



Ear Infection-Causing Microorganisms and Pacifier Use in Children Under 5 Years Old

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Submitted: 11 November 2022; Accepted: 04 December 2022; Published: 16 January 2023

ABSTRACT

Research took place in Balad City between May 1 and November 1, 2022. Patients like these are treated at primary health care clinics and the Balad Children's Hospital. There were 221 individuals younger than 5 years old diagnosed with an ear infection. Fifty youngsters who seemed healthy and had never used a pacifier served as a control group. All patients and controls had ear swabs cultured. Approximately 70% of ear samples cultivated were successful. Staph. aureus accounted for 31% of all isolates. 4.0% streptococcus pyogenes 6–9% Strep pneumonia. About 10% of the isolates were found to have Pseudomonas aeruginosa in the ear. 3% also tested positive for M. catarrhalis. Other bacteria belonging to the family Enterobacteriaceae were also discovered (E. coli in 5%, K. pneumonia in 3% and 6%, and P. mirabilis in 5%). Candida albicans, a kind of (yeast-like fungi), was also detected in the ears of roughly 11% of study participants. Sixty-six percent of all patients were found to be using some sort of pacifier or dummy, whereas 34 percent were not. The purpose of this research was to see if restricting kids' pacifier use could reduce their risk of ear infections.

Keywords: *Evidence based, Rhinosinusitis, Pharyngitis, Otitis media, Management*

INTRODUCTION

Otitis media (OM) is inflammation of the middle ear (ME) (1). The most common bacteriological agents that cause otitis media differ according to the type; *S. pneumoniae*, non-typable *H. influenzae*, and *M. catarrhalis* are most common bacterial of acute OM (2), *P. aeruginosa*, *S. aureus*, and *Proteus* spp. are predominant pathogens of chronic suppurative otitis media, and it was also seen that non-spore forming anaerobes such as *Bacteroides* spp. can be isolated from exudates obtained from patients with chronic otitis media.

Chronic otitis media is an inflammation of the middle ear cleft that persists or keeps coming back, and causes a long-term or permanent damage to the ear (3). It has been an important cause of middle ear disease since prehistoric times (4). Its incidence appears to be depending for some extent on race and socioeconomic factors for example; it is significantly more common in cold and damp areas like Inuit (Eskimos) and American Indians (5). Poor hygiene and nutrition has been suggested as a basis for the wide spread prevalence of chronic otitis media in developing countries (6). Ear infection is common in children because their short and narrower Eustachian tube (7). The most common presentation of the disease is discharging ear associated with hearing difficulty and sometime earache when superadded by acute attack (8). A wide range of microorganisms were isolated in the cultures of the ear discharge, vary from study to other but *Pseudomonas aeruginosa* and *Proteus* species are most frequently isolated (10).

Aim of study

RESULTS

221 patients with the symptoms of ear infection were collected by using a sterile swab. *Staph. aureus* was the most common bacteria isolated from ear infection as well as *Staph. epidermidis*, *Pseudomonas aeruginosa* and *Streptococcus pneumoniae* as shown in (Table 1).

E. coli, *Proteus mirabilis*, *Klebsiella pneumoniae* and *Moraxella catarrhalis* were also found. *Streptococcus pyogenes* has also appeared in six

The aim of this study was to explore possibility to limit the use of pacifiers in children to prevent ear infection.

MATERIALS AND METHODS

The number of children with Ear infection was 221 patients whose ages were under 5 years old of the patients attended Balad Children Hospital and primary health care centers of Balad first health care sector. A sterile transport swabs have been used to collect ear discharges under sterile conditions. The swabs were dipped in a transport media used for maintaining the specimens for several hours to protect the specimens from dehydration or damage until the specimens reach the laboratory for the specific tests. Usually the physician is in charge of collecting specimens.

The culture had been done as specifically targeted *S. pneumoniae*, *H. influenzae*, and *M. catarrhalis*, Group A streptococci, *Pseudomonas* and *Enterobacteriaceae*. Briefly, the swabs were moved into horse blood agar and chocolate agar using 10 μ L sterile plastic loops. MacConkey agar was used for *Enterobacteriaceae* detection. Plates were incubated overnight at 37°C in a humid environment containing 5% CO₂. Capsular pneumococcal isolates were identified based on α -hemolytic colony morphology, optochin susceptibility (11). *M. catarrhalis* isolates were identified based on colony morphology, Gram stain and oxidase production (12). Manitol salt agar was also used to distinguish *Staphylococci* species. Sabouraud dextrose agar was also used for *C. albicans* isolation. Biochemical tests; catalase test and coagulase test were also conducted to identify the microbes.

(3.90%) of the positive isolates. *Staph. epidermidis* and *Micrococcus* spp. *Candida albicans* was also found in relatively high number of the positive isolates in ear as shown in (Table 1).

221 of children with ear infection under five years were distinguished into two groups according to the use of pacifiers. It shows that 145 (65.61%) of the total patients were using pacifiers or dummies, While 76 (34.39%) of them were not using pacifiers at all (Figure 1).

Aside from the effect of pacifiers on the pathogenicity and epidemiology of the children's ear and throat inflammation, another risk factors takes place such as oral thrush, teeth problems, language problems and sometimes diarrhea due to an intestinal inflammation. In this study, 66% of the patients were using pacifiers and some of these users suffered from another health problem in addition to ear inflammation. These problems represented in some children such as oral thrush, teeth problems and intestinal inflammation (Figure 2).

Sensitivity tests revealed that *Staph. aureus* was sensitive to ciprofloxacin, tobramycin, ofloxacin and gentamicin. While it was completely resistant to amoxicillin, cefotaxime and ampicillin. *Strep. pneumonia* was sensitive to each one of ciprofloxacin and gentamicin respectively. it also showed high resistant to amoxicillin, cefotaxime, ampicillin and ofloxacin. *Strep. pyogenes* showed a high sensitivity to ciprofloxacin, gentamicin, cefotaxime and ofloxacin and a high resistant to amoxicillin and ampicillin. *M.catarrhalis* was sensitive to ciprofloxacin, cefotaxime, tobramycin, ofloxacin and gentamicin. Moreover, it was highly resistant to amoxicillin and ampicillin. *P. mirabilis* was 100% sensitive to Ciprofloxacin and amikacin. *E. coli* and *K. pneumonia* was nearly sensitive to the all antibiotics except for amoxicillin and ampicillin. As for *Pseudomonas aeruginosa*, it was highly resistant to the all antibiotics used (Table 2).

DISCUSSION

Results showed that ear infection samples gave about 154 (69.68%) positive bacterial culture, and about 67 (30.32%) of samples registered as a negative bacterial culture.

This study included 221 of children with ear infection under 5 years old. They were distinguished into two groups according to the use of pacifiers. It shows that 145 (65.61%) of the total population were using pacifiers. While 76 (34.39%) of them were not using pacifiers at all. Moreover, these results were almost similar to the results of Viviane and Regina (13). The fact that a high number of pacifiers users were found within 221 children whom were all suffering from ear infection. This suggests that there is a

possible connection between the use of pacifiers and ear infection and this suggestion was described early in the 20th century, and many studies reached the same conclusion such as in Hanafin and Griffiths in the US (16), Garrelts and Melnyk (14).

Staphylococcus aureus is the major cause of nosocomial infections. The importance of *Staphylococcus aureus* as a causative pathogen of OM came from the developing antibiotics-resistance of these bacteria and their high ability of colonization (15, 16). This agrees with the result mentioned by (17) reported that *S. aureus* was the most prominent causative agent of CSOM in children older than six years. *Pseudomonas aeruginosa* was the second most bacteria isolated from ear. It is one of the main pathogens that cause CSOM. *Streptococcus pneumonia* and *Moraxella catarrhalis* that is considered from the microbiota of nasopharynx in healthy adults has constituted 10 (6.49%) and 5 (3.25%) respectively. Many researchers such as (18) reported these microorganisms.

Mixed isolates of both *Staphylococcus aureus* and *Streptococcus pneumonia* can be explained as chronic otitis media infections when the body surface defenses get low autochthonic bacteria will take their place and induce secondary infection. These findings were supported by the results of (19).

The source of infection with gram negative enterobacteriaceae may not in necessarily come from the nasopharyngeal passage, it may come from the ear canal contamination with feces, and that due to the poor hygiene or the ignorance to the importance of the daily cleansing of the ear that the child must receive regularly (20).

The former results were almost similar to a study in Nigeria by Shamsuddeen(21). Whereas the *Staph. aureus* was the most common isolated bacteria followed by *Proteus* and *Pseudomonas*. In addition to the bacterial isolates, *Candida albicans* was unlikely found in the ear swab in about 17(11.04%). The presence of this microorganism in ear is probably resulted from the migration of this organism through the nasopharyngeal cavity to the Eustachian tube which is usually leads to the inner and middle ear inflammation and that usually occurs in case of chronic supportive otitis media.

Aside from the effect of pacifiers on prevalence of the children ear and throat inflammation, another risk factors takes place such as oral thrush, teeth problem, language problem and sometimes diarrhea due to an intestinal inflammation. In this study, 66% of the populations were using pacifiers and some of these users suffered from another health problem in addition to ear inflammation. These problems represented in some children such as oral thrush, teeth problem and intestinal inflammation and even speech or communication problems were exist as well as described by Hanafin and Griffiths (22).

The antibiotic susceptibility test showed that antibiotics were affecting bacteria in different degrees as its shown in Table 2; it was found that the highest susceptibility of organism was to amikacin, cefotaxime, gentamicin, tobramycin and ofloxacin. As for amoxicillin and ampicillin, the organisms gave an absolute resistance to the said antibiotics. The other antibiotics were affecting bacteria in different degrees. We can see from the results above that some of the bacteria’s resistance to some of antibiotics that it may due to the uncoordinated random use of antibiotics, which may lead to the bacterial acquirement to some resistance genes by the conjugation process (23).

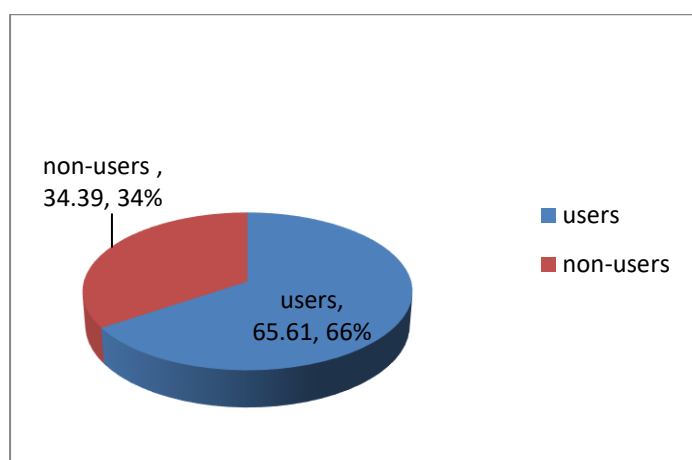


FIGURE 1: Distribution of children according to the use of pacifiers

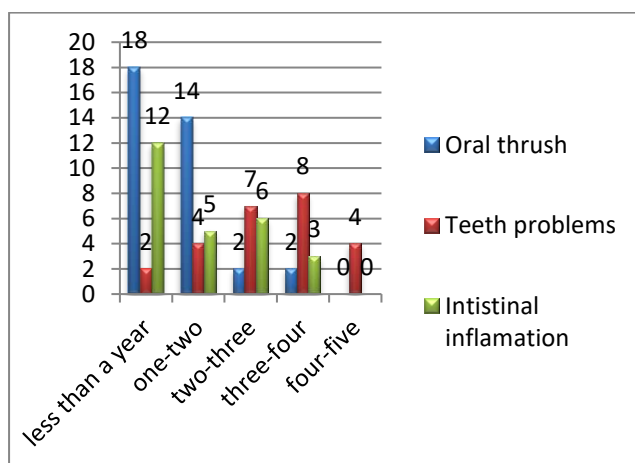


FIGURE 2: Distribution of the other risk factors resulted from the use of pacifiers according to the age groups

TABLE 1: Distribution and type of microbes isolated from Ear and Throat.

Type of microbes of the isolates	Number of isolates in Ear	
	No.	%
Staph. aureus	47	30.52
Staph. epidermidis	25	16.23
E. coli	8	5.19
K. pneumonia	5	3.25
Proteus mirabilis	8	5.19
Pseudomonas aeruginosa	15	9.74
Bacillus cereus	4	2.60
Strep. pneumonia	10	6.49
Strep. pyogenes	6	3.90
Candida albicans	17	11.04
Total	154	100

TABLE 2: The antimicrobial susceptibility test that shows the sensitivity of the total microbes to some of the most used antibiotics

Bacterial isolates (No.)	CIP (%)	AK (%)	AX (%)	CTX (%)	AM (%)	TOB (%)	OFX (%)	CN (%)
Staph. aureus (70)	83	14	0	0	0	79	91	66
p. aeruginosa (23)	13	0	0	0	0	0	0	0
Strep. pneumonia (22)	77	14	0	0	0	18	0	82
Strep.k pyogenes (22)	100	14	0	86	0	14	91	100
M. catarrhalis (11)	100	27	0	100	0	100	100	11 100
P. mirabilis (8)	100	100	0	0	0	25	0	37
E. coli (14)	86	100	0	100	0	79	93	100
K. pneumonia (13)	100	15	0	100	0	92	100	100

CONCLUSIONS

A possible connection may occur between the pacifiers use and ear infection due to the possible movement of the throat microbes through the auditory canal to the middle ear, which leads to otitis media infection.

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