

Original Article

# Prevalence and Bacteriology of Tonsillitis among Patients attending Otorhinolaryngology Department at Muhimbili National Hospital, Dar es Salaam-Tanzania

\*Zephania Saitabau Abraham<sup>1</sup>, Jane Bazilio<sup>2</sup>, Aveline Aloyce Kahinga<sup>3</sup>,  
Joel Manyahi<sup>4</sup> Daudi Ntunaguzi<sup>3</sup>, Enica Richard Massawe<sup>3</sup>

<sup>1</sup> Department of Surgery, University of Dodoma-College of Health and Allied Sciences, Tanzania

<sup>2</sup> Department of Otorhinolaryngology-Tumbi Regional Referral Hospital, Tanzania

<sup>3</sup> Department of Otorhinolaryngology-Muhimbili University of Health and Allied Sciences, Dar es Salaam-Tanzania

<sup>4</sup> Department of Microbiology and Immunology- Muhimbili University of Health and Allied Sciences, Dar es Salaam-Tanzania

## ABSTRACT

**Background:** Tonsillitis is a common infectious disease contributing to significant social-economic impact worldwide. Like other infectious diseases, the determination of the pathogenic agents is important in antibiotic selection for the medical treatment of tonsillitis. Data on bacteriology of tonsillitis in Tanzania is scarce. The aim of this study was thus to determine the prevalence and bacteriology of tonsillitis in one of the largest tertiary hospital in Tanzania.

**Methods:** Descriptive cross-sectional study was conducted involving 485 patients at Muhimbili National Hospital, from June to December 2016. Data was collected using specially designed questionnaires. Laboratory isolation of bacterial pathogens implicated in tonsillitis followed by consequent antimicrobial susceptibility testing was done at the Country's largest laboratory. Gathered data was then analyzed using the SPSS program version 20.

**Results:** A total of 485 patients were recruited in the study, where majority were females (55.7%) and the mean age was found to be 27.7 years. Out of 485 patients 100(20.6%) had tonsillitis. Male preponderance was found (51%). The most affected age group was 1-10years (42.6%).

Nearly 25% of patients had family history of tonsillitis with siblings being commonly affected. The isolated bacteria were Coagulase negative staphylococcus 41.7%, *S. pyogenes* 40%, *Bacillus* species 8.3%, *K.pneumoniae* 5.8%, *E.Coli* 2.5% and *P.aeruginosa* 1.7%. *S.pyogenes* was susceptible to Ceftriaxone 95.7%; Azithromycin 93.6%; Doxycycline 91.5%; Clindamycin 87.2%; Ampicillin 80.9%; Erythromycin 74.5%; Amoxiclav 59.6% and resistant to penicillin G(38.3%).

**Conclusion:** Tonsillitis was found to be prevalent in our setting with young individuals being most commonly affected. Male preponderance was found in this study and family history of tonsillitis was depicted in nearly 25% of patients.

## Corresponding Author:

Zephania Saitabau Abraham  
Department of Surgery, University of Dodoma-  
College of Health and Allied Sciences,  
Box 259, Dodoma-Tanzania

**Key words:** Prevalence, Tonsillitis, Bacteriology, Otorhinolaryngology, Tanzania

Majority had recurrent tonsillitis and *S. pyogenes* was found to be the commonest isolated pathogenic bacterium and was susceptible to most of the drugs available in our setting though it was found to be resistant to penicillin G.

## INTRODUCTION

Tonsillitis refers to inflammation of the pharyngeal tonsils and most often occurs in children. Though rare in those less than 2 years of age; Tonsillitis caused by Streptococcus species typically occurs in children aged 5-15 years, while viral tonsillitis is more common in younger children.<sup>1</sup>

The oropharynx and Waldeyertonsillar ring are normally colonized by many different species of aerobic and anaerobic bacteria, including *Staphylococcus*, non-hemolytic Streptococci, *Lactobacillus*, *Bacteroides*, and *Actinomyces*. Oropharyngeal cultures obtained during the infection are not always useful in distinguishing the offending pathogen as they often yield multiple organisms, reflecting the normal flora of the oral mucosainpolymicrobial infections beta-lactamase producing organisms can protect Group A streptococci from eradication with penicillins.<sup>2</sup>

The tonsils are inductive sites for humoral and cell-mediated immune responses. They produce antibodies locally as well as B cells, which migrate to other sites around the pharynx and periglandular lymphoid tissues to produce antibodies. In contrast to lymph nodes, the tonsils have no afferent lymphatics; therefore, their specialized epithelium plays an important role in antigen presentation and processing.<sup>3,4,5,6,7</sup>

The prevalence of bacterial tonsillitis, specifically group A beta-haemolytic streptococci (GABHS), is 15% to 30% of children with sore throat and 5% to 15% of adults with sore throat. Acute tonsillitis is most commonly seen in winter and early spring in temperate climates, although it may occur at any time of the year.<sup>1,10</sup>

Tonsillitis has significant impact on health status and quality of life as it causes significant morbidity and time lost for school or work. There is paucity of data on tonsillitis in Tanzania and thus posing challenge in development of evidence based intervention for management of tonsillitis in our country. The aim of this study was thus to address the existing gap.

## METHODS

### Study design and participants

This was a hospital based, descriptive cross-sectional study and it was carried out between June and December 2016. The study recruited 485 patients who came to seek treatment at the Department of Otorhinolaryngology (ORL) at Muhimbili National Hospital.

### Inclusion criteria

All patients who attended at ORL Clinic and those admitted in ORL wards and consented to participate in the study were included. Those who were not ready to participate though available at the selected sites during data collection were excluded.

### Sampling technique

Convenient sampling technique was employed in recruitment of study participants.

### Data collection techniques

Data was collected from the selected hospital sites by the principal investigator, trained residents and specialists using special designed questionnaires.

All patients with tonsillitis underwent surface tonsillar swab for culture, microscopy and biochemical tests to determine bacterial agent involved and antimicrobial susceptibility was done for pathogenic bacteria.

The specimens were collected aseptically using sterile cotton wool swab stick from both palatine tonsils and transported to the laboratory with the assistance of microbiologist and thereafter, culture, microscopy and biochemical tests were done.

### Laboratory processing of collected tonsillar swabs

Swab specimens were processed and tested at the Microbiology Laboratory at MNH. Culturing for colony characteristics followed by Gram staining and biochemical tests were used to identify pathogenic bacteria. Culture media used were blood agar, MacConkey agar, nutrient agar and fresh blood agar.

Preliminary identification of bacteria was based on the colony characteristics of the organism i.e. colonial morphology, haemolysis on blood agar, changes in the physical appearance of the differential media and enzyme activities of the organisms and Gram staining. Biochemical tests were performed on colonies from the nutrient agar.

### Antimicrobial susceptibility testing

Antimicrobial susceptibility pattern of isolated bacterial pathogens was performed on Muller Hinton Agar by Kirby Bauer disc diffusion method according to the guidelines of the Clinical and Laboratory Standards Institute (CLSI). Susceptibility of *Streptococcus pyogenes* was tested against penicillin G (10unit), ampicillin (10µg), amoxicillin/clavulanate (20/10µg), erythromycin (15µg), clindamycin (2µg), azithromycin (15µg), ceftriaxone (30µg) and doxycycline.

### Data analysis

Data analysis was done using SPSS version 20. Chi-square test or Fishers Exact Test was used to determine the association between independent and dependent variables and p-value of less than 0.05 was considered to be statistically significant.

### Ethical considerations

Study subjects were informed about the study and what it comprises. The informed consent was carefully reviewed with them so as to make an informed decision on whether to participate or not.

For patients younger than 18 years, informed consent was obtained from their parents or

guardians. This study was approved by the Research and Publication Committee of the MUHAS.

## RESULTS

Socio-demographic characteristics of the study population

Out of 485 patients, 55.7% were females and 44.3% were males. Majority of the patients (32%) were from age group 1-10 years (Table 1)

**Table 1: Socio-demographic data of the study population.**

Variable	Socio-demographic data			
Gender	MALE%	FEMALE%	TOTAL	
Age group	1-10	90 (41.9)	65 (24.1)	155 (32)
	11-20	21 (9.8)	33 (12.2)	54 (11.1)
	21-30	30 (13.9)	42 (15.6)	72 (14.8)
	31-40	24 (11.2)	36 (13.3)	60 (12.4)
	41-50	22 (10.2)	44 (16.3)	66 (13.6)
	>50	28 (13.0)	50 (18.5)	78 (16.1)
	TOTAL	215 (44.3)	270 (55.7)	485 (100)

### Prevalence of tonsillitis by age

Out of 485 patients recruited into the study; 100 (20.6%) had tonsillitis, of these 66(42.6%) were aged 1-10 years and 5(6.4%) were above 50 years. (p value=0.000) Age range of patients with tonsillitis was found to be 1-65 years. (Table 2)

**TABLE 2: Prevalence of tonsillitis by age**

AGE GROUP	TONSILLITIS				TOTAL
	YES	%	NO	%	
1-10	66	(42.6)	89	(57.4)	155 (32)
11-20	10	(18.5)	44	(81.5)	54 (11.1)
21-30	7	(9.7)	65	(90.3)	72 (14.8)
31-40	5	(8.3)	55	(91.7)	60 (12.4)
41-50	7	(10.6)	59	(89.4)	66 (13.6)
>50	5	(6.4)	73	(93.6)	78 (16.1)
TOTAL	100	(20.6)	385	(79.4)	485 (100)

**Prevalence of tonsillitis by gender.**

Out of 100 patients with tonsillitis, 51(51%) were males. (p-value was 0.082) (Table 3)

**TABLE 3: Prevalence of tonsillitis by gender.**

TONSILLITIS					
GENDER	YES	%	NO	%	TOTAL
MALE	51	(23.7)	164	(76.3)	215 (44.3)
FEMALE	49	(18.1)	221	(81.9)	270 (55.7)
TOTAL	100	(20.6)	385	(79.4)	485 (100)

**Proportion of family history for tonsillitis among patients with tonsillitis**

Out of 100 patients with tonsillitis, 21(21%) had family history of tonsillitis while 79% had no such family history of tonsillitis. (Table 4)

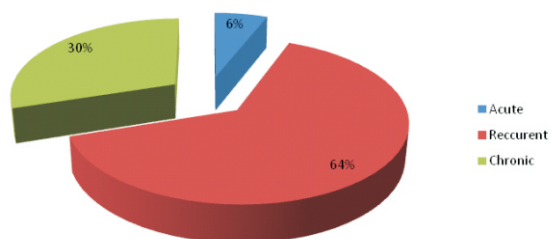
**Table 4: Proportion of Family history for tonsillitis among patient with tonsillitis**

FAMILY HISTORY	N	%
YES	21	21
NO	79	79
TOTAL	100	100

**Clinical classification of tonsillitis**

Among 100 patients with tonsillitis, majority 64(64%) had recurrent tonsillitis, few 6(6%) had acute tonsillitis. (Figure 1)

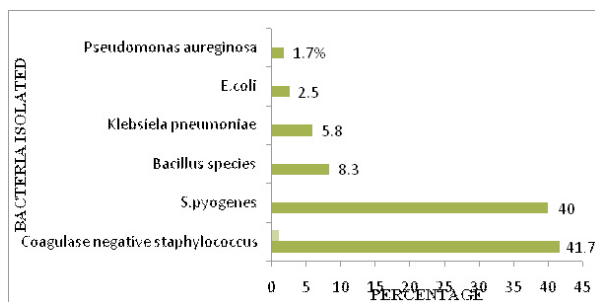
**Figure 1: Clinical classification of tonsillitis**



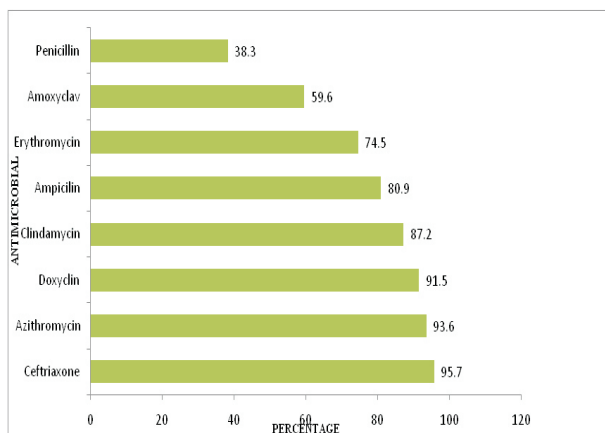
**Frequency distribution of bacteria isolated from patients with tonsillitis**

A total of 120 bacteria were isolated from 100 throat cultures, the most commonly isolated bacteria were coagulase negative Staphylococcus 50(41.7%), Streptococcus pyogenes 48(40%) and Bacillus species 10(8.3%) and the least was E.coli 3(2.5%). (Figure 2)

**Figure 2: Frequency of bacteria isolated from patient with tonsillitis**



**Figure 3: Antimicrobial susceptibility of S.pyogenes**



Majority of Streptococcus pyogenes isolated were sensitive to ceftriaxone (95.7%), Azithromycin (93.6%), doxycycline (91.5%) (Figure 3 above)

## DISCUSSION

The overall prevalence of tonsillitis is not well known in Tanzania. This study revealed the overall prevalence to be 20.6% though it was a hospital based study and this finding is almost similar to other studies done in Bangladesh by Shah *et al* and Karevold *et al* in Oslo Norway which reported the prevalence of tonsillitis to be 19.9% and 21.6% respectively. Findings from this study appear dissimilar to those found by Kvestad *et al* in a Norwegian town and Choudhry in Turkey which found the prevalence of tonsillitis to be 11.7% and 12.1% respectively. Another study done by Hannaford in Scotland reported the prevalence of tonsillitis to be 30.8%. Such differences may be attributed by different geographical distribution of the studied population, study design and sample size. Most of the studies done elsewhere were community based with large sample size compared to this study.

Studies done elsewhere have shown children to have higher incidence of tonsillitis similar to what has been found in this study where the commonly affected age group was 1-10 years and this constituted 42.6% as compared to other age groups. A study which was conducted in Nigeria had similar finding where 15.8% of under-five had pharyngotonsillitis and similarly the study from Scotland found tonsillitis to be common in children as compared to adult.<sup>11,12</sup>

The prevalence of tonsillitis was found to be higher in males (51%) compared to females (49%) in this study. Such finding appears similar to what has been reported by Abdel *et al* (65.3%) and Agrawal *et al* (57.14%) where males had predominance of tonsillitis.<sup>13,14</sup> Findings from these two studies appears dissimilar to what was found by Karevold *et al* and Alasir *et al* where female predominance of tonsillitis was found.<sup>10,15</sup> Similarly, two other studies found female predominance of tonsillitis and these were the study by Kvestad *et al* (14.1% female predominance) and the other from Benin (1.3:1 female to male ratio).<sup>16,17</sup>

The proportion of patients with family history of tonsillitis in this study was 21%, majority were siblings (38.1%) followed by fathers (33.3%). This finding was different from what was observed in a study which was conducted in Russia which reported a 53.3% family history.<sup>18</sup> A study done in Northern England by Denise *et al* also showed 50% of family members had history of tonsillitis and siblings were commonly affected followed by mothers, father and grandparents. The observed differences could be attributed by differences in studied population.<sup>19</sup>

In this study from MNH, 120 bacteria isolates were investigated to determine their types and susceptibility pattern. The most common bacterial isolates were coagulase negative staphylococci 41.7% followed by *Streptococcus pyogenes* 40%, *Bacillus* species 8.3%, *Klebsiella pneumoniae* 5.8%, *E. Coli* 2.5% and *Pseudomonas aureginosa* 1.7%. All these bacteria were found in age group 1-10 years. In acute tonsillitis, majority of causative bacteria isolated were *Streptococcus pyogenes* 5(71.4%) while in recurrent and chronic majority were Coagulase negative *Staphylococcus* 31(41.3%) and 17(44.7%) respectively.

These results differ from other studies done elsewhere where the most common isolated bacteria was *Staphylococcus aureus*.<sup>13,14,15,20,21,22</sup> Another study done in Benin showed *Streptococcus pyogenes* to be the most commonly isolated bacteria.<sup>17</sup> The possible reason for variation in these studies could be attributed to differences in the study population, specimen collection technique and history of the type of antibiotic used.

This study found *S. pyogenes* to be sensitive to ceftriaxone 95.6%, azithromycin 93.6%, doxycycline 91.5%, clindamycin 87.2%, Ampicillin 80.9%, Erythromycin 74.5%, Amoxiclav 59.6% and resistant penicillin V 38.3%. This appears to be in line with studies done elsewhere where the study done by Print *et al* report streptococci pyogenes to be sensitive to ceftriaxone whilst Wilson *et al* also reported *S. pyogenes* to be sensitive to azithromycin and cefuroxime.<sup>17,23</sup>



These results slightly differ from that obtained by Agrawal *et al* who reported Beta haemolytic Streptococci to be 100% sensitive to erythromycin, whilst in our study, 66.67% strains of beta haemolytic streptococci were resistant to cotrimoxazole and cefaclor while 33.33% were resistant to ampicillin and ciprofloxacin.<sup>14</sup> A study done by Babaiwa *et al* in Nigeria showed streptococcus pyogenes to be resistant to amoxicillin, amoxicillin/clavulanic acid and erythromycin to varying degrees.<sup>20</sup> The observed differences may be accounted by inappropriate administration of antimicrobial agents to patients who do not need them. This practice promotes the emergence of resistant pathogens. The frequent inappropriate exposure to antibiotics which is common may possibly explain this observation and to validate this statement majority of patients in this study were exposed to amoxiclav and amoxicillin.

#### **LIMITATIONS OF THE STUDY**

Few number of recruited study participants may limit reliability of the results. The tested drugs are those commonly used in developing countries and thus may not mimic what is applicable in other parts of the world.

#### **CONCLUSION**

The study found tonsillitis to be quite prevalent in our hospital setting and with slight male preponderance. The commonly encountered variant of tonsillitis was recurrent tonsillitis and with the pathogenic bacterium being *Streptococcus pyogenes* and was susceptible to most drugs though resistant to Penicillin G.

#### **LIST OF ABBREVIATIONS**

MNH	-	Muhimbili National Hospital.
MUHAS	-	Muhimbili University of Health and Allied Sciences.
ORL	-	Otorhinolaryngology.
ENT	-	Ears, Nose and Throat
CLSI	-	Clinical and Laboratory Standards Institute

#### **DECLARATIONS**

##### **Ethics approval and consent to participate**

The approval to conduct the study was granted by Ethics and Research Committee for Muhimbili University of Health and Allied Sciences

##### **Consent for publication**

A written informed consent from the study participants/guardians was before recruiting them into this study.

##### **Source of funding**

Dr. Jane Bazilio has devoted her own finance in ensuring completion of data collection.

##### **Availability of data and material**

The detailed reported information can be obtained from the corresponding authors when needed and from archives of the department of otorhinolaryngology-MUHAS

##### **Competing interests**

The authors declare that they have no competing interests

##### **Authors' contributions**

JBand ZSA participated in preparation of the manuscript, study design, data collection and analysis. ER: Participated in design of the study and review of the analyzed study findings. JM participated in design of the study. AAK participated in design of the study and review of the analyzed study findings. DN participated in design of the study.

##### **ACKNOWLEDGEMENTS**

Authors would like to express their gratitude to the Academic staff and ENT surgeons at the Department of Otorhinolaryngology at MUHAS/MNH for their valuable comments during the phase of study design, data collection and compilation of the report, Notable appreciation to members of staff in the

Department of Microbiology-MNH/MUHAS for provision of technical assistance in culturing the collected specimens.

## REFERENCES

1. Pynnonen M, Brinkmeier JV, Thorne MC, Chong LY, Burton MJ. Coblation versus other surgical techniques for tonsillectomy. *The Cochrane Library*. 2017 Jan 1.
2. Veer V. CURRENT DIAGNOSIS & TREATMENT: OTOLARYNGOLOGY HEAD AND NECK SURGERY, 3rd edn. *The Journal of Laryngology & Otology*. 2012;126:974.
3. Olofsson K, Hellström S, Hammarström ML. The surface epithelium of recurrent infected palatine tonsils is rich in  $\gamma\delta$  T cells. *Clinical and experimental immunology*. 1998 Jan;111(1):36.
4. Shirley WP, Woolley AL, Wiatrak BJ. Pharyngitis and adenotonsillar disease. Cummings CW, Flint PW, Haughey BH, et al. *Otolaryngology: Head & Neck Surgery*. 5th ed. Philadelphia, PA. 2010.
5. Gigante J. Tonsillectomy and adenoidectomy. *Pediatr Rev*. 2005 Jun 1;26(6):199-203.
6. Polak ME, Borthwick NJ, Gabriel FG, Jager MJ, Cree IA. Activation of tonsil dendritic cells with immuno-adjuvants. *BMC immunology*. 2008 Dec;9(1):10.
7. Bailey BJ, Johnson JT, Newlands SD, editors. *Head & neck surgery--otolaryngology*. Lippincott Williams & Wilkins; 2006.
8. Schroeder HE, Moreillon MC, Nair PN. Architecture of minor salivary gland duct/lymphoid follicle associations and possible antigen-recognition sites in the monkey *Macaca fascicularis*. *Archives of oral biology*. 1983 Jan 1;28(2):133-43.
9. Shah R, Bahauddin M, Islam MR, Islam MS, Sadlee SM, Kamal M. Chronic Tonsillitis and its Relation with Childhood Asthma. *Age*;245:55.
10. Karevold G, Kvestad E, Nafstad P, Kvaerner KJ. Respiratory infections in schoolchildren: co-morbidity and risk factors. *Archives of disease in childhood*. 2006 May 1;91(5):391-5.
11. Yilgwan CS, John C, Abok II, Okolo SN. Pattern of acute respiratory infections in hospitalized children under five years of age in Jos Nigeria. *Nigerian Journal of Paediatrics*. 2013;40(2):150-3.
12. Hannaford PC, Simpson JA, Bisset AF, Davis A, McKerrow W, Mills R. The prevalence of ear, nose and throat problems in the community: results from a national cross-sectional postal survey in Scotland. *Family practice*. 2005 Mar 16;22(3):227-33.
13. Hammouda M, Abdel-Khalek Z, Awad S, Abdel-Aziz M, Fathy M. Chronic tonsillitis bacteriology in Egyptian children including antimicrobial susceptibility. *Australian Journal of Basic and Applied Sciences*. 2009;3(3):1948-53.
14. Agrawal A, Kumar D, Goyal A, Gupta R, Bhooshan S. Bacteriological evaluation and their antibiotic sensitivity pattern in tonsillitis. *IOSR J Dental Med Sc*. 2014 Mar;13(3):51-.
15. Alasil S, Omar R, Ismail S, Yusof MY, Ameen M. Bacterial identification and antibiotic susceptibility patterns of *Staphylococcus aureus* isolates from patients undergoing tonsillectomy in Malaysian University Hospital. *African Journal of Microbiology Research*. 2011 Nov 23;5(27):4748-52.
16. Kvestad E, Kvaerner KJ, Røysamb E, Tambs K, Harris JR, Magnus P. Heritability of recurrent tonsillitis. *Archives of Otolaryngology-Head & Neck Surgery*. 2005 May 1;131(5):383-7.
17. Sadoh WE, Sadoh AE, Oladipo AO, Okunola OO. Bacterial isolates of tonsillitis and pharyngitis in a paediatric casualty setting. *Journal of Medicine and Biomedical Research*. 2008;7(1-2).
18. Khasanov SA, Asrorov AA, Vokhidov UN. Prevalence of chronic family tonsillitis and its prevention. *Vestnik otorinolaringologii*. 2006(4):38-40.

19. Howel D, Webster S, Hayes J, Barton A, Donaldson L. The impact of recurrent throat infection on children and their families. *Family practice*. 2002 Jun 1;19(3):242-6.
20. Babaiwa UF, JO ON. Bacterial tonsillarmicrobiota and antibiogram in recurrent tonsillitis. *Biomedical Research*. 2013.
21. Jayasimha VL, Vinodkumar CS, Raghukumar KG, Basavarajappa KG. Surface Tonsillar bacteria versus deep tonsillar bacteria in tonsillitis. *J Pub Health Med Res*. 2013;1(2):92-4.
22. Zautner AE, Krause M, Stropahl G, Holtfreter S, Frickmann H, Maletzki C, Kreikemeyer B, Pau HW, Podbielski A. Intracellular persisting *Staphylococcus aureus* is the major pathogen in recurrent tonsillitis. *PloS one*. 2010 Mar 1;5(3):e9452.
23. Dakhil BR, Hamim SS. *World Journal of Pharmaceutical Sciences*.