International Journal of Otolaryngology and Head & Neck Surgery, 2023, 12, 69-84
https://www.scirp.org/journal/ijohns
ISSN Online: 2168-5460
ISSN Print: 2168-5452

Acute Mastoiditis Clinical Course and Management in Patients Presented to Khartoumar Ear, Nose and Throat Hospital during the Period from November 2017 to November 2019

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How to cite this paper: Elkhalifa, M.H., Elawad, M. and Mehnab, S. (2023) Acute Mastoiditis Clinical Course and Management in Patients Presented to Khartoumar Ear, Nose and Throat Hospital during the Period from November 2017 to November 2019. *International Journal of Otolaryngology and Head & Neck Surgery*, **12**, 69-84.
https://doi.org/10.4236/ijohns.2023.122008

Received: September 19, 2022
Accepted: March 13, 2023
Published: March 16, 2023

Abstract

Introduction: Acute mastoiditis is the most common complication of Acute Otitis Media (AOM) and it's the cause of serious morbidity. There is no standard universally agreed-upon management approach to acute mastoiditis. This study aims to view the clinical presentation and management approaches in Khartoum Ear, Nose and Throat Hospital. **Methodology:** This is a prospective case series and a hospital-based study conducted at Khartoum Ear, Nose and Throat Hospital during the period from November 2017 to November 2019. A total of 61 patients were included in the study. **Results:** The median age at presentation is 5 years old, males are more affected than females with a ratio of 1.35:1, and the mean duration of symptoms prior to hospital admission was 9.6 days. The most common presenting symptoms were otalgia (83.3%), ear discharge (83.3%) and post-auricular swelling (83.3%), and the most common signs at admission were tenderness over the mastoid (95.1%), retroauricular swelling and protrusion of the auricle (82%), and redness over the mastoid (77%). The abnormal tympanic membrane was found in all patients with central perforation being the commonest finding (73.8%), and bulging tympanic membrane (21.3%). 34.4% of patients received oral antibiotics before admission and the mean duration of symptoms prior to admission increased significantly in those who received antibiotics 12.7 days in comparison to those who didn't 8.3 days. Only 52.5% of patients had a past history of recurrent acute otitis media, and 8.2% had a past history of acute mastoiditis. All the patients with recurrent mastoiditis had a past history of recurrent acute otitis

media. Computed Tomography (CT) scans were obtained for 50.8% and 83.9% of those scans showed coalescent mastoiditis. Further evidence of intracranial extension was found in 6.5% and Magnetic Resonance Imaging (MRI) was obtained for them. Of the study group, 67.2% presented with subperiosteal abscess, 4.9% with facial nerve palsy and 3.3% with brain abscess. Thirteen patients with no complications were managed initially with injectable and topical antibiotics and were successful in only 6 of them (46%), abscess incisions and drainages were needed in 46 patients and were successful in 34 of them (73.9%). Eighteen patients (29.5%) needed mastoidectomy and all of them were managed successfully (100%). One patient (1.6%) was referred for intracranial abscess drainage in a specialized hospital, also one patient (1.6%) initially presented with intracranial abscess died on the second day of admission and 96.8% were discharged in good condition. The mean duration of hospital stay was 7.5 days. **Conclusion:** Patients present to the hospital after a prolonged period with a higher rate of complications, and the delayed presentation increased significantly in patients who received oral antibiotics prior to admission. Conservative medical treatment in non-complicated acute mastoiditis was ineffective in more than half of the patients and abscess incision and drainage and/or mastoidectomy are often necessary for the management.

Keywords

Mastoiditis, Acute Otitis Media, Mastoidectomy, Mastoid Abscess, Khartoum, Ear, Nose and Throat

1. Introduction

Acute mastoiditis is the infectious inflammation of the mastoid bone and it is the most common complication of AOM. True mastoiditis as a complication of AOM implies an invasive or persistent infection involving the mastoid bone and/or surrounding structures [1].

Prior antibiotic treatment of AOM does not seem to protect from acute mastoiditis, and there is no significant difference in prior antibiotic use between those who developed a subperiosteal abscess and those who did not [2].

Diagnosis usually rests on the presence of post-auricular swelling, protrusion of the pinna, post-auricular erythema and tenderness [3]. Patients usually present with fever, but it is less common in those treated with antibiotics [2].

Initial workup involves a thorough history and physical examination, paying close attention to signs of more severe infection (toxic appearance, neurological changes, neck stiffness, no improvement after 48 hours of antibiotics) [4] also Laboratory markers such as C-Reactive Protein (CRP) and White Blood Cell (WBC) counts are usually elevated [5].

The role of radiology becomes extremely important in diagnosing the complications of mastoiditis which can be serious and life-threatening [6]. Acute mastoiditis is mainly a disease of childhood and exposing a child's brain to the risk of io-

nizing radiation leads many authors to question the real indications for CT scan imaging in the setting of acute mastoiditis.

Classical treatment consisted of routine imaging and cortical mastoidectomy. However, in the last years, more conservative measures have been employed with success. The conservative approaches include treatment with intravenous antibiotics alone, or in combination with myringotomy or without pressure equalization tube placement. The presence of a subperiosteal abscess, historically requiring mastoidectomy has also been treated conservatively via incision and drainage or needle aspiration [4].

This study aims to view the clinical presentation and management approaches in Khartoum ENT Hospital.

2. Materials and Methods

2.1. Study Design

This study included patients of all ages who presented to Khartoum Ear, Nose and Throat Hospital with acute mastoiditis between November 2017 and November 2019; all patients with chronic mastoiditis or previous ear surgery were excluded from the study. The subjects consisted of 61 patients with a mean age of 7.9 years. History, examination, investigations and in-hospital management modalities data were collected using a unified structured data collection sheet designed to address the study objectives. CT scan was obtained for 50.8% of our study group and the indications were suspicion of complications, failure to improve on medical treatment and planning for mastoidectomy. Evidence of intracranial extension was found in 2 patients (6.5%) and MRI images were obtained for them.

Ethical clearance from Sudanese medical specialization board ethical committee and permission from the administration of the hospital has been obtained

2.2. Data Analysis

Data was analyzed by Statistical Packages for Social Sciences (SPSS) 23.0 software. Categorical variable were presented as proportion out of available observations and comparison between subgroups using Chi-square test. Comparison between sub groups of continuous variables used t-test. $P < 0.05$ was considered statistically significant. Microsoft Office 2010 has been used for graphs and tables.

3. Results

The study included sixty-one patients mean age of 7.9 years, **Figure 1** shows age distribution. Thirty-five patients (57.4%) were males and 26 (42.6%) were females with male to female ratio of 1.35:1. Thirty patients (49.2%) were from urban areas whereas 31 (50.8%) were from rural areas.

The presenting symptoms in order of frequency were otalgia in 83.3%, ear discharge in 83.3%, post-auricular swelling in 83.3%, fever in 63.9%, malaise in 45.9%, Hearing impairment in 32.8%, decreased appetite in 22.9%, headache in 21.3%, nasal blockage in 13%, nasal discharge in 11.5%, cough in 9.8%, vertigo in 9.8%,

tinnitus in 8.2%, sore throat in 8.2%, mouth deviation in 4.9%, shortness of breath in 3.3%, diplopia in 1.6%, neck stiffness in 1.6% and 1.6% had deterioration of consciousness (Table 1).

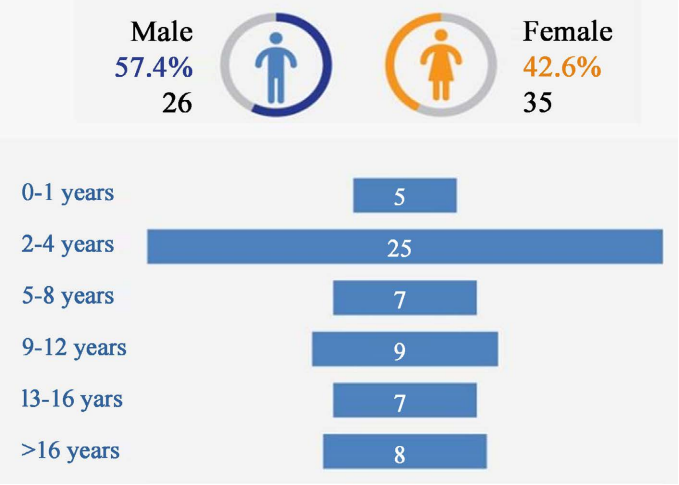

Figure 1. Shows age distribution among the study group (n = 61).

Table 1. Presenting symptoms in acute mastoiditis among the study group (n = 61). The duration of ear symptoms ranged between 1 and 21 days prior to admission with a mean of 9.6 days.

Presenting symptoms	Number	Percentage
Otalgia	51	83.3%
Ear discharge	51	83.3%
Post-auricular swelling	51	83.3%
Fever	39	63.9%
Malaise	28	45.9%
Hearing loss	20	32.8%
Decreased appetite	14	22.9%
Headach	13	21.3%
Nasal blockage	8	13%
Nasal discharge	7	11.5%
Verigo	6	9.8%
Cough	6	9.8%
Tinnitus	5	8.2%
Sore throat	5	8.2%
Mouth deviation	3	4.9%
SOB	2	3.3%
Diplopia	1	1.6%
Deteriorated consciousness	1	1.6%
Neck stiffness	1	1.6%

The duration of ear symptoms ranged between 1 and 21 days prior to admission with a mean of 9.6 days and a median of 8 days (Table 2).

Duration of ear symptoms prior to hospital admission in patients who received oral antibiotics increased significantly ($p = 0.004$), patients who didn't receive medications presented after a mean of 8.3 days of the start of symptoms and those who received medications presented after a mean of 12.7 days (Table 3).

Thirty-two patients (52.45%) had a past history of AOM ranging from one to eight previous attacks; the mean was 2.9 attacks. Four patients (6.6%) had a history of bronchial asthma and 3 patients (4.9%) had a history of rhinusinusitis (Table 4).

Five patients (8.2%) had past history of acute mastoiditis and all of them had a history of recurrent AOM and this finding was statistically significant ($p = 0.038$) (Table 5).

Temperature at presentation with a mean of 37.7˚C, heart rate ranged from with a mean of 96.9 beats per minute and respiratory rate ranged between a mean of 20.8 breaths per minute (Table 6).

Table 2. Duration of symptoms in days prior to hospital admission among the study group (n = 61).

Duration (days)	Percentage (%)
From 1 - 3	15
From 4 - 7	39
From 8 - 14	31
From 15 - 21	15

Table 3. Cross tabulation between duration of symptoms prior to hospital admission and previous history of medication in the study group.

	Mean duration of symptoms prior to hospital admission (SD)	*P*-value (t-test)
Past history of medications prior to admission (n = 21)	12.67 days (5.607)	0.004
No past history of medication prior to admission (n = 40)	8.25 days (5.234)	

Table 4. Distribution of cases according to past medical history in the study group (n = 61).

Past history	Frequency	Percent (n = 61)
Similar condition	5	8.2%
AOM	29	47.6%
Bronchial asthma	4	6.6%
Rhinosinusitis	3	4.9%
None	20	32.7%

The presenting signs in order of frequency were tenderness over the mastoid in 95.1%, retroauricular swelling in 82%, protrusion of the auricle in 82%, redness over the mastoid in 77%, purulent ear discharge in 71%, fluctuant retroauricular swelling in 67%, Sagging of the posterior canal in 47.5%, positive reservoir sign in 36.1%, enlarged CLN in 23%, granulation tissue in the external auditory canal in 15%, discharging mastoid sinus in 6.6%, unilateral LMN facial nerve palsy in 4.9% and 3.3% presented with localizing neurological signs (Table 7).

The tympanic membrane showed pathological features in all patients. Central perforation is present in 73.8%, bulging in 21.3%, attic perforation in 3.3% and

Table 5. Cross tabulation between patients with past history of acute otitis media and patients with past history of similar condition among the study group (n = 61).

		Past history of recurrent AOM		Total
		Yes	No	
Past history of similar condition	Yes	5	0	5
	No	27	29	56

Table 6. Shows vital signs at presentation among the study group (n = 61).

Vital signs	Minimum	Maximum	Mean	Std. deviation
Temperature	37.00˚C	39.00˚C	37.7525	0.6454
Pulse	80 b/m	120	96.93	10.672
Respiratory rate	13 c/m	32	20.82	4.577

Table 7. Distribution of examination findings among the study group (n = 61).

Signs	Frequency (n = 61)	Percent
Tenderness over the mastoid	58	95.1%
Retroauricular swelling	50	82%
Protrusion of the auricle	50	82%
Redness over the mastoid	47	77%
Purulent ear discharge	43	71%
Fluctuant retroauricular swelling	41	67%
Sagging of the post canal wall	29	48%
Positive reservoir sign	22	36%
Enlarged CLN	14	23%
Granulation in EC	9	15%
Mastoid discharging sinus	4	7%
FN palsy	3	5%
Localizing neurological signs	2	3.3%

retracted tympanic membrane in only 1.6% (Figure 2).

Investigations at presentation showed white blood cell count with a mean of 15.1 × 10^3 cell/mm^3, hemoglobin with a mean of 10.7 mg/dl and ESR with a mean of 63.39 mm/hr (Table 8).

CT scan was done to 31 patients (50.8%), it showed mastoid cortex erosion and subcutaneous abcess in 48.4% (n = 31), lost mastoid bony trabeculae and intact cortex in 22.6%, middle ear cleft opacity with intact bony trabeculae and intact ossicles in 16.1%, mastoid opacity and eroded ossicles in 6.45% (Table 9).

Two scans (6.5%) showed evidence of intracranial extension and MRI was obtained for them and it showed cerebellar abscess in one case and temporal lobe abscess in the other.

Forty-six patients (75.4%) had complications with mastoiditis at presentation, 67.2% presented with subperiosteal abscess, 6.6% with a discharging mastoid sinus, 4.9% presented with facial nerve palsy and 3.3% presented with brain abscess (Table 10).

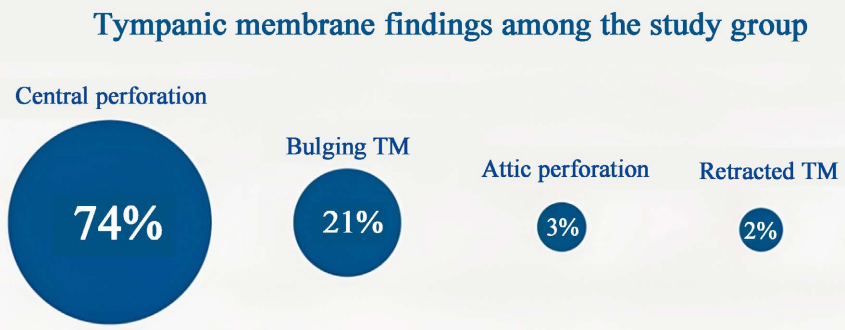

Figure 2. Shows the tympanic membrane findings among the study group (n = 61).

Table 8. Investigations results at presentation among the study group (n = 61).

Investigation	N	Minimum	Maximum	Mean	Std. deviation
Hemoglobin	61	6.10	13.50	10.6836	1.82247
White blood cell count	61	6.10	22.00	15.1230	3.46273
Erythrocyte sedimentation rate	61	5	120	63.39	26.349

Table 9. Computed tomography findings in the study group (n = 31).

CT scan findings	Frequency (n = 31)	Percent
Middle ear and mastoid opacity, intact bony trabeculae and ossicles	5	16.1%
Lost trabeculae and preserved ossicles	7	22.6%
Eroded ossicles	2	6.45%
Cortex erosion and subcutaneous extension	15	48.4%
Intracranial extension	2	6.45%

Thirteen patients presented with uncomplicated acute mastoidits was initially started on injectable antibiotics alone; 4 patients developed subperiosteal abscess during their hospital stay and needed incision and drainage, 3 patients didn't improve after 48 hours of admission, one of them managed with maryngotomyinadition to antibiotics and 2 patients with evidence of coalescent mastoiditis on CT scan images required further cortical mastoidectomy. Only 6 patients (46%) (n = 13) was treated successfully with conservative treatment alone (Table 11).

Fifty-three patients (86.9%) underwent surgical management (Table 12), 46 of them (86.8%) (n = 53) underwent abscess incision and drainage and 34 of them (73.9%) (n = 46) were successfully managed. 12 patients (26.1%) (n = 46) required mastoidectomy after initial abscess drainage. Six patients (11.3%) underwent mastoidectomy as the initial management modality and all of them were successfully managed (Table 12). Only one patient (1.9%) underwent myrigotomy

Table 10. Frequency of patients presenting with complications of acute mastoiditis and AOM among the study group.

Complications			Frequency	Percent (n = 61)
Subperiostel abscess	With discharging mastoid sinus	4	41	67.2%
	Without discharging mastoid sinus	37		
Facial nerve palsy			3	4.9%
Intracranial extention	Temporal lobe abscess	1	2	3.3%
	Cerebellar abscess	1		

Table 11. The percentage of cure rate in different treatment modalities in acute mastoiditisamong the study group.

Modality of treatment	Cured	Failed	Percentage of cure rate
Medical only (n = 13)	6	7	46% (n = 13)
Maryngotomy (n = 1)	1	0	100% (n = 1)
Abscess incision and drainage (n = 46)	34	12	73.9% (n = 46)
Mastoidectomy (n = 18)	18	0	100% (n = 18)

Table 12. Surgical management modalities in acute mastoiditis patients in the study group (n = 53).

Surgical management	Frequency (n = 53)	Percent
Abscess incision and drainage only	34	64.2%
Mastoidectomy only	6	11.3%
Abscess drainage followed by mastoidectomy	12	22.6%
Myringotomy	1	1.9%
Total	53	100%

Table 13. Outcome of acute mastoiditis in the study group (n = 61).

Outcome	Frequency	Percent
Died	1	1.6%
Referred	1	1.6%
Improved and discharged	59	96.8%
Total	61	100.0%

Table 14. Relation between modality of treatment and duration of hospital stay in successfully managed patients of acute mastoiditis among the study group (n = 59).

Modality of treatment	Mean duration of hospital stay in days	Std. deviation
Medical only (n = 6)	5.33	1.366
Abscess drainage (n = 34)	5.44	2.191
Mastoidectomy (n = 18)	12.39	4.089
Myrigotomy (n = 1)	3	-
Total (n = 59)	7.52	4.373

without ventilation tube insertion.

Fifty-nine patients (96.8%) improved and discharged from the hospital in good condition, 1.6% referred to neurosurgical unit for drainage of intracranial abscess. 1.6% initially presented with cerebellar abscess died on the second day of admission (Table 13).

Duration of hospital stay ranged from 2 and 21 days with a mean of 7.5 days, 12.4 days for the mastoidectomy patients, 5.4 days for patients managed with abscess incision and drainage in addition to medical treatment and 5.3 days for patients treated with injectable antibiotic (Table 14).

4. Discussion

This study found that the median age is 5 years and that's closely related but slightly higher than Tawfik *et al.* [7], Marchisio *et al.* [8] and Garcia *et al.*'s [9] studies (4.9, 4, 3.8 years respectively) which included only pediatric population.

Males were found to be affected in 57.4% of the cases with a male to female ratio of 1.35:1, thisresult is closely related to Thompson *et al.*'s [10] study who report that 57.6% of the cases were males. These results ware in favor with studies done in Eastern Denmark [11], Sweden [12], France [13], Italy [8], Greece [14], Israel [15] [16] [17] and Tunisia [18]; in which the male affection is slightly more than females. This may be due to the higher incidence of AOM in males as well as more recurrent episodes than females reported in some studies [1].

The most common presenting symptoms in this study were otalgia, post-auricular swelling and fever in 83.3%, 83.3% and 63.9% respectively; and this is closely similar to the study done in Helsinki university central hospital [19] with similar number

of cases (88%, 66% and 71% respectively), however, they report ear discharge in only 43% which is very low compared to our result of 83.3% of ear discharge which indicate that AM in our study occur mostly in the resolution phase of AOM. The mean of the duration of middle ear symptoms prior to admission was 9.6 days which is closely related to Laulajainen *et al.*'s study [19] who report 9.7 days but significantly longer than many other studies; in Luntz *et al.*'s [15] study, it was 6.9 days; in attlmyer B. *et al.* [20], it was 5.1 days, 6.1 days in Psarmommatis *et al.* [14] and 5 days according to Tamir *et al.* [21]. This indicates a much delayed presentation in our patients after the onset of the symptoms.

The mean temperature at presentation was 37.7˚C which is slightly lower than Luntz *et al.* [15] study which was 38.1˚C. This could be attributed to the shorter duration of symptoms prior to admission in that study compared to ours (6.2 days vs. 9.6 days).

The most consistent presenting sign was tenderness over the mastoid in 95.1% followed by protrusion of the auricle in 82% and redness over the mastoid in 77%. These findings were consistent with other studies with slight variations; in Marom *et al.* [22] tenderness and eryhtema of the post-auricular region was found in 83% and protrusion of the auricle in 89%. In Abid *et al.* [18], all children had some evidence of post-auricular inflammation (redness and/or swelling and/or tenderness) and most of them presented with auricular protrusion (84%).

All the patients in this study had abnormal tympanic membranes with perforations noted in 77.1% of them where as in other studies pathological redness and bulging but intact tympanic membranes was the most common finding. In Luntz *et al.* [15], Abid *et al.* [18] and Marom *et al.* [22], bulging of the tympanic membrane was found in 97%, 90.6% and 65% respectively. It was only found in 21.3% of our study group. This indicates a much advanced disease at presentation compared to other studies.

CT scan was obtained to 50.8% of our study group and the indications were suspicion of complications, failure to improve on medical treatment and planning for mastoidectomy. Of those scanned, 83.9% showed coalescent mastoiditis with further evidence of intracranial extension in only 6.5%. CT scans were obtained in 68% on average in literature ranging from 3% - 100% according to Van den Aardweg *et al.*'s [3] systematic review and our results fall in that range, however, the imaging was not routinely designed to assess both for mastoid coalescence and intracranial complications initially and that could explain the lower rate of intracranial complicalions in our study in patients with coalescent mastoiditis compared to Zevallos *et al.*'s [23] study findings (7.7% vs. 29.3%).

Forty-six patients (75.4%) had complications with mastoiditis at presentation this is related to 68.8% in the study of Abid *et al.* [18] in Tunisia, but its far more than only 22% of patients in Luntz *et al.*'s [15] study, 14.8% in Albaraznji *et al.*'s study [24] and 7.2% in Marchisio *et al.*'s [8] study. Subperiosteal abscess was the most prevalent in our study, in Abid *et al.* [18] and in Luntz *et al.*'s [15] study as well 67.2%, 59.4% and 16.6% respectively, 4.9% presented with facial nerve palsy compared to 1.5% in Luntz *et al.*'s [15] study and 2 patients (3.3%) presented with

brain abscess compared to 7.2% in Luntz *et al.*'s [15] study.

Medical treatment only was given initially to 13 patients (21.3%) (n = 61) none of them presented with complication; it was successful in managing 6 patients (46%) (n = 13). Abscess incision and drainage was needed in 46 patients (75.4%) (n = 61) and was successful in the management of 34 patients (73.9%) (n = 46). Eighteen patients (29.5%) (n = 61) needed mastoidectomy and all of them were treated successfully (100%). This is in comparison to the systemic review conducted by Anne *et al.* [25] which found that the mean cure rate with intravenous antibiotics alone to be 71.7%, subperiosteal abscess incision and drainage in addition to maryngotomy achieved 94% cure rate and mastoidectomy 100% cure rate.

In Abid *et al.*'s [18] study, where 10 patients were managed with medical treatment only; 9 of them (90%) successfully and one needed mastoidectomy, subperiosteal abscess and drainage was the initial management in 11 patients with a success rate of 63.6% and in Aziz and El-Hoshy's [26] study in Cairo university hospital, 5 patients initiated on ceftriaxone injection only were successfully treated (100%), all patients in their study who presented with subperiosteal abscess were managed with mastoidectomy and myrigotomy. In these studies, the authors found that initial medical treatment with empiric antibiotics is a sound option. In this study, the results indicate a low success rate of medical treatment alone in uncomplicated cases and we conclude that if medical treatment with empiric antibiotics is initiated; patients should be closely monitored and complications and failure of management be anticipated with an aversion to abscess incision and drainage and/or mastoidectomy when needed.

The mean duration of hospital stay in this study was 7.5 days, that's comparable to In Marchisio's study [8] mean of 7.1 days, Oestriecher-Kadem *et al.*'s [27] study result of 8.3 days and 8.5 days in Albaraznji *et al.* [24].

5. Conclusion

Patients present to the hospital after a prolonged period with a higher rate of complications, and the delayed presentation increased significantly in patients who received oral antibiotics prior to admission. Conservative medical treatment in non-complicated acute mastoiditis was ineffective in more than half of the patients and abscess incision and drainage and/or mastoidectomy are often necessary for the management.

Limitations of the Study

The limitations of the study include the national data base for acute mastoiditis, making it difficult to determine the true prevalence of the disease. Additionally, the socioeconomic limitations of many patients prevented follow-up visits, as they were referred to Khartoum Ear, Nose and Throat Hospital from different regions in the country. This limited the ability to track the complete clinical course of acute mastoiditis, making it a challenge to gather comprehensive data on the disease.

Acknowledgements

We gratefully acknowledge all teachers in this training program for their precious knowledge and teaching.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Data collection sheet

Acute Mastoiditis Clinical Course and Management in Patients Presented to Khartoum ENT Hospital

General Information

Name: _____

Gender: Male ( ) Female ( ) Age: ( )

Occupation: _____

Residence: Urban ( ) Rural ( )

Contact number: _____

Informer: _____

Date: _____

Clinical Information: Write √ between the brackets site: Right side ( ) Left side ( ) Bilateral ( )

Duration _____

Presenting Symptoms

Ear pain ( ) Ear discharge ( ) Hearing impairment ( ) Vertigo ( ) Tinnitus ( )

Post-auricular swelling ( ) Nasal blockage ( ) Nasal discharge ( ) Sore throat ( )

Cough ( ) Shortness of breathing ( ) Fever ( ) Malaise ( )

Headache ( ) Decreased appetite/refusal of feeding ( ) Mouth deviation ( ) Diplopia ( )

Deteriorated consciousness ( ) Neck stiffness ( )

_____

_____

Past History

Past history of similar condition ( ) History of recurrent AOM ( ) Number of attacks of AOM ( )

History of immune compromise ( ) History of asthma ( ) History of DM ( )

History of Rhinosinusitis ( )

Family History

Family history of similar condition ( ) Family history of recurrent AOM ( )

Family history of bronchial asthma ( ) Family history of rhinosinusitis ( )

Drug History

Past Drug History 1_____ 2_____ 3_____

Current Medications 1_____ 2_____ 3_____

Clinical Examination

General Examination

Looks well ( ) Looks unwell ( ) Vital signs: temp ( ) Pulse () RR ( ) BP ( )

Nasal discharge ( ) Nasal polyp ( ) Inflamed pharynx ( )

Hypertrophied tonsils ( ) Postnasal dripping ( )

Enlarged cervical lymph nodes ( ) Neck rigidity ( ) Localizing neurological signs ( )

Other: _____

_____

Local Examination

Retro auricular Swelling ( ) Protrusion of the auricle ( ) Redness in the mastoid area ( )

Tenderness over the mastoid ( ) Fluctuant retroauricular swelling ( ) Mastoid discharging sinus ( )

Affected Facial nerve ( )

Otoscopic Examination

Ear Canal: Sagging of posterior canal wall ( ) Purulent discharge ( )

Tympanic Membrane: Intact normal ( ) Bulging ( ) Retracted ( )

Perforated tympanic membrane ( ): Central perforation ( )

Attic perforation ( ) Positive reservoir sign: ( )

Granulation tissue in the external canal and/or middle ear ( ) Cholestiatoma ( )

Hospital Management

Investigations

Laboratory:

CBC ( )

ESR ( )

Radiology:

CT SCAN done ( )

Findings

MRI done ( )

Findings

Treatment Medical:

Surgical

Abcess drainage ( ) If yes: Initial management ( ) Following initial medical management ( )

Maryngotomy: ( ) If yes: Without ventilation tube ( ) With ventilation tube ( )

Mastoidectomy( ) If yes: Initial management ( ) Following initial medical management ( )

Following abscess incision and drainage ( )

Outcome

Improved and discharged ( ) Referred ( ) If yes: Reason for refer _____

In hospital complications: No ( ) Yes ( )

If yes: Extracranial complications ( )

Intracranial complications ( )

Died ( ) If yes: Cause of death_____

Duration of hospital stay ( )