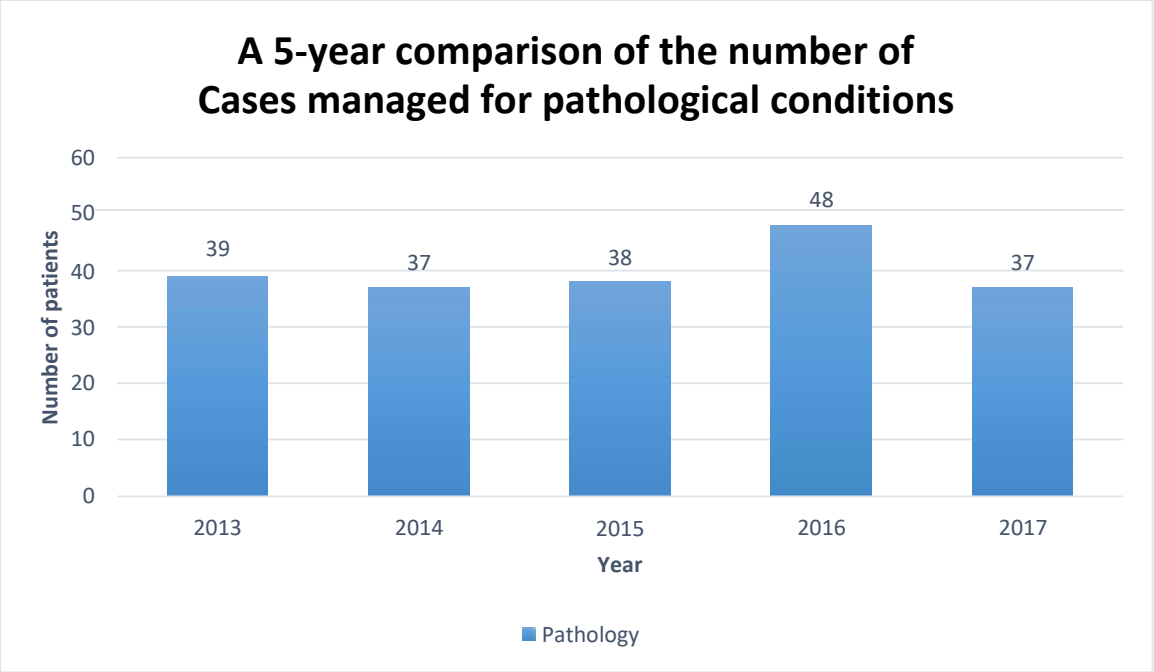

Figure 3.5. A year on year distribution of patients treated for pathological conditions.

Table 3.4 Distribution of treatment for pathological conditions.

Procedure	Frequency	Percentage (%)
Biopsy	121	60.80
Surgical management of lesions	55 (Mucous extravasation cyst) 23 (Other)	39.20
Total	**199**	**100**

Table 3.5. Diagnosis of specimens sent for histological evaluation.

Pathology classification	Pathology type	Age			Gender Distribution		Total	Percentage (%)
		0-5	6-10	11-17	M	F		
Benign tumours of the jaw	Ameloblastoma	0	4	15	9	10	19	15.70
	Odontogenic myxoma	1	0	2	0	3	3	2.48
	Adenematoid odontogenic tumour (AOT)	0	1	1	0	2	2	1.65
	Odontoma	0	0	3	1	2	3	2.48
Odontogenic cysts	Dentigerous cyst	0	5	2	5	2	7	5.79
	Odontogenic keratocyst (OKC)	0	4	7	7	4	11	9.09
	Radicular cyst	1	1	5	5	2	7	5.79
	Calcifying odontogenic cyst	0	1	2	2	1	3	2.48
Non-odontogenic cysts	Simple bone cyst	0	1	1	1	1	2	1.65
	Nasopalatine duct cyst	0	0	4	3	1	4	3.31
Fibro-osseous lesions	Ossifying fibroma	2	4	6	8	4	12	9.92
	Fibrous dysplasia	0	4	5	5	4	9	7.44
	Cherubism	1	0	0	0	1	1	0.83
	Giant cell granuloma	1	0	0	0	1	1	0.83

Salivary gland pathology	Pleomorphic adenoma	0	0	3	1	2	3	2.48
	Mucous retention cyst	1	0	3	2	2	4	3.31
Benign soft tissue lesions	Apthous ulcer	0	0	1	1	0	1	0.83
	Epithelial hyperplasia	0	1	1	0	2	2	1.65
	Pyogenic granuloma	0	0	2	1	1	2	1.65
	Fibrous epulis	2	1	1	3	1	4	3.31
	Squamous papilloma	0	1	0	0	1	1	0.83
	Arteriovenous malformation	0	0	1	0	1	1	0.83
	Neuroma	0	0	1	0	1	1	0.83
	Lymphangioma	0	2	0	0	2	2	1.65
Malignancies	Oral cancer	0	0	3	3	0	3	2.48
	Myofibroblastic tumour	1	0	0	1	0	1	0.83
Temporomandibular joint pathology	Pterygomandibular fusion	1	0	0	1	0	1	0.83
Miscellaneous							11	9.09
Total		**11**	**30**	**69**	**59**	**51**	**121**	**100**

Twenty-seven different types of pathological conditions were identified from the patients requiring biopsies (Table 3.5). The most common pathological condition was an ameloblastoma which occurred in 15.70% of biopsies, it was most frequent in patients between the ages of 11-17, while the most common class of pathology was cysts of the jaw which were diagnosed in 28.11% of specimens. These were then further divided into odontogenic and non-odontogenic cysts.

Ossifying fibroma was the second most common diagnosis at 9.92% followed by odontogenic keratocyst, which accounted for 9.09% followed by fibrous dysplasia at 7.44%. Fibro-osseous lesions accounted for 19.02% of biopsies, of this the most common sub-type was juvenile aggressive ossifying fibroma (JAOF) which accounted for 52.17% of fibro-osseous lesions diagnosed, followed by fibrous dysplasia at 39.13%.

All other pathological conditions individually accounted for less than 2%. Eleven of the diagnoses were only seen once in the 5-year period.

There was no significant difference between the annual number of pathological related procedures performed over the five-year period ($\chi 2$ (4, N = 694) = 2.2723, p-value = 0.6858) was observed.

3.1.3 Trauma

Trauma was the 3rd most frequent discipline of paediatric maxillofacial surgery comprising of 142 cases over 5 years. Mandibular fractures were the most common presenting form of trauma at 64.01%, dentoalveolar fractures were second most common at 15.50%, the third highest was soft tissue lacerations at 13.38% and last was other facial fracture at 7.04%.

A chi-square goodness of fit test for equal expected frequencies shows that there was a significant difference between annual number of trauma cases over the five-year period, $\chi 2$ (694, N = 4) = 11.38, p-value = 0.02261.

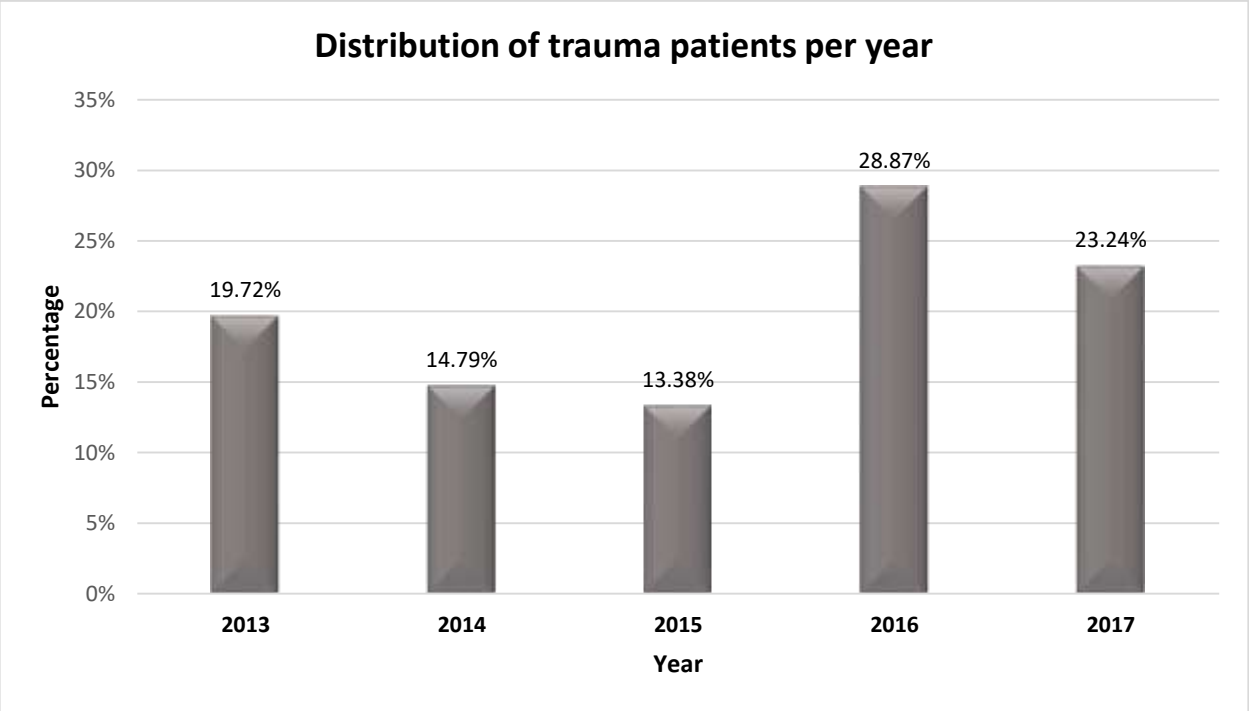

Figure 3.6. Percentage distribution of trauma patients over the 5-year period.

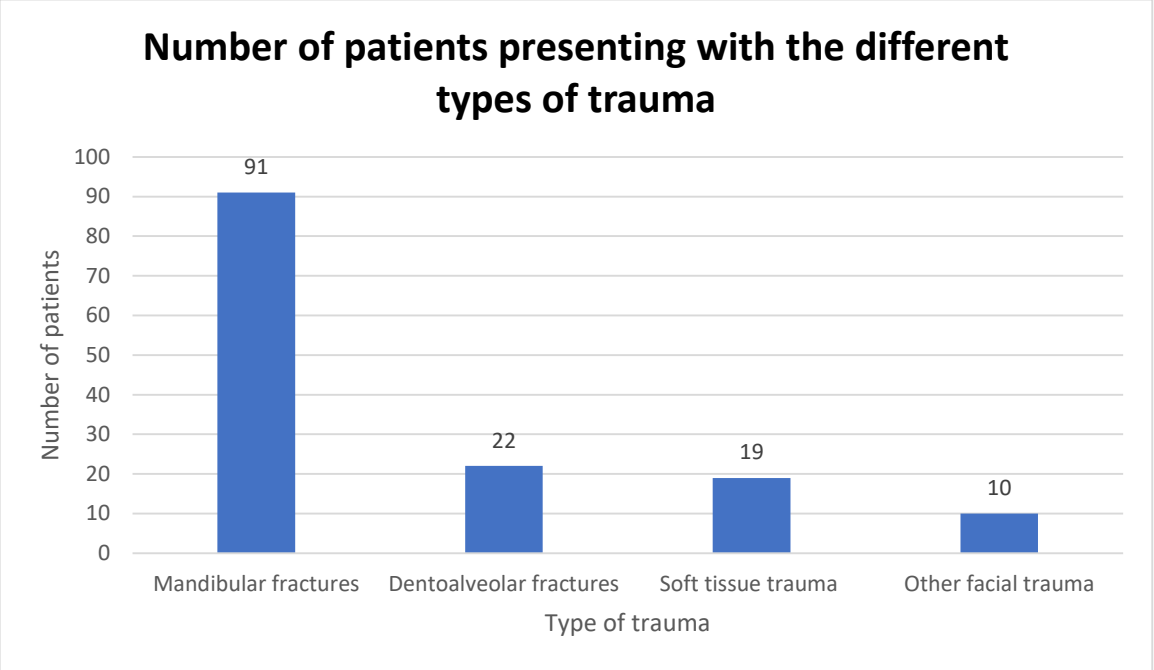

Figure 3.7. Number of patients presenting with the different types of maxillofacial trauma.

Table 3.6. Maxillofacial trauma by age and gender.

Age (Years)	Gender		Total	Percentage (%)
	M	F		
0-5	12	2	14	9.86
6-10	20	12	32	22.54
11-17	73	23	96	67.61
	105	37	142	100.00

Males were more commonly the victims of maxillofacial trauma than females with a ratio of 3.1:1. Males aged between 11 and 17-years accounted for 53.52% of all trauma cases. The least exposed to trauma were females aged between 0 and 5 years (Table 3.6). A Fisher's exact test for independence was performed to test if there is a relationship between maxillofacial trauma and age group ($\chi 2$ (2, N = 694) = 3.4011, p-value = 0.1826). Since the p-value is greater than significance level (α = 0.05 we conclude that there is insufficient evidence to suggest an association between gender and age group among patients presenting with maxillofacial trauma.

3.1.4 Infection and sepsis

Treatment of infection and sepsis was the 4th most common procedure performed in the MFOS department. There was a total of 57 cases of infection and sepsis over 5 years (Figure 3.8).
Three cases required further histological evaluation to confirm the diagnosis.

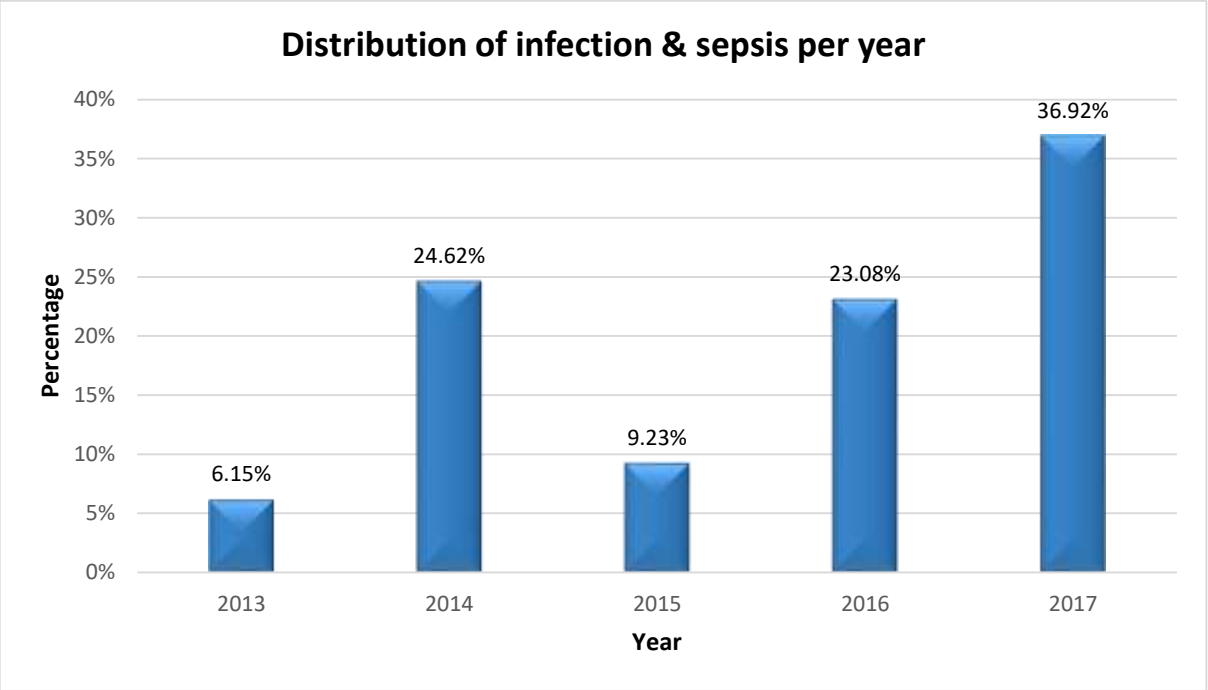

Figure 3.8. Distribution of infection and sepsis over the five-year period.

Figure 3.8 shows the distribution of cases with infection and sepsis over the five-year period. There was an incremental increase between 2013-2014 followed by a decrease in 2015, from 2016-2017 the number of cases increased. The chart is negatively skewed implying an overall increase in the number of cases over the five-year period. A chi-square goodness of fit testfor equal expected frequencies shows that there was a significant difference in the annual number of cases over the five-year period ($\chi 2$ (4, N = 694) = 20.308, p-value = 0.0004342).

Table 3.7. The age and gender distribution of patients presenting with infection and sepsis.

Age (Years)	Gender		Total	Percentage (%)
	M	F		
0-5	12	2	14	9.86
6-10	20	12	32	22.54
11-17	73	23	96	67.61
Total	105	37	142	100.00

Table 3.7 shows the distribution of patients by age and gender over the five-year period. 39 (60%) were male while 26 (40%) were female. In terms of age group 17 (26.15%) were between 0-5 years, 24 (36.92%) between 6-10 and 24 (36.92%) between 11-17-years old. A Fisher's exact test for independence showed that there is insufficient evidence to suggest an association between gender and age group among sepsis patients, p-value = 0.133.

3.1.5 Craniofacial Surgery

Paediatric craniofacial surgery contributed 35 cases over the 5-year period (Figure 3.9). Craniofacial surgeries included cleft lip and palate repair and grafting; and post tumour ablative surgery reconstruction grafts. Cleft lip treatment was carried out for 20 patients, 11 males and 9 females. Facial reconstruction cases accounted for 15 cases, 7 males and 8 females, the youngest of the patients being 16 years of age

Table 3.8 Distribution of craniofacial surgery cases.

	2013	2014	2015	2016	2017	Row total
Cleft lip and palate repair and grafting	3	1	10	1	5	**20**
Row %	30.00	25.00	83.33	50.00	71.43	**57.14**
Facial reconstruction	7	3	2	1	2	**15**
Row %	70.00	75.00	16.67	50.00	28.57	**42.86**
Total	**10**	**4**	**12**	**2**	**7**	**35**
Cumulative %	**28.57**	**11.43**	**34.29**	**5.71**	**20.00**	**100.00**

Table 3.8 shows the distribution of Craniofacial Surgery patients over the five-year period where 20 (57.14%) were cleft lip and palate repair and grafting cases while 15 (42.86%) were facial reconstruction cases for patients post tumour ablative surgery.

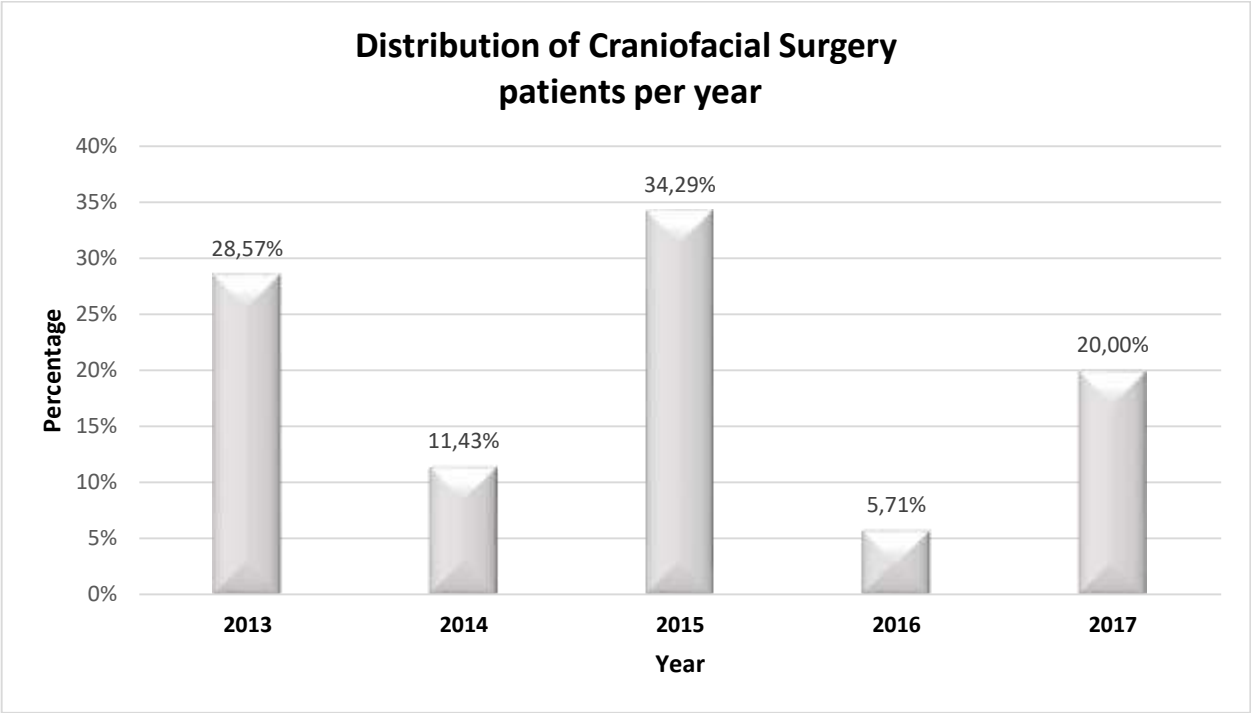

Figure 3.9 Percentage distribution of craniofacial surgery cases per year for 5 years.

3.1.6 Orthognathic Surgery

Orthognathic surgery was performed in only 13 patients over a period of 5 years (Figure 3.10). Eight of the patients were females and the other five males. The youngest patient to undergo orthognathic surgery was 15 years old.

Three cases had surgically-assisted rapid palatal expansion (SARPE), five cases were single jaw movements (three maxillary osteotomies, and two mandibular osteotomies), four cases of bimaxillary correction and one case was a post-traumatic osteotomy. The youngest patient to undergo orthognathic surgery was 15 years old.

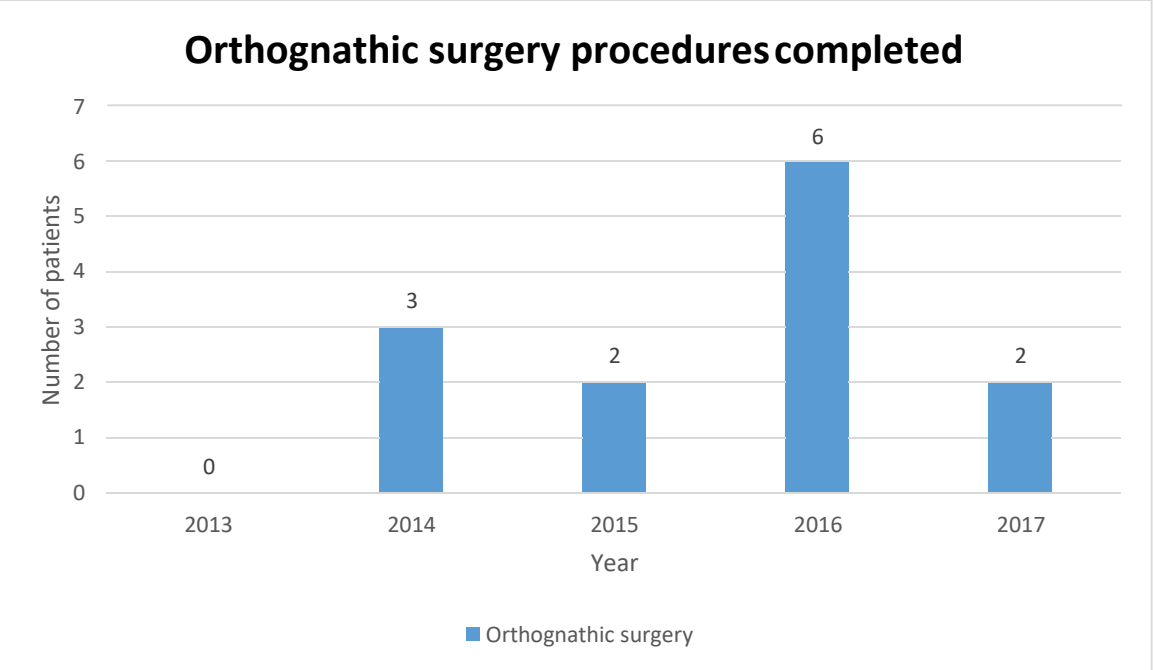

Figure 3.10. Orthognathic surgery procedures completed between 2013 and 2017.

3.1.7 Temporomandibular joint disorders

Over the 5-year period, there were only eight paediatric patients who presented to the maxillofacial department for temporomandibular joint disorders. The youngest patient to present with TMJ disorder was 6 years old.

There were four males and four females presenting with TMJ disorders. TMJ ankylosis presented in four males and two females. Gap Arthroplasty (GA) was the only treatment in the six cases of TMJ ankylosis, closed reduction of a TMJ dislocation in one case and autologous blood injection into the TMJ in one case.

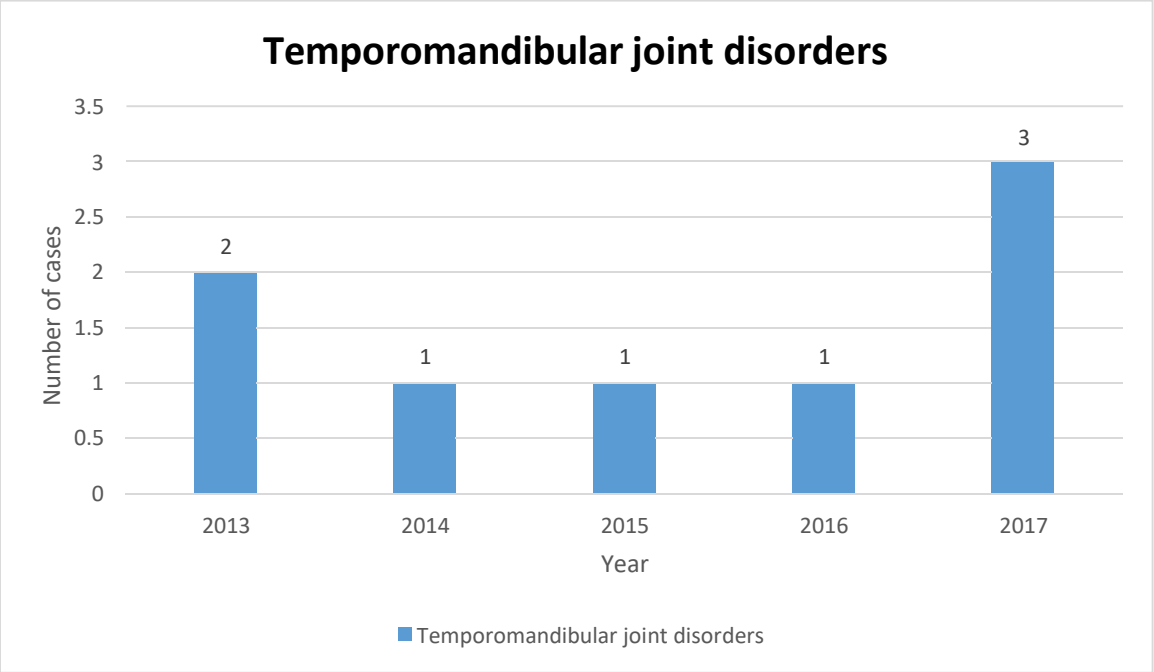

Figure 3.11. Distribution of temporomandibular joint disorder cases.

3.1.8 Treatment of oncological diseases and implant surgery

Treatment of oncological diseases and implant surgery were the least commonly performed procedures. All oncological cases were males (one in the age group of 0-5 and the remaining three in the age group of 11-17 years). The youngest patient was treated for a myofibroblastic tumour in the nasal cavity. From the group of 11-17-years old, two were treated for osteosarcoma and one for rhabdomyosarcoma.

The two implantology cases completed were as a means of restoring function post mandibular reconstruction with iliac crest bone graft. Both were females between ages11-1-years.

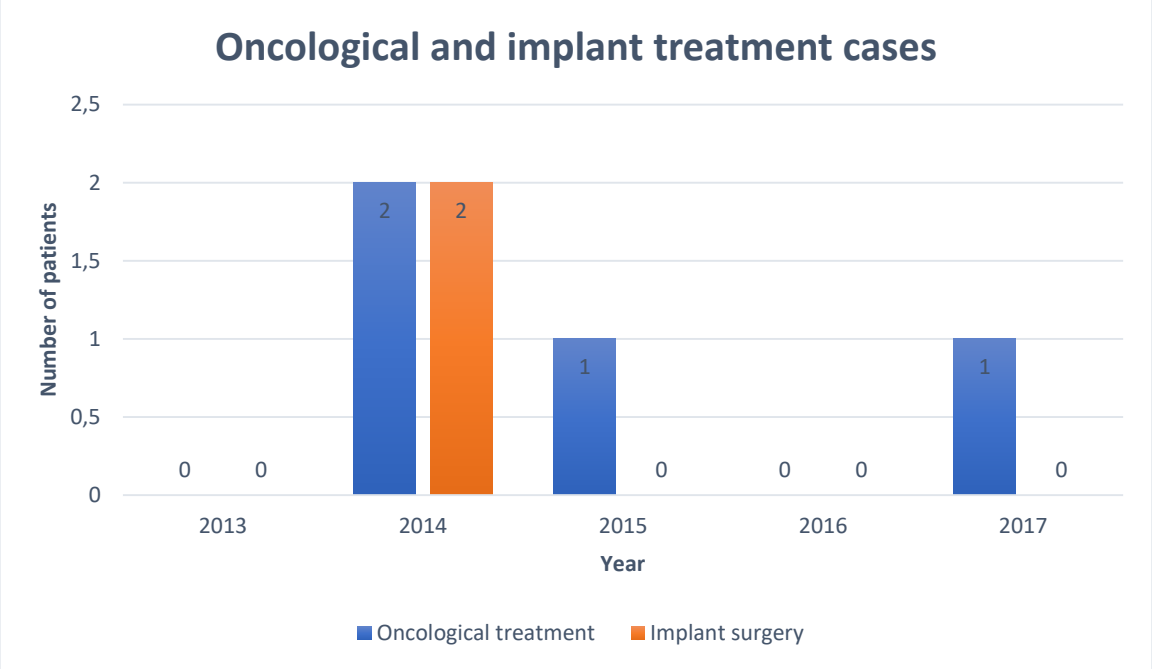

Figure 3.12. Number of oncological and implant cases completed from 2013 to 2017.

Chapter 4

4.1Discussion

This retrospective study sought to evaluate the procedures performed in paediatric maxillofacial and oral surgery at Wits oral health centre over a five-year period. On average 139 paediatric patients were seen per year in the MFOS department. There was no significant difference in the number of patients seen between the years.

Although more males were treated during the study period, the difference between males and females was not statistically significant.

The number of patients treated in the age group 11-17-years was statistically significant from the other age groups. This is understandable as the most frequent surgical procedures during the 5-year period (oral surgery, treatment of pathological conditions and trauma) were undertaken in this age group. There are no comparative studies which included the scope of treatment of paediatric MFOS.

There was statistical significance in the number of procedures completed under general anaesthesia (GA) over local anaesthesia (LA). This could be as a result of ease of management of paediatric patients under GA when compared to treatment under LA. The morbidity and cost factors involved in GA remain fairly high.[23] To offset the high cost of GA, inhalation and intravenous (IV) sedative techniques can be used in patients requiring only minor oral surgery[23, 24].

Although there may be decreased hospital costs when alternatives such as IV sedation are used, they are however not without complications. When propofol is used in IVI sedation, complications such as transient hypoxia and airway obstruction have been reported.[23.]

For this reason, IV sedation must only be administered in a medical facility which has immediate access to an emergency physician skilled in airway management. This is often compounded by the fact that in many maxillofacial procedures, the airway is shared between the surgeon and the anaesthetist. This often precludes routine use of IVI sedation in many maxillofacial and oral procedures.[24]

The most common surgical procedures in the paediatric population over the 5-year period were oral surgery, treatment of pathological conditions, trauma and management of infection and sepsis respectively. There is paucity of studies that have evaluated the distribution of procedures in paediatric maxillofacial and oral surgery to compare with the findings of the present study. There are however studies that have looked into the individual fields of paediatric MFOS.

4.1.1 Oral surgery

During the 5-year period, oral surgery was the most common procedure undertaken, with third molar surgery being by far the most common oral surgical procedure. Anecdotal evidence suggests that the majority of the patients treated in the public hospitals are Black. Since the majority of the patients were black (though not quantified in this study), the present study appears to corroborate the findings by Liversidge (2008) that mandibular third molar initiates and completes maturation significantly earlier in Black children from South Africa compared to White and Bangladeshi children in London and Cape Coloureds in Cape Town.[25] This development and early maturation of third molars at a younger age increases the risk of occurrence of symptoms such as pericoronitis that will then necessitate early removal of wisdom teeth in Black children. A study conducted in the Western Cape confirmed that pericoronitis is the main reason for wisdom teeth extractions in young adults.[26] The present study also showed a marked decrease in oral surgery patients year on year. The reason behind this significant decrease in the number of oral surgical procedures is unclear. We postulate that the increase in the number of families with medical insurance drove patients for treatment in private practices where there is less congestion/shorter waiting period and perceived better care.

4.1.2 Diagnosis and treatment of pathological conditions

Maxillofacial and oral disease was the second most common presentation to the department, with a consistent trend year-on-year. The most commonly diagnosed pathological conditions were odontogenic cysts (23.15%), benign odontogenic tumours (22.31%) and fibro-osseous lesions (19.02%) respectively.

The ratio of odontogenic cysts to non-odontogenic cysts was 4.6:1, and of these, odontogenic keratocyst (9.09%) was the most common diagnosis, followed by dentigerous and radicular cysts at 5.79% each. This finding is in agreement with previous reports that odontogenic cysts are more common in the paediatric population than non-odontogenic cysts.,[14] Contrary to our findings, Jones and Franklin (2006) reported that dentigerous and radicular cysts are the most common odontogenic cysts[14,]

The second most common class of pathological conditions was benign odontogenic tumours of the jaw; however, this was because 19 (70%) of the 27 cases in this category were ameloblastomas, followed by odontogenic myxomas (3) and AOT (2). This finding is in contrast with the findings by Jones and Franklin (2006) who reported that in this category, odontomas constituted almost 80% of the total number.

Only two types of ameloblastomas (majority in the 11 to 17-year age category) were represented: multicystic (73.7%) and unicystic (26.3%), which is in keeping with that reported in the literature.[29,30] Although the racial demographics was not quantified in the present study, the majority of the patients were Black South Africans. The high prevalence of odontogenic tumours in the present study is thus attributable to high numbers of ameloblastomas, which are known to occur more frequently in Blacks than Caucasians or other population groups.[29,31]

The third most common pathological condition was fibro-osseous lesions accounting for 13,55% of cases, with a male to female ratio of 1,6:1. The most common subtype being ossifying fibroma, which accounted for 57% of fibro-osseous lesions. The disease has a gender predilection towards males.[32]

Our findings are in agreement with that by Jones and Franklin (2006) that mucous extravasation cysts are the most common salivary gland lesion.[14] The present study also confirms the rarity of salivary gland tumours in the paediatric population, a finding supported by Jones and Franklin.

4.1.3 Trauma

Trauma was the third commonest presentation to the department. The incidence of maxillofacial trauma in paediatric patients is infrequent when compared to that of adults. The aetiology of trauma in paediatrics differs by age group: children under the age of 12 years usually suffer from accidental falls whereas those 12 years and older show a high incidence of violence and assault related trauma.[33]

There was a significant difference in the number of patients seen year on year, this is in line with the WHO statement indicating that paediatric trauma would be the number one disease globally by 2020.[22] Our study indicates a high occurrence (53.52%) of paediatric trauma in males aged between 11-17-years. This is in agreement with previous findings, confirming that males are generally more prone to traumatic injuries than females.[33,35] Mandibular fractures, followed by dentoalveolar fractures were the most common fracture types. Bamjee made a similar observation that the lower third of the face is affected significantly by trauma more than other maxillofacial regions.[33]

4.1.4 Infection and sepsis

There was a significant difference in the number of patients seen each year with a large increase in patients seen from the beginning of the 5-years to the end. A possible reason for the increase in number of patients could be the increase in oral disease burden associated with the increasing population in Gauteng.

4.1.5 Craniofacial surgery

The majority of patients treated in this category were patients with cleft lip and palate defects. As the repair of cleft defects is conducted in a staged manner over a few years during the course of early childhood,[36] some patients were seen more than once during the time frame of this study.

The remaining 15 craniofacial cases were facial reconstructions post-tumour ablative surgery. The youngest patient to undergo jaw reconstruction was 16 years old following resection of odontogenic tumour. Jaw reconstruction in paediatric patients is often made difficult by unavailability of adequate bone stock.[37]

4.1.6 Orthognathic surgery

Orthognathic surgery is only undertaken once skeletal maturation is near completion.[19] This decreases the likelihood of growth related changes occurring once the surgery has been done. This explains why so few Orthognathic Surgery cases were performed during the study period. Only 13 patients had orthognathic surgery period after confirmation of skeletal maturity with hand-wrist and cervical spine analysis on a lateral cephalometric radiograph.

4.1.7 Temporomandibular joint disorders

Treatment of TMD accounted for eight cases. The most commonly performed procedure was GAP arthroplasty for temporomandibular joint ankylosis.

A meta-analysis by Ma et al (2015) has shown that both gap arthroplasty and interpositional arthroplasty are successful in achieving a better outcome with regards to maximum incisal opening.[38] Both procedures have similar recurrence rate of reankylosis.[38]

4.1.8 Treatment of oncological diseases

Not a single case of squamous cell carcinoma (SCC) was reported over the 5-year period of this study. This confirms that although SCC is the most prevalent cancer of the head and neck region (>90%) (accounting for 4-5% of all cancer cases); it is however extremely rare in the paediatric population.[2,4] Rhabdomyosarcoma and osteosarcoma were the most common malignancies, all occurring in males in the 11-17-year group, similar to that reported by Taiwo et al[39]. Paediatric cancer is one of the leading causes of childhood death worldwide, with leukaemia being the most common cancer in children.[40] No case of leukaemia was recorded in our study. This is attributable to the fact that our study focused on malignancies that manifested in the head and neck region, oral cavity in particular.

Furthermore, a comparative study of paediatric maxillofacial oncology in Nigeria, a sub-Saharan country, over the same period of time produced 43 cases of malignancy.[39] Of these cases Burkitt's lymphoma (presumably accentuated by high HIV infection rates) was the most common followed by rhabdomyosarcoma, the former being more common in children under the age of 10 and the latter more common in children over the age of 10 years.[39]

The comparatively low number of cases managed could be attributable to other specialities carrying out treatment without the need for maxillofacial surgeons.

4.1.9 Implant surgery

The use of dental implants in growing children has generated much discussion as it has been reported that they behave like an ankylosed tooth and that their placement may prevent the growth of osteoid tissue once osseointegration has taken place.[41] The two patients who had undergone dental implant treatment had previously been treated by resection of odontogenic tumours followed by iliac crest bone graft in their late teens. Placement of implants and their subsequent loading minimise bone resorption in non-vascularised bone grafts and is crucial for the prevention of bone graft loss (Pogrel et al., 1997).[42]

Over and above allowing for restoration of form and function, implants thus play a critical role in the maintenance of bony structure. The usage of implants in paediatric patients however should be carefully evaluated, as they do not follow the regular growth process of the craniofacial skeleton. The general recommendation is that their usage should be restricted to patients with completed craniofacial growth.

4.2 Conclusion and recommendations

A large variance in the distribution of procedures in paediatric MFOS exists, determined by the geographic location of the treating units, disease patterns, availability of resources, expertise and level of postgraduate training. The present study was conceived to retrospectively evaluate the distribution of procedures of paediatric MFOS undertaken at WOHC over a 5-year period. Oral surgery, treatment of pathological conditions, management of trauma and treatment of infection and sepsis were the most commonly performed surgical procedures, whilst oncological treatment and implant surgery were the least performed procedures. The majority of the surgical procedures were undertaken under GA in patients aged between 11-17-years. Wisdom tooth removal was the most common of all surgical procedures. A high occurrence of paediatric trauma in males (mostly mandibular fractures) was observed in the same age group. OKC and ameloblastoma were the most common odontogenic cysts and tumours respectively. The present study suggests that even though salivary gland tumours are uncommon in children, cystic lesions such as mucous extravasation cysts remains the most common salivary gland lesion.

Notwithstanding its limitations, this study has added valuable data on the distribution of procedures in paediatric MFOS. Information such as this is valuable in evaluating registrar training and level of exposure of trainees in paediatric surgery. Prevention strategies and educational campaigns targeted at the high-risk age group (11-17-years) must be informed by evidence accrued from studies such as the present one.

We recommend that prospective longitudinal studies be conducted to address the inherent deficiencies associated with retrospective studies such as unavailability of records. In addition, consideration must be given for a streamlined electronic system that can be used throughout the hospital to provide consistency with information and serve as a central data bank.

Chapter 5

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Chapter 6

6.1 Data collection sheet

Appendix 1

Patient study No.	Year of treatment	Age	M / F	Diagnosis	Treatment category/ Referral	Anaesthetic	Additional information
1							
2							
3							
4							
5							
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6.2 University approval letter

Appendix 2

UNIVERSITY OF THE
WITWATERSRAND
JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

04 February 2019
Person No: 552310
PAG

Dr MI Vally
6 Hercules Str
Extension 9
Lenasia
1827
South Africa

Dear Dr Muhammed-Jibreel Vally

Master of Science in Dentistry: Approval of Title

We have pleasure in advising that your proposal entitled *A 5 year review of the scope of paediatric maxillofacial & oral surgery at the Wits Oral Health Centre* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

6.3 Title change approval letter

Appendix 3

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

25 March 2021
Person No: 552310
TAA

Dr MI Vally
6 Hercules Str
Extension 9
Lenasia
1827
South Africa

Dear Dr Muhammed-Jibreel Vally

Master of Science in Dentistry: Change of title of research

I am pleased to inform you that the following change in the title of your Dissertation for the degree of **Master of Science in Dentistry** has been approved:

From:	**A 5 year review of the scope of paediatric maxillofacial & oral surgery at the Wits Oral Health Centre**
To:	**A 5 year review of paediatric maxillofacial and oral surgery procedures performed at the Wits Oral Health Centre**

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

6.4 Hospital and theatre permission letters

Appendix 4

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 12th April 2019

TITLE OF PROJECT: A 5-year review of the scope of paediatric maxillofacial and oral surgery at the Wits oral health centre.

UNIVERSITY: Witswatersrand

Principal Investigator: Dr M Vally

Department: Maxillofacial and oral surgery

Supervisor : Prof RE Rikhotso

Permission Head Department (where research conducted): Yes

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Academic Hospital. The CEO / management of Chris Hani Baragwanath Academic Hospital is accordingly informed and the study is subject to:-

- **Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.**
- The Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- The MAC will be informed of any serious adverse events as soon as they occur
- Permission is granted for the duration of the Ethics Committee Approval.

Recommended
(On behalf of the MAC)
Date: 12/4/2019

Approved/~~Not Approved~~
Hospital Management
Date: 15/04/2019

Appendix 5

Po Box 1840
Lenasia
1827

6 August 2019

Theatre Manager
Chris Hani Baragwanath academic hospital
University of the Witwatersrand
Diepkloof
1862

Dear Sir/Madam

Re: Request to access Maxillofacial and oral surgery patients' records for the purpose of research

This letter serves as a request to access patient records within the unit of maxillofacial and oral surgery at the Wits oral health centre. This research is being conducted in fulfilment of the degree Masters in Dental Science in the field of Maxillofacial and oral surgery.

My research is titled: *A 5-year review of the scope of paediatric maxillofacial and oral surgery at the Wits oral health centre.*

This study will require the use of theatre records over a period of 5 years, from January 2013 to December 2017. Permission has been granted by Wits Oral Health Sciences CEO and the CEO of Chris Hani Baragwanath Academic Hospital. Provisional study approval has been granted by the Human research and ethics commission.

Prof RE Rikhotso (HOD MFOS) will be supervising this study.
Contact: Risimati.Rikhotso@wits.ac.za Tel. 011 717 2130
Principal Investigator: Dr M Vally
Email: Dr_Vally@hotmail.com Tel. 076 364 6379

Please find attached a copy of the research protocol for your perusal.

Kindest regards

Theatre manager
Chris Hani Baragwanath Academic Hospital

Approved / Not Approved

Victoria Khamgole #6777

Appendix 6

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Enquiries: Mr Billy R. Ditshwane

Discipline: Operating Theatre Complex

Rank: Manager Nursing (Theatre)

Tel: 011 488 4821

Email: Billy.Ditshwane@gauteng.gov.za

Dr Valley

P.O. Box 1840

Lenasia

1827

RE: REQUEST TO ACCESS MAXILLO-FACIAL AND ORAL SURGERY PATIENTS, RECORDS FOR RESEARCH PURPOSES

Sir

In lieu of your letter wherein you request to be allowed access to Maxillo-facial and Oral surgery patients records for research purposes in line with your degree in Masters in Dental Science study programme, you are hereby granted permission to access the records as requested. Please note that the records are only to be used for requested study purposes only, and not for other unauthorised purposes. This is in line with the ethical-legal principle required from health professionals to adhere to prescripts of confidentiality in as far as patients are concerned.

You may contact Ms. Tiny Schoeman who is the Operational Manager of ENT Theatre for access to the required documents on this number (*076 045 8414*), or alternatively get the keys to our archives room from our personal Assistant in the manager's office in block 4 reception area. My contact number is (*071 683 3780*)

Regards

B.R. Ditshwane

Signature _____ Date: 12/08/2019

6.5 Head of department approval letter

Appendix 7

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

School of Oral Health Science

Department of Oral Biological Sciences, 7 York Road, Parktown, 2193. Tel: 011 717 2045 Fax: 086 553 3890 Email: Julithe.Moisson@wits.ac.za

29 March 2019

Dr M. Vally
Maxillo Facial Oral Surgery
Faculty of Health Sciences
University of the Witwatersrand
Johannesburg

RE: PERMISSION TO CONDUCT RESEARCH

Your request for permission to conduct a research has been approved by the Committee.

Regards,

Prof M. S Nemutandani
CEO/Head of School
Date: 03/04/2019

6.6 Ethical clearance

Appendix 8

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R14/49 Dr M Vally

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M190701

NAME: (Principal Investigator)	Dr M Vally
DEPARTMENT:	School of Oral Health Sciences Department of Maxillo-Facial and Oral Surgery Dental School University
PROJECT TITLE:	A five year review of the scope of paedicatric maxillofacial and oral surgery at the Wits Oral Health Centre
DATE CONSIDERED:	2019/07/26
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Professor R Rikhotso
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2019/08/26

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **July** and will therefore reports and re-certification will be due early in the month of **July** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

30/07/2019
Date

PLEASE QUOTE THE CLEARANCE CERTIFICATE NUMBER IN ALL ENQUIRIES

6.7 Plagiarism report

Appendix 9

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