Intra-Osseous Jaw Lesions in Paediatrics and Adolescents: Clinicopatological and Treatment Audit in Khartoum Teaching Dental Hospital 2019

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Abstract - Background and Aim: ***this study aims to assess the frequency clinical and pathological behaviors and the treatment modalities of jaw lesions in Sudanese pediatrics and adolescents treated in Khartoum teaching dental hospital from first January 2016 to last December 2019.***

Methods: ***In this descriptive-analytical study, all medical and surgical records of pediatrics and adolescents patients with jaw lesions who treated in Khartoum teaching dental hospital has been investigated, and histopathological slides were reviewed. The lesions were divided into eight major groups comprise benign odontogenic tumors, benign nonodontogenic tumors, odontogenic cysts, non-odontogenic cysts, fibro-osseous lesions, inflammatory lesions, reactive lesions, and malignant tumors. The patients were categorized into three age groups according to their dental ages. The obtained data were analyzed with SPSS software, using the chi-square test and other relevant methods.***

Results: ***A total of 138 intra-osseous jaw lesions were evaluated. The mean age was 13.9 years with standard deviation (SD) of 5years. The male to female ratio was 1.16:1. Odontogenic cysts were the most common lesions while the reactive lesions were the least frequent lesions. Both jaws involved equally, the posterior region of mandibular bone was the more affected location. Dentigerous cyst was the most prevalent lesion. Enucleation and curettage was the most surgery done, recurrence was observed in 9.4 % of cases.***

Conclusion: ***jaw lesions in Sudanese children and adolescents patients showed variable patterns of presentations that treated effectively with minimal complications. Histopathological characteristics of jaw lesions and biological behavior were significantly affected diagnosis, treatment selection and outcomes.***

Keywords: jaw, lesion, pediatrics, adolescents, odontogenic.

I. INTRODUCTION

In this In this Pediatrics and adolescents patients represent a very interesting study group, as several long terms developmental and physiological changes take place in their maxillofacial area during their growth. During this period, they may complaint of swellings of bone or soft tissue origin, when these swelling occurred in the jaw bone, a wide range of pathological lesions should be considered at a time, with variable behaviors that ranging from hemartomas, congenital overgrowths, inflammatory conditions to true neoplasms. Classification of these lesions has been done by several pathologists, there was no standardization of diagnostic criteria used, and thus there are various ways of classification and categorization of these lesions. First classification attempted by Baroca 1866 (1), one century later a group of experts from different countries, sponsored by the World Health Organization (WHO), produced classification aimed to define the clinicopathologic criteria of jaw lesions necessary to diagnose these entities, followed by subsequent modifications (2) and (3) till the last World Health Organization's histological typing of jaw lesions published 2017 (4), Which became the main reference for the researcher when studying such lesions (5).

Jawbone pathologies tend to appear in a wide spectrum of clinical, histological and radiographic features and tend to vary among different geographic areas and ethnic groups. Previous studies showed odontogenic lesions are less common than non odontogenic lesions (6), (7). Other studies reported different results due to differences in the study population and ethnic variations (8). The most common jaw lesion was dentigerous cyst, follow by odontoma, odontogenic keratocyst, ameloblastoma, ossifying fibroma, and giant cell lesion. the majority of studies reported dentigerous cyst is first common jaw lesion in pediatrics and adolescents (9) (10), other found radicular cyst was the most common (6), (8), (11), while (12), (13) reported odontoma was the most common jaw lesion.

Symptoms of intraosseous jaw lesions are usually uncommon other than Jaw swelling which is a leading feature. pain or other signs and symptoms such as tooth mobility, tenderness, sensory changes, discharges, and airway abstraction are depended mainly on lesion extension and behavior (14).

Diagnostic studies for jawbone lesions depend on thorough demographics and thorough history, clinical examinations, and radiological examinations and tissue biopsies (15) and (16). Treatment selection depends on lesion extension,

histological type, and pathological behavior. Treatment modalities range from non-surgical and surgical which range from simple excision to resection that may need some sort of reconstruction (17) and (18). Occlusion disturbance, tooth loss and facial disfiguring are the most significant complications (19), early diagnoses and appropriate management may reduce the chances of long term complications and minimize functional and structural deficits. This study aimed to determine the frequency and clinical and pathological behaviors and correlate the efficacy of different treatment modalities of jaw lesions in patients less than 21 years old treated in Khartoum teaching dental hospital.

II. MATERIALS AND METHOD

In this Hospital Based Retrospective analytical Study, 138 patients presented with jaw lesions who treated surgically under general anesthesia in Khartoum teaching hospital from first January 2016 to December 2018, their hospital files reviewed after ethical clearances. Data were gathered from patients' surgical files including personal and demographic data, chief complaint and history of chief complain, physical examination, preoperative and postoperative radiographs, diagnoses and treatment conducted, and the patient follow-up records for one year postoperatively.All preoperative and postoperative histopathology slides were reviewed at the University of Khartoum Faculty of Dentistry Department of Oral & Maxillofacial Surgery Prof. A.M. Suleiman Oral Histopathology Diagnostic Laboratory.

The resulted diagnoses were categorized into eight groups; benign odontogenic tumors, benign nonodontogenic tumors, odontogenic cysts, non-odontogenic cysts, fibro-osseous lesions, inflammatory lesions, reactive lesions, malignant tumors. To establish the distribution of the lesions regarding dental ages, patients were categorized into 3 groups: group 1 (G1) = primary dentition, group 2 (G2) = mixed dentition, and group 3 (G3) = permanent dentition period. Then data statistically analyzed. Mean age with standard deviation was estimated, distribution of each group of lesions, according to gender, age, location were determined. Histopathological types, radiological patterns, treatment modalities, and recurrences were assessed.

III. RESULT

Out of 138 cases of intraosseous jaw lesion, we found 39 (28.3%) Odontogenic Cysts, 32 (23.2%) Benign odontogenic tumors, 20 (14.5%) Fibro-osseous lesions, 18 (13.1%) Malignant tumors, 10 (7.2%) Inflammatory lesions, 9 (6.2%) Non odontogenic Cysts, 5 (3.6%) Benign non-odontogenic tumor, and 5 (3.6%) Reactive lesions. The patients' age (mean±standard deviation) was (13.9 ± 5.2.) the male to female ratio was 1.16:1, both Maxillae were involved equally with a high predilection to the posterior site, (P value = 000). (see Table 1). Lesions seen more common in group G3 (13-21years) followed by age group G2 (6 - 12 years) then age group one (G1) (less than 6 years). (P-value = 000). (Table 2).

Chart.1 depicts frequency, distribution, and symptoms of the lesions among three age groups, swelling was the leading symptoms while other symptoms are rare.

Table 1, distribution of eight groups of jaw lesions based on age, gender, and site.

Parameters	**Frequency**		**Age**	**Gender**		**Site**			**Location**		
Jaw lesion	**NO**	**%**	**(Mean±SD)**	**F**	**M**	**Both**	**Man**	**Max**	**Ant.**	**Post.**	**Both**
Benign Nonodontgenic Tumor	5	3.6%	(13.6±7.44)	3	2	0	2	3	1	4	0
Benign odontogenic Tumor	32	23.2%	(15.91±4.54)	18	15	1	24	8	10	22	1
Fibro-osseous lesion	20	14.5%	(13.75±4.64)	11	9	1	6	13	2	16	2
Inflammatory lesion	10	7.2%	(10.3±5.79)	6	4	1	5	4	1	9	0
Malignant tumor	18	13.1%	(9.12±5.94)	6	11	3	9	5	1	13	3
Nonodontogenic Cyst	9	6.5%	(16.78±2.59)	3	6	0	0	9	9	0	0
Odontogenic cyst	39	28.3%	(14.69±3.79)	14	25	0	16	23	14	24	1
Reactive lesion	5	3.6 %	(13.5±7.85)	3	2	0	4	1	0	4	1
Total	138	100%	(13.92±5.2)	64	74	6	66	66	38	92	8
P-value				0.541		0.4	0.001		0.005		0.29

(F female, M male, Mn mandible, max maxilla, ant Anterior, Post Posterior)

Table 2. Distribution of jaw lesions according to the gender and age groups.

	Age group y			gender		
jaw lesion	**G1**	**G2**	**G3**	**G1**	**G2**	**G3**
Ameloblastoma	0	0	15	-	-	8M:7F
Ameloblastic fibroma	1	0	1	0M:1F	-	1M:0F
calcifying epithelial odontogenic tumor	1	0	1	0M:1F	-	1M:0F
adenomatoid odontogenic tumor	0	2	5	-	1M:1F	1M:4F
Odontoma	0	0	3	-	-	2M:1F
Odontogenic Myxoma	0	2	1	-	0M:2F	0M:1F
calcifying odontogenic cyst	0	0	3	-	-	1M:2F
Dentigerous	0	8	9	-	7M:1	7M:2F
odontogenic keratocyst	0	3	9	-	2M:1F	4M:5F
Radicular Cyst	0	1	6	-	1M:0F	3M:3F
Nasopalatine	0	1	8	-	1M:0F	4M:4F
Fibrous Dysplasia	1	1	3	1M:0F	1M:0F	0M:3F
Ossifying Fibroma	1	5	8	0M:1F	3M:2F	3M:5F
Cherubim	0	1	0	-	1M:0F	-
central giant cell granuloma	0	1	2	-	0M:1F	1M:1F
Eosinophilic granuloma	1	0	0	1M:0F	-	-
Inflammatory lesion	2	6	2	1M:1F	2M:4M	1M:1F
Osteofibroma	0	1	0	-	0M:1F	-
Central Xanthoma	0	0	1	-	-	0M:1F
Fibromatosis	1	0	0	1M:0F	-	-
Osteoblastoma	0	0	1	-	-	0M:1F
Osteoma	0	0	1	-	-	1M:0F
Rhabdomyosarcoma	1	0	5	0M:1F	-	3M:2F
Burkitt's lymphoma	0	4	1	-	3M:1F	1M:0F
Other jaw sarcomas	4	3	0	3M:1F	2M:1F	-
All	13	39	86	7M:6F	24M:15F	43M:43F
Percentage	9.4%	28.3%	62.3%			
p value	0.04	000	000			

G1 group 1, G2 group 2, G3 group 3, M male, F female.

The dentigerous cyst was the most common intra-osseous jaw lesion represented 12.3% of all lesions. Clinically dentigerous cyst presented as a painless swelling, Age of occurrence (mean±standard deviation) was (13±3.5) years, male: female ratio of 3.5:1, more in the maxilla than in mandible with most patients seen in group 3 all of them were treated successfully by enucleation and curettage Ameloblastoma constituted 15 cases (10.9%) of the study sample, the age of occurrence (mean±standard deviation) was (17±2.4) years with most patients seen in group3. Male: female ratio of 1.14:1. All cases occurred in mandible. 60% of them were unicystic variants, 40% were conventional/ (solid) variant, and only one case of unicystic ameloblastoma treated by enucleation and curettage the remaining underwent resection one showed recurrence. Five cases of solid ameloblastoma treated by resection one of them recurred and one treated by enucleation.(Table 3).

Ossifying fibroma represents 8.7% of all cases, age of occurrence (mean±standard deviation) was (3.8±16) years, female: male ratio of 1:1.4. Mandible: maxilla ratio of 1.4:1. Six cases treated by enucleation and curettage and eight cases underwent surgical resection one of them recurred.

Odontogenic keratocyst age of occurrence (mean±standard deviation) was (15.5±4.8) years, the study showed 12 odontogenic keratocyst represented 8.7% of all cases, male: female ratio of 1.4:1, they were equally distributed to both

jaws. Enucleation and curettage were used in 10 patients with one case recurred, two patients underwent resection without recurrence reported.

Tables 3 comparing the most common four jaw lesions regarding clinical and radiological characteristics and treatment done.

Type of surgery	Dentigerous Cyst	Ameloblastoma	Ossifying Fibroma	Odontogenic Keratocyst
Distribution according to age gender and location				
Age (mean±SD)	13+-3.5	(17±2.4)	16+-3.8	15.5 +4.8
Duration (mean±SD	10+17.6	21+18.6	10+14	7.5+4.5
Total cases/ %	17 / 12.3%	15 / 10.9%	14 / 10.1%	12 / 8.7%
Male	13	8	5	7
Female	4	7	9	5
Mandible	6	15	5	6
Maxilla	11	0	9	6
Anterior	4	1	1	4
Posterior	12	14	13	8
Symptoms and duration on presentation				
Swelling	17	16	14	12
Pain	2	0	1	0
Tooth mobility	4	7	1	2
Radiological characteristics				
Well define	17	15	9	11
Ill define	0	0	4	1
Unilocular	12	7	1	9
Multilocular	0	7	1	1
Radiolucency	17	15	10	11
Radio opacity	0	0	1	0
Mixed	0	0	2	1
Unirrupted tooth	10	7	0	1
Treatment modality and recurrence				
Enucleation + curettage/R	17(0)	3(1)	7(0)	10(1)
Resection/R	0	5(1)	4(1)	2(0)
segmental resection/R	0	7(0)	0	0

SD standard deviation, R Recurrence

The study revealed 18 cases of malignant tumors 6 rhabdomyosarcoma age (mean±SD) (12±4.7), seen equally in both gender, mandible: maxilla ratio of 2:1. Burkitt's lymphoma seen in 5 cases, age of occurrence (mean±standard deviation) was (9±3.44). 2 cases of neuroblastoma, 2 osteosarcoma, one ameloblastic carcinoma, one malignant teratoma, and one round cell tumor jaw sarcoma, All sarcomas were treated by resection plus chemotherapy, All Burkitt's lymphomas were referred to chemotherapy.

The study revealed Surgery alone was the main treatment modality, followed by oncology medicine alone, seven patients referred to oncology after surgery, enucleation with curettage with or without application of crony's solution was the main surgery, followed by local excision or resection including mandibular marginal resection without continuity loss, segmental resection including maxillectomy, shaving or surgical contouring, and decortication with sequestrectomy. recurrence seen in 9.4% of all surgeries, the highest recurrence rate 50% seen in surgical contouring, followed by sequestrectomy 33.3% half of them seen in patients with osteopetrosis, local excision 12.5% and enucleation and curettage 4.2%, no recurrence was seen in segmental resection, (Table 4)

Table 4 showing treatment modalities and their recurrences

Type of surgery	BOT/R	BNOT/(R)	Cyst (R)	FO\(R)	Inflammatory+reactive\(R)	MT/(R)	Total	R
Enucleation + curettage	14/1	1(0)	45(1)	8(0)	3(0)	2(1)	73(3)	3
Resection	10(1)	3(0)	3(0)	5(1)	2(0)	9(2)	32(4)	4
segmental resection	8(0)	1(0)	0(0)	1(0)	0	0	10(0)	0
Sequestrectomy	0	0	0	0	9	0	9(3)	3
Surgical contouring	0	0	0	4(2)	0	0	4(2)	2
Total surgeries	32	5	48	18	14	11	128	12
Percent	25%	4%	37.5%	14%	11.%	8.5%	100%	9.4%

(BOT benign odontogenic tumors, BNOT benign nonodontogenic tumor, FO fibrooseous lesion,, MT malignant tumor, R recurrence

IV. DISCUSSION

In The study revealed odontogenic cysts were the most common group of lesions followed by benign odontogenic tumors, similar result was obtained by previous studies (11), (9), however, other studies reported odontogenic tumors were the common lesion followed by odontogenic cyst (20). while (21) found that fibro-osseous lesions were the most common jaw lesions in pediatrics and adolescents.

In this series the findings revealed jaw lesions occurred equally in both maxillae, and tend to involve posterior site of the jaw, this findings agreed with other studies (14), (6), however, Elarbi et al. (22) and Urs et al. (9) they reported that jaw lesions occurred more in maxilla than mandible. male predominance was observed which was similar to results obtained previously (23), and (24), in contrast to them tow other studies (14), (11) found that females were affected more commonly than male, and other reported an equal gender distribution (12). Malignant lesions were the dominant lesion during primary dentition, while cystic lesions and Odontogenic tumors are seen more frequently during mixed and permanent dentition period respectively, similar results were obtained other studies (6), (25) And (10).

In this study 98.5 % of jaw lesions showed swelling on presentation, Al-Khateeb et al. (26) and Urs et al. (9) were agreed with our findings, however, pain, tenderness, and tooth mobility tend to be seen in cases of inflammatory lesions and some reactive lesions or lesions with aggressive or malignant behaviors, (6) and (11).

Odontogenic cyst represented the most common jaw lesions followed by odontogenic tumors then Fibro-osseous lesions, that was similar to other studies, (6), (11), (27), (28), however, Al Yamani et al. (21), Latrou et al. (25) and recently da Silva et al. (24) found fibro-osseous lesions were the common one, in contrary to them Jones et al. (20) found odontogenic tumor was the most common.

Jaw cysts showed male/female ratio of 2.5/1, odontogenic cyst tended to occur more commonly in mandible posterior portion, similar findings were previously reported (25), (9) and (27) however, Jones et al. (20) and Bodner et al. (29) saw jaw cyst distribute equally among both sex.

The benign odontogenic tumor showed equally distributed among both gender with mandible posterior portion was a commonly affected site and they occurred in the older age group, this finding was in line with other studies (12), (30), while Skiavounou et al. (6) showed male predilection. benign odontogenic tumor in our findings tend to show swelling, minorities of them presented with pain or tenderness, radiologically they appeared unilocular or multilocular with well-defined border and less likely associated with unirrupted tooth similar findings reported previously (31). Their treatment varied between enucleation with curettage and resection only one case showed recurrence after surgery, these findings were similar to previous studies (10), (32), (18) and (33). ameloblastoma was the most common benign odontogenic tumor followed by odontoma similar result was obtained in previous studies (34), (32), (18), but other results show odontoma was the most common benign odontogenic tumor (7), (12).

Regarding clinical histological and radiological feature and treatment outcome of fibro-osseous lesions, our finding consisted with (35) (36), (37) and (38), ossifying fibroma was the third most common jaw lesion in pediatrics and adolescents and the first most common lesion of jawbone

pathology of non-odontogenic origin seen commonly on females and mandible (27).

Jaw osteomyelitis in children showed equal gender distribution affected mandible more than maxilla with male to female ratio of 1.5:1 pain and pus discharge were constant features similar results reported previously by (39), (40) and (41) which were in line with our study, Up to 30% of osteomyelitis occurred in osteopetrosis patients and presented with multiple recurred osteomyelitis this finding was consistent with (42)who advised using of hyperbaric oxygen.

Many previous studies reported that central giant cell lesions, occurred equally in both sex and mostly found in the anterior mandible, painless swelling found to be the main feature (6) and (14) that were consistent with our findings except that we observe posterior mandible was the common location. Regarding the treatment of giant cell lesions in this series enucleation and curettage with or without preoperative intralesional steroid was the main treatment modality similar findings were reported by (19), (14) and (43), however (44) advocated using intralesional steroid or subconscious calcitonin or interferon-alpha as the first line of treatment and surgery should be preserved for refractory cases.

Malignant tumor represent 12% of all lesions in this study most of 6 of them were rhabdomyosarcoma that seen more frequently in mandible with equal gender distribution age range between 3 to 19 years. Burkett's lymphoma was the second most common malignancy in this series the majority of cases involve Posterior mandible. besides swelling, all malignancies showed pain and tooth mobility, radiologically they found as ill define Radiolucent lesions, this result agrees with (22), While (45), and (46) found malignant jaw lesion was much rarer than our result many other study support this point (6) and (25).

Regarding the treatment of malignant lesions, many previous studies agreed with our result in that surgical resection with or without oncology medicine was the main treatment modality for sarcomas while Burkett's lymphoma should be treated by chemotherapy (47) and (48).

Dentigerous cyst was the most common jaw lesion in our sample followed by ameloblastoma, then ossifying fibroma, and odontogenic keratocyst, (6) agreed with us, while (24) and (11) found the highest prevalent lesion was the radicular cyst, the study findings showed similarity in frequency and distribution regarding age gender and location previous previous study (27), swelling on presentation was the common feature, well defined unilocular radiolucency associate with unirrupted tooth was the characteristics radiological feature results that previously obtained (20), enucleation with curettage was main treatment modality for dentigerous cyst, the finding agreed with many other studies (11), (25) and (49).

Ameloblastoma in this series was the second most common lesion of all cases and first common odontogenic tumor majority of cases seen during permanent dentition period, commonly seen in male and mandible posterior jaw was the common location, This result was similar to results in previous studies (50), (30), (51), however (32) and (52) reported no gender variation, Unicystic variant of ameloblastoma has been reported to be more common than sold one (33) and (53) this like our result which showed (57%) of ameloblastoma were unicystic variant. however (18) reported a low percentage of unicystic ameloblastoma.

Odontogenic keratocyst represented the fourth more common jaw lesion in pediatrics and adolescents and was ranked as the second most common jaw cyst, mostly seen in the male, they were equally distributed to both jaws and they were the most common jaw cyst showing recurrence after surgery a similar result was reported in other studies (11), (54), (55), however (29), (49) found that it tends to occur more commonly in mandible.

Regarding Treatment modalities and recurrences, we found enucleation and curettage was a most common type of surgery and it associated with 0.04% recurrences similar results were obtained by (14), (25), (11), (56), (9), in contrary to our study (54), (55) in their extensive revision of jaw lesions treatment, they not advocated enucleation and curettage in case of malignant or large lesions or lesions with aggressive behavior. Total recurrence was reported to be 9.4% of the study sample, with variable percentage among each type of surgery and pathology these findings were consistent with (57), (9) and (42).

V. CONCLUSION

In children's and adolescent's jawbone lesions, epidemiology, clinical and radiological characteristics are useful diagnostic tools when managing jaw lesion in young patients. Jaw lesions in Sudanese children and adolescents patients showed variable patterns of presentations that treated effectively with minimal complications.

Histopathological characteristics of jaw lesions and biological behavior were significantly affected treatment modalities and their outcomes.

VI. FUTURE SCOPES

As this study is single center study further multi-center studies with larger sample size are warranted to get more accurate pictures about jaw lesions and their management in younger Sudanese.

Public awareness, and prompt referring of patients with jaw lesion to maxillofacial surgeon from all other medical

surgical practitioners should be affirmed, as any unnecessary delay may have their consequences

More multidisciplinary coordination for treating the young patients with malignant or aggressive benign jaw lesion, with use of modern maxillofacial reconstructive aids are mandatory.

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