

Bacteriology of Antral Effluents and their Sensitivities at IKOT EKPENE and Calabar, South-South Nigeria

Dr. Robert B. Mgbe

Ear Nose and, Throat Department
University of Calabar Teaching Hospital, Calabar

Dr. Mbora E. Offiong

Ear Nose and Throat Department
University of Calabar Teaching Hospital, Calabar

Dr. Abiola Grace Adekanye

Ear Nose and Throat Department
University of Calabar Teaching Hospital, Calabar

Dr. Ubleni Emanghe

Department Of Medical microbiology, University of Calabar, Calabar.

ABSTRACT

Sinusitis is a common infection all over the world. It occurs very often together with rhinitis and the term rhinosinusitis is used interchangeably with sinusitis. It is usually triggered by viral inflammation of the sinuses which is later followed by bacterial infection. **Objective:** The aim of this study is to find out the microbial distribution in antral sinus effluents in calabar and Ikot ekpene and to determine their sensitivity pattern. **Method:** Patients with symptoms like headache, cacosmia, purulent nasal discharge and confirmed radiological evidence of sinusitis had antral washout done on one or both sides. The effluent was collected and immediately sent to the microbiology lab for microscopy, culture and sensitivity. **Results:** Forty eight patients were used for the study during a nineteen year period; year 2000- 2019. There were 30 males and 18 females with a male:female ratio of 1.6:1. The age range was 10-70 years with a mean age of 40 years. The distribution of microbes seen was as follows; Staphylococcus species(29.1%), Streptococcus species(18.7%), Coliforms (16.7%), Heamophilus, Proteus, Bramharella and Pseudomanas (4.2%) each, Candida (2.0%) and no growth in(16.7%). Ofloxacin, ciprofloxacin, gentamicin, ceftriaxone and augmentin had good sensitivity to the microbes while chloramphenicol and ampicillin had very low sensitivity. **Conclusion:** Rhinosinusitis occurs more in adults. Staphylococcus streptococcus and coliforms are the dominant species in our environment. Ofloxacin, ciprofloxacin, ceftriaxone and augmentin are the antibiotics with the highest sensitivity.

Keywords: Antral effluents, Bacteriology, Antimicrobial sensitivity

INTRODUCTION

The paranasal air sinuses, maxillary, frontal, sphenoid and ethmoid sinuses are air filled cavities within the facial /skull bones having a common origin with the nose and sharing the same type of epithelium ¹ They open into recesses on the lateral nasal wall called meatuses. Blockage of these drainage channels or even local disease of the nose or sinus predispose the sinus to diseases like inflammation, polyps, etc. Sinusitis is an inflammation of the mucous membrane of the sinuses. Rhinosinusitis is a more exact term.^{2,3} Sinusitis is usually triggered by a viral upper respiratory tract infection with only about 2% cases being complicated by bacterial sinusitis.^{4,5} Inflammation, stasis and secretion within the sinus cavity will eventually lead to bacterial or fungal infection manifesting as fluid or pus in the sinus and clinically as pains around the face, eyes, forehead cheeks and sometimes, headache. Sinusitis is the sixth most common diagnosis for which antibiotics are prescribed.⁶ The maxillary sinus is the most commonly affected in sinusitis and it is the site of antral washouts. This study tries to identify the common organisms causing sinusitis in our region and the sensitivity pattern seen over the last two decades.

METHOD

This is a retrospective study of the microbiology of antral effluents from specialist ENT clinics at Ikot Ekpene, Akwa Ibom state and the University of Calabar Teaching Hospital, Calabar Nigeria. The duration of study was 19 years, between January 2000 to Dec 2019. Clinical diagnosis of Sinusitis was based on symptoms including frequent rhinorrhoea, pains around the face, headache, cacosmia, purulent nasal discharge and examination findings including tenderness on percussion over the sinuses and radiological evidence of opacity or fluid level in the sinus. Where sinusitis was confirmed, unilateral or bilateral antral puncture was done and sinus aspirate taken before washout. All patients for this study must have kept away from any antibiotic at least three months before samples were obtained from them.

Antral puncture was done in the clinic under local anaesthesia – 2% xylocaine in 1/100000 adrenalin. A trocar and canula was used to puncture the maxillary sinus at the level of the genu of inferior concha. As the puncture is achieved the trocar is withdrawn while a sterile 5ml syringe is attached to the trocar and the plunger pulled to aspirate fluid or pus in the antrum. Whatever effluent found is collected with two multitipped swabs and immediately transferred to an agar transport medium and sent to the microbiology lab for microscopy culture and sensitivity. They were inoculated in Mc conkey oxoid and cholate oxoid culture media plates. Incubation in air at 35-37degrees centigrade was done for the Mc conkey inoculated plates while specimens inoculated in cholate agar were incubated in a CO2 enriched atmosphere at the same temperature of 35-37 degrees centigrade. Following 24 hours growth, isolates were gram stained and further identified according to the standard microbiological methods. All pure isolates were subjected to antimicrobial susceptibility testing of commonly available antibiotics. Susceptibility testing was done according to the modified Kirby Bauer method (CLSI) performance standard for antimicrobial sensitivity testing; Seventeenth informational supplement M/100-S17 (vol 27 No 1).

According to availability at the time, the following antimicrobial discs were used; Chloramphenicol 10ug, Ampicillin 25ug, Erythromycin 10ug, Gentamycin 10ug, Streptomycin 10ug, Ofloxacin 10ug, Ciprofloxacin 10ug, Augmentin 10ug, Ceftriaxone 10ug, on Muever hinton agar. Growth zones or inhibitors after 18 -24 hours incubation appropriate to each

pathogen were measured and compared with the break point for the particular antibiotic agent. The breakpoints of the pathogens were determined and categorized as susceptible, intermediate or resistant. Anaerobic culture was not carried out on the specimens due to lack of facilities.

Data were collected and expressed in the form of tables and charts.

RESULTS

A total of 48 patients were included in this study. They were 25 males and 23 females with a male to female ratio of 1.6:1. Age range was 10-70 years with a mean of 42 years. All 48 patients had either one sided or bilateral antral washouts done. Distribution of bacterial agents cultured was as follows; Staphylococcus species 14(29.1%), Streptococcus species(18.7%), Coliform 8(16.7%), No growth 8(16.7%) Haemophilus, Proteus, Bramharella and Pseudomonas, 2 each ((4.16%), Candida 1 (2%). See figure 1.

Table 1: Bacterial distribution of microbes

S.No	BACTERIA TYPE	NO	PERCENTAGE
1	Staphylococcus	14	29.1%
2	Streptococcus	9	18.7%
3	Coliforms	8	16.7%
4	No growth	8	16.7%
5	Proteus	2	4.2%
6	haemophilus	2	4.2%
7	Pseudomonas	2	4.2%
8	Bramharella	2	4.2%
9	Candida	1	2.0%

Table 3: Age and sex distribution of chronic sinusitis patients

Age (yrs)	1-10	11-20	21-30	31-40	41-50	51-60	61-70	Total
M	1	6	4	6	3	3	2	25
F	-	2	4	11	2	2	2	23
Total	1	8	8	17	5	5	4	48
%	2.08	16.67	16.67	35.41	10.42	10.42	8.33	100

Table 4. Distribution of antimicrobial sensitivity pattern.

Drug	Number (N)	High sensitivity	%	Medium sensitivity	%
Genticin	19	15	79	4	21
Streptomycin	10	4	40	4	40
Ofloxacin	16	16	100	1	10
Erythromycin	8	5	62.5	3	37
Chloramphenicol	8	2	25	3	37
Augmentin	5	4	80	2	40
Ciprofloxacin	15	14	93	2	13
Ceftriaxone	6	5	83	2	33

DISCUSSION

Sinusitis is said to be commoner in females but that has not been our experience; we had a slight male preponderance which is different from two studies done by Ologe et al and Maleshetti et al **3,6** but agrees with another study which had a male preponderance⁷ The difference maybe attributed to different settings and environments used for the study. Sinusitis occurs more in adults than in the children and the elderly. Our Peak age was 31-40years. This is different from the peak incidence for other studies **6,7**. One patient was ten years old. Our age range approximates to the age range used by Al madrassi in his study.

There has been a somewhat steady decrease in the cases of purulent sinusitis seen in specialist ORL clinics over the last two decades in our study region in Nigeria. This may be due to availability/ abuse of antibiotics. Chronic sinusitis is a common disease worldwide but presentation to specialist facilities has been on the decline over the decades again due to the wide spread use /misuse of antibiotics. **3,8,9**. The microbiology of sinusitis is affected by previous antimicrobial therapy, vaccinations and presence of normal flora.**10**

In our review, only aerobic bacterial microbes were isolated. Anaerobes were not cultured due to lack of facilities. even though aerobes and anaerobes may co-exist in the antrum **10,11**.

Samples for culture in our review were direct aspirates from the antrum as is the standard practice.**2,4** Staphylococcus was the most prevalent organism followed by streptococcus species. Similar findings were reported in Nigeria. **3,8**.

It appears that over time, the bacteriology of antral effluents has changed from a staphylococcus and streptococcus dominated culture to include other microbes. These two microbes have attracted a lot of interest and new antibiotics focused on them which may account for the reduction in their numbers. According to Karina et al, there is no consistent data for chronic sinusitis; the variability of results from different studies may be due to the different techniques used as collection method. **12** Other studies too have shown staphylococcus to be the leading pathogen in sinusitis **3,8,13 14**.

Some workers have suggested that the Caldwell luc approach maybe the best for treating sinusitis in case of displaced teeth.**15**. In this study, after ensuring that antral washout was done four weeks from the last ingestion of any antibiotics, a number of the samples cultured yielded no bacterial growth. Other workers also had samples with no growth in their studies. **8,10,11**.

Isolates in this study over the decades were susceptible to ofloxacin, ciprofloxacin, gentamicin, ceftriaxone, augmentin while chloramphenicol and penicillin were the least effective. This study suggests that ciprofloxacin would be the drug of choice for antimicrobial treatment in adults. In children, we may use Augmentin, gentamicin, ceftriaxone as other drugs like colistin and ofloxacin may be harmful to them. Axelsson et al argue that Occurrence of sinusitis locally and world wide is decreasing due to the use of **antibiotics**.**11**

Candida albicans was isolated only in one patient over the two decades. This rare occurrence agrees with other studies by Karina et al. In an assessment of 62 patients that underwent FESS for chronic rhinosinusitis they had one case of fungus growth. Fungal sinusitis is rare and often associated with immune deficiency states like HIV, Pulmonary tuberculosis, diabetes, etc **12**

Conclusion: Chronic purulent sinusitis is more a disease of adults than children and the elderly. Over the decades, *Staphylococcus* and *Streptococcus* species were the dominant causative organisms in our region; The Occurrence of sinusitis locally and world-wide is decreasing. Assessment of the bacterial isolates of sinus disease over a period of time and knowledge of the sensitivity pattern can be a basis for empirical treatment which will suffice in cases where microscopy, culture and sensitivity is not available.

References

- [1]. Dhingra P L Diseases Of Ear Nose And Throat, 2007 Vol 8, 4th edition; Elsevier Publishers Ltd.51.
- [2]. Bruce A: Sinusitis And Antibiotics: The Lancet, Infectious Diseases. 2012;12(5):355
- [3]. Ologe F E, Nwabuisi C. Bacteriology Of Chronic Sinusitis In Ilorin, Nigeria' *African Journal Of Clinical And Experimental Microbiology*. 2003; 4(2):1595-689
- [4]. Ah Se K W, Evans A.: Sinusitis And Its Management: 2007. *BMJ*: 17 334(7589): 358-361 doi 10.1136/bmj 39092.679-722BE.
- [5]. Schied D. C; Hamm R. M Acute Bacterial Rhinosinusitis In Adults, Part 1: 2004 *American Family Physician* 1:70(9) 1685-1692.
- [6]. Maleshetti S, Halve A, Karembelker R . Bacteriology Of And Antibiotic Treatment Of Maxillary Sinusitis; A Prospective Study: *International Journal Of Otolaryngology Head/Neck Surgery*. 2017; 3(4)2454-5929 Doi:<http://dx.doi.org/10.18203/issn 2454-5929.ijohns.20174318>
- [7]. Madrassi A, Mathlouthi N, MbarEK H, Halouani C, Mezi S, Zogoli C, Chebbi G, Mhamed R B, Akkari K, Benzarti S: Complicated Sinusitis In Children; 18 Cases Report: *world j othorhinolaryngol* 2015;5(1): 30-36 doi10.5319/wjo15.11.30.
- [8]. Aneke E C, Ezeanolue B C. Profile Of Aerobic Bacteria Isolated In Chronic Maxillary Sinusitis Patients. *Niger Post Grad Med J*. 2004;11 (12): 116-20
- [9]. Derekoy F S, Aktas D, Buyukbasuta A, Ozurt M, Mekerzt T O T. Bacteriology Of Antrum In Chronic Maxillary Sinusitis 1999; 6(3)
- [10]. Brook I: Microbiology of acute and Chronic Maxillary Sinusitis. *Laryngoscope*. 2005; 115:824.
- [11]. Axelsson A, Brorson J E. The Correlation Between Findings In The Nose And Maxillary Sinus In Acute Maxillary Sinusitis; *Laryngoscope* 1973; 83(12): 2003-2011
- [12]. Karina M, Andreia A B, Ricardo G T, Edwin T, Roberto M, Wilma T A. Maxillary Sinus Microbiology From Patients With Chronic Rhinosinusitis *Braz J Otolaryngol* 2010;76(5): 548-51
- [13]. Barshak M B, Durand M L: The Role Of Infection And Antibiotics In Chronic Rhinosinusitis: *Laryngoscope, Investigative Otolaryngology* 2017 ; 23(2): e25536 ./<https://doi.org/10.1002/1102.61>.

- [14]. Hartog B, Degener J E, Vanbenthen P P, Hordik G K. Microbiology Of Chronic Maxillary Sinusitis In Adults. Isolated Aerobic And Anaerobic Bacteria And Their Susceptibility to 20 Antibiotics. *Acta Otolaryngol* 1995; 115(5):627-7
- [15]. Akhlagi F, Esmaeelinejad M, Safai P: Aetiologies And Treatments Of Odontogenic Maxillary Sinusitis: A Systemic Review: *Iranian Red Crescent Med J* 2015; 17(12):e25536doi:1058/ircmj:25536
- [16]. Su W Y, Liu C, Hung S Y, Tsai W F. Bacteriological Study Of Chronic Maxillary Sinusitis. *Laryngoscope* 1983;93(7): 931-4