CRIMSON PUBLISHERS
Wings to the Research

Experiments in
Rhinology & Otolaryngology

ISSN 2637-7780

Research Article

Characterization of Bacteria Associated with Untreated Otitis Media with Effusion Among Primary School Children in Kano Metropolis, Nigeria

Nas FS[1], Ali M[2]*, Aminu MA[2] and Nasiru AS[3]

[1]*Department of Biological Science, Bayero University Kano, Nigeria*

[2]*Department of Microbiology, Kano University of Science and Technology, Nigeria*

[3]*Department of Medical Laboratory Science, Bayero University Kano, Nigeria*

***Corresponding author:** Muhammad Ali, Department of Microbiology, Kano University of Science and Technology, Wudil Kano, Nigeria

Submission: May 05, 2018; **Published:** September 20, 2018

Abstract

Otitis media with effusion is an inflammation of the middle ear in which fluid accumulates behind the eardrum. The aim of the study was to determine the bacteria isolates associated with untreated otitis media with effusion among primary school children in Kano metropolis Nigeria. A total of 42 samples were collected using sterile swab sticks from the subjects with symptoms of otitis media with effusion among primary school children within Kano metropolis from April 2017-July 2017. The samples were inoculated onto the surface of Nutrient agar, Mannitol salt agar, Chocolate agar and MacConkey agar. Identification of the isolates was done using Gram staining, bacteriological analysis and Biochemical tests. A total of 189 (8 species) isolates were recovered from 42 samples. The isolates were Staphylococcus aureus, E. coli, Klebsiella pneumoneae, Streptococcus pneumoneae, Pseudomonas aeruginosa, Proteus mirabilis, H. influenza and Staphylococcus epidermidis. Staphylococcus aureus has the highest prevalence with 34 isolates which accounted for 18%, this is followed by E. coli with 26 isolates and accounted for 15% while least number of isolates (17) was recorded in Staphylococcus epidermidis which accounted for 9%. It is concluded that Otitis media is polymicrobial infection.

Keywords: Bacteria; Effusion; Kano; Microorganism; Otitis media

Introduction

Isolation of bacteria isolates

The clinical wound swab samples were inoculated onto Nutrient agar (Life save Biotech, USA), Mannitol salt agar (Biomark, India), Chocolate agar and Mac Conkey agar (Life save Biotech, USA) plates and incubated aerobically at 37 °C for 24 hours [1-5]. After incubation bacterial growth was observed for colony appearance and morphology. Each colony was re-inoculated into freshly prepared agar plates until a pure colony was obtained.

Identification of bacterial isolates

Presumptive colonies were confirmed by gram staining, biochemical (Indole, Methyl-red, Vougues Proskeaur, Citrate utilization Catalase and Oxidase) tests, nitrate reduction, sugar fermentation and motility test. Each plate was graded as positive or negative [6-15]. Bacteria isolates were characterized according to Bergy's manual of systemic determinative Bacteriology by Holt et al. [15].

Results

Identification of bacterial isolates

The identification of the bacteria isolates using Gram staining, biochemical characterization and sugar fermentation is presented in Table 1 & 2. The result indicated that, a total of 8 isolates were identified namely; *Staphylococcus aureus, E. coli, Klebsiella pneumoneae, Streptococcus pneumoneae, Pseudomonas aeruginosa, Proteus mirabilis, H. influenza* and *Staphylococcus epidermidis*.

Prevalence of bacterial isolate

The prevalence of the bacteria isolate from untreated otitis media with effusion from 42 subjects is presented in Table 3. A total of 189 isolates were recovered [16]. *Staphylococcus aureus* has the highest prevalence with 34 isolates which accounted for 18%, this is followed by *E. coli* with 26 isolates and accounted for 15% while least number of isolates (17) was recorded in *Staphylococcus epidermidis* which accounted for 9%.

Discussion

The study was aimed to identify some bacteria associated with untreated otitis media with effusion among primary school children in Kano metropolis, Nigeria. The analysis of study population used in this research showed that more male subjects were infected with otitis media with effusion than female subjects, as 23 males was recorded against 19 females. The mechanisms involved for such sexual dimorphisms are multi-factorial, including the endo-

crine and genetic effects on the immune system and physiology, as well as sex-related differences in behavior. In humans, females reportedly mount stronger humoral and cellular immune responses to infection or antigenic stimulation than do males. This result was contrary to that of Jik et al. [17]. who found that females (with total percentage isolates of 54.16%) were more susceptible to infection of the middle ear than the males (45.84%) although statistically, there was no significant difference (p>0.05).

The result also disagrees with that of Olubanjo et al. [18] who conducted research in Kupa medical centre with prevalence rates of 47.1% for males and 52.9% for females. The age distribution of the subjects (Table 1) revealed that otitis media with effusion is more frequent among children with a smaller number of age. There are many reasons why children are more likely to suffer from otitis media than adults. Children have more trouble fighting infections; this is because their immune systems are still developing [19]. Infants in whom otitis media with effusion develop in the first year of life have an increased risk of recurrent middle ear infection. According to this study, the overall prevalence of the disease tends to decrease with age especially after the age of 7. There are several factors responsible for transmission of otitis media among children, such factors include; overcrowding, poor nutrition, poor hygiene, and lack of attention to symptoms may also increase the incidence, type and severity of otitis media.

In the present study, several methods including Gram staining, biochemical characterization and bacteriological analysis using selective and differential agar medium were deployed for characterization of bacterial isolates. A total of 189 bacteria isolates were recovered from 42 different samples of effusions from untreated otitis media infection. Out of 189 bacterial pathogens isolated from 42 samples, *Staphylococcus aureus* was the most frequently isolated organism with total of 34 isolates which accounted for 18%. The prevalence rates of other isolates in according to this study were *E. coli* 15% (28 isolates), *Klebsiella pneumoneae* 14% (26 isolates), *Streptococcus pneumoneae* 12% while least percentage prevalence was recorded in *S. epidermidis* 9% with total of 17 isolates. The result of this study was in conformity with that of who found *Staphylococcus aureus* as the most frequent isolates among children with otitis media infection in Ganawuri Area of Plateau State Nigeria. The predominance of *Staphylococcus aureus* in this study is like that found by Iseh & Adegbite et al. [20] who have found that *S. aureus* (46.2 per cent) was the commonest organism cultured in their study14. On the other hand, this study was contrary to that of Gibney et al. [21] who found *Streptococcus pneumoniae* was the most cultured organism (82 per cent). In another study conducted in Soa Paulo, Brazil, *Streptococcus pneumoniae* accounted for 16 per cent of the pathogens isolated from Brazilian children with acute otitis media, whereas *Staphylococcus aureus* accounted for only 1 percent. This result is also contrary to the present study. The difference in the prevalence of bacteria isolates may be due to the geographical variability.

Conclusion

Otitis media is the inflammation of middle ear cavity and children are mostly infected the infection. According to this study, more male subjects were infected with otitis media with effusion than female subjects. Characterization of bacterial isolates from effusion of otitis media infection among children without treatment revealed the presence of [22] *Staphylococcus aureus, E. coli, Klebsiella pneumoneae, Streptococcus pneumoneae, Pseudomonas aeruginosa, Proteus mirabilis, H. influenza* and *Staphylococcus epidermidis*. *Staphylococcus aureus* was the most frequently isolated organism according to this study. It is concluded that Otitis media is polymicrobial infection.

Acknowledgement

The authors wish to thank the management of State Universal Basic Education Board for their support. We acknowledge to technical staff of Microbiology Laboratory of Kano State University of Science and Technology Wudil for the use of Laboratory facilities.

Table 1: Age and sex distribution of the subjects.

Age (years)	Male	Female	Total	Percentage (%)
7 – 8	6	5	11	26
08-Sep	5	5	10	24
09-Oct	4	4	8	19
10-Nov	5	3	8	19
Nov-15	3	2	5	12
Total	23	19	42	100

Table 2: Identification of Bacterial Isolates from untreated otitis media with effusion.

Tests	A	B	C	D	E	F	G	H
GS	-	+	-	+	-	-	-	+
SH	Rod	Coccus	Rod	Coccus	Rod	Coccus	Spiral	Rod
IN	+	+	-	-	-	-	+	-
MR	+	+	-	+	-	+	-	-
VP	-	-	+	+	-	-	+	+
CU	-	-	+	+	+	+	+	-
CA	+	-	+	+	+	+	+	+
CO	-	-	-	+	-	-	-	-
OX	-	-	-	-	+	-	+	-
MO	+	-	-	-	+	+	+	-
NT	+	+	+	+	+	+	+	+
MF	+	-	+	+	+	-	-	-
LF	+	+	+	+	-	-	-	+
Organism	*E. coli*	*S. pneum*	*Kleb pne*	*S. aureus*	*P. aerugi*	*P. mirab*	*H. influe*	*S. epider*

Key: GS: Gram Staining; SH: Shape, IN: Indole, MR: Methyl Red, VP: Vougues Proskeaur, CU: Citrate Utilization, CA: Catalase, CO: Coagulase, OX: Oxidase, MO: Motility, Nitrate reduction test, MF: Mannitol fermentation, LF: Lactose fermentation

How to cite this article: Nas F, Ali M, Aminu M, Nasiru A. Characterization of Bacteria Associated with Untreated Otitis Media with Effusion Among Primary School Children in Kano Metropolis, Nigeria. Exp Rhinol Otolaryngol. 2(3). ERO.000539.2018.DOI: 10.31031/ERO.2018.02.000539

Table 3: Prevalence of Bacterial isolate from untreated otitis media with effusion.

Bacteria Isolate	No. of Isolates	Percentage Prevalence (%)
Staph aureus	34	18
E. coli	28	15
Klebsiella pneumoneae	26	14
Streptococcus pneumoneae	23	12
Pseudomonas aeruginosa	21	11
Proteus mirabilis	21	11
Haemophilus influenza	19	10
Staphylococcus epidermidis	17	9
Total	189	100

References

1. Jawetz M, Adelberg S (2007) Medical microbilogy (4th edn), pp. 1710-1715.
2. Antonietta MA, Anna MC, Massimo M, Chiara V, Alessia M, et al. (2008) Children with recurrent otitis show defective IFNγ-producing cells in adenoids. PAI 19(6): 523-526.
3. Little P, Gould C, Moore M, Warner G, Dunleavey J, et al. (2002) Predictors of poor outcome and benefits from antibiotics in children with acute otitis media: pragmatic randomised trial. BMJ 325(7354): 22.
4. Ehrlich GD, Veeh R, Wang X, Costertor JW, Hayes JD, et al. (2002) Mucosal biofilm formation on middle ear mucosa in the chinchilla model of otitis media. JAMA 287(13): 1710-1715.
5. Gitiban N, Jurcisek JA, Harris RH, Mertz SE, Durbin RK, et al. (2005) Chinchilla and murine models of upper respiratory tract infections with respiratory syncytial virus. J Virol 79(10): 6035-6042.
6. Arvind R (2008) 100+ Clinical cases in paediatrics. Elsevier India Pvt. Limited, India.
7. Segal N, Givon LN, Leibovitz E, Yagupsky P, Leiberman A, et al. (2005) Acute otitis media caused by streptococcus pyogenes in children. Clin Infect Dis 41(1): 35-41.
8. Shulman ST, Tanz RR (2005) Streptococcal otitis media: from epidemiology to pathogenesis. Clin Infect Dis 41(1): 42-44.
9. Bluestone CD, Stephenson JS, Martin LM (1992) Ten-year review of otitis media pathogens. Pediatr Infect Dis J 11(8): S7-S11.
10. Del Castillo F, Delgado RA, Rodrigo C, De Liria G, Cervera J, et al. (2007) National consensus on acute otitis media (OMA). An Pediatr (Barc) 66(6): 603-610.
11. Lopez P, Sierra A, Zapata MA, Vanegas B, Castrejon MM, et al. (2010) Non-typeable Haemophilus influenzae and Streptococcus pneumoniae: Primary causes of acute otitis media in Colombian children: a prospective study. BMC Infect Dis 14: e416-e417.
12. Glezen WP (2000) Prevention of acute otitis media by prophylaxes and treatment of influenza virus infection. Vaccine. 19(1): S56-S58.
13. National Population Commission (NPC) (2006) National population census result. Abuja, Nigeria.
14. Mohammed S, Muhammad NM, Abdulkarim IA (2015) Ethnobotanical survey of medicinal plants in metropolitan kano, Nigeria. International Journal of Public Health Research 3(6): 345-351.
15. Holt JG, Krieg NR, Senath PHA, Staley JT, Williams ST (1994) Bergey's manual of determinative bacteriology (9th edn), Baltimore Md Williams and Wilkins, USA.
16. Fish EN (2008) The X-files in immunity: sex-based differences predispose immune responses. Nat Rev Immunol 8(9): 737-744.
17. Jik AW, Ogundeji EB, Maxwell IK, Ogundeji AO, Samaila JM, et al. (2015) Identification of microorganism associated with otitis media among children in Ganawuri area of plateau state, Nigeria. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e- 14(12): 61-67.
18. Olubanjo O (2007) Epidemiology of acute suppurative otitis media in Nigerian children. The Internet Journal of Pediatrics and Neonatology 8(1).
19. Mills MV, Henley CE, Barnes LL, Carreiro JE, Degenharlt BF (2003) The use of osteopathic manipulative treatment as adjuvant therapy in children with recurrent acute otitis media. Areh Pediatric Adotese Med 157(9): 861-866.
20. Iseh K, Adegbite T (2004) Pattern and bacteriology of acute suppurative otitis media in Sokoto, Nigeria. Annals of African Medicine 3(4): 164-166.
21. Gibney KB, Morris PS, Carapetis JR, Skull SA, Smith VHC, et al. (2005) The clinical course of acute otitis media in high-risk australian aboriginal children: a longitudinal study. BMC pediatrics 5(1): 16.
22. Alejandro H, Jack LP, Howard ER, Nader S, Ellen RW, et al. (2011) Treatment of acute otitis media in children under 2 years of age. The New England Journal of Medicine 364(2): 105-115.

How to cite this article: Nas F, Ali M, Aminu M, Nasiru A. Characterization of Bacteria Associated with Untreated Otitis Media with Effusion Among Primary School Children in Kano Metropolis, Nigeria. Exp Rhinol Otolaryngol. 2(3). ERO.000539.2018.DOI: 10.31031/ERO.2018.02.000539