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Dr. Teba Kasim Mohamed
Babylon Health Directorate, Babylon, Iraq

Dr. Firas Salam Fakhri
Babylon Health Directorate, Babylon, Iraq

Faris Muhammad Al-Haris
College of Medicine, Kufa University, Babylon, Iraq

Corresponding Author:
Dr. Teba Kasim Mohamed
Babylon Health Directorate, Babylon, Iraq

Nasal colonazation in relatively healthy children by clinical examination in Al-Zahraa teaching hospital in Al-Najaf City

Dr. Teba Kasim Mohamed, Dr. Firas Salam Fakhri and Faris Muhammad Al-Haris

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Abstract
Background: Nasal colonization by bacterial pathogens is linked to the risk of invasive infections, which are a leading cause of mortality in children globally. While viruses are the primary cause of respiratory tract infections (RTIs), bacteria contribute to localized infections such as sinusitis, pneumonia, and meningitis. Most colonization remains asymptomatic but can become invasive in vulnerable hosts. Study Objective: The goal of this study was to screen for asymptomatic nasal colonization by potential bacterial pathogens and analyze the correlation between carriage rate and various socio-demographic factors.
Patients and Method: This cross-sectional study involved healthy children to examine nasal carriage of bacterial pathogens. The study was conducted at the laboratory unit in Al-Zahra Teaching Hospital for Maternity and Children in Al Najaf city, Iraq, from January to October 2016. Nasal swabs were tested for five prevalent bacterial pathogens: Streptococcus pneumoniae, Haemophilus influenzae, Haemophilus parainfluenzae, Moraxella catarrhalis, and Staphylococcus aureus. A total of 100 healthy children (1- < 12 years old) were included, and bacteria were identified using standard techniques.
Results: The overall carriage rate of nasal pathogens was 33%, with Streptococcus pneumoniae and Staphylococcus aureus accounting for 11% and 22%, respectively. The study found no statistically significant differences between age, gender, residency, social level, and attendance concerning the carriage of these two bacteria.
Conclusions: The study revealed nasal colonization of common pathogenic bacteria, including Staphylococcus aureus and Streptococcus pneumoniae. However, no significant relationships were found between nasal swab results and age, gender, residency, social level, and attendance, as all p-values were greater than 0.05.

Keywords: Nasal Colonazation, Healthy Children, Al-Zahraa Teaching Hospital, Al-Najaf City

Introduction
Age, gender, socioeconomic position, breastfeeding, the time of year, smoking exposure, nursery attendance, infections, antibiotic use, and vaccinations are only a few of the variables that might affect the colonisation of commensal bacteria in the human nasopharynx [1-3]. Age significantly affects how often bacterial colonisation is. Colonisation often rises gradually, reaching a peak at 2-3 years of age, then declines until 15–16 years of age, before rising once again in people over the age of 65 [4]. Though females are more likely to carry Streptococcus pneumonia, which has a reduced antibiotic sensitivity, colonisation rates do not seem to be substantially impacted by gender [5, 6]. Low socioeconomic level has been noted as a risk factor for respiratory pathogen colonisation and carriage [7]. Although breastfeeding has a lower frequency of acute respiratory infections, it has little to no effect on nasopharyngeal colonisation [8]. There has been seasonal fluctuation in colonisation rates, with an increase in the middle of winter, probably as a result of things like increased interpersonal interaction, inadequate ventilation, viral illnesses, and antibiotic use [9]. Nasopharyngeal mucosa may become damaged and inflamed as a result of smoke exposure, making it more vulnerable to colonisation [6]. Attending a nursery is strongly associated with increased pathogen carriage, particularly in bigger centres [10]. In children who stay at home, older siblings also contribute to the nasopharyngeal microbiota [11]. Viral upper respiratory infections (URIs) worsen the function of the Eustachian tube and enhance otitis pathogen colonisation in the nasopharynx [1, 11].

HIV infection increases the risk of pneumococcal infection in children because it reduces mucosal immunity (IgA) and immunological response [10]. Antibiotic treatment lowers bacterial carriage for a short period of time, but the strains are quickly replaced by either an expansion of more resistant strains or newly acquired resistant strains [12]. Antibiotics may alter the nasopharyngeal flora in a variety of ways, including by reducing the number of vulnerable bacteria, increasing the number of bacteria that are resistant to them, and upsetting the equilibrium between pathogenic and non-pathogenic bacteria [13]. Depending on the medication administered, antibiotic effects on different bacterial species might vary [14]. It has been shown that pneumococcal conjugate vaccinations may lower nasopharyngeal bacterial uptake and carriage [2]. Antibiotic resistance is less of a burden on immunised children and their contacts because vaccination prevents the spread of antibiotic-resistant pneumococci [15]. Furthermore, vaccination recipients who received the HIB vaccine during vaccine trials had a 60% decrease in Haemophilus influenzae type b carriage [16]. Study's purpose to check for possible bacterial pathogens in asymptomatic nasal colonisation and connect the carriage rate with other socio-demographic parameters.

Method

Across-sectional study was performed on 100 healthy children for screening asymptomatic colonization of the nasal cavity by Potential Bacterial Pathogens in bacteriologic Unit in Al Zahra Teaching Hospital for maternity and children at Al Najaf city, Iraq from January _ October 2016.

A total of 100 healthy children were included in this study according to inclusion criteria and exclusion criteria. Inclusion criteria: Age between 1-12 year, Healthy children. Exclusion criteria: Children < 1 year or > 12 year, any history of antibiotic used in last 1 month, any history of chronic immunosuppressant diseases and drugs used. Data collection. The study was approved within the Ethics roles. Before taking swabs, the parents were briefed about the study and informed consent was obtained. Relevant information regarding the socio-demographic characters was obtained that includes: Age, Gender, Attendance, Residency, Social level [17], this included the following classes: A-Upper class - professional e.g. Doctor, lawyers, engineers. B-Middle class- other professional e.g. teachers, nurses. C1-lower middle-class-skilled non-manual workers e.g. police, clerical staff, supervisor. C2-skilled working class-trained skilled workers e.g. electricians, good vehicle drivers' plumbers. D-Working class-unskilled manual workers e.g. laborers, farm workers. E-Unskilled/ unemployed-those on state benefits e.g. pensioners, cleaners, messengers. After that, the procedure done by open swab packaging under aseptic technique and moistened with sterile water and insert the swab into the anterior nostril with sweep upwards towards the top of nostril as well as repeated the procedure with the same swab in the other nostril. The collected swabs were within 1/2 hour transported to laboratory and inoculated on 5% sheep blood agar and chocolate agar. Agar plates were then incubated at 37 °C in 5% CO2. Each plate was observed at 24 and 48 hours. Identification of bacteria was done by standard laboratory techniques and we saw staphylococcus aureus as colonies in clusters (grapelike) and streptococcus pneumonia as short chains. Statistical analysis: Data obtained were tabulated according to the following parameters Socio-demographic characteristics of studied children. Results of nasal swab culture among studied children. Relationship between culture results and different socio-demographic variables. Statistical analysis was conducted by using SPSS (statistical package for social sciences) program version 20 with which we use frequencies, percentages and chi square test for categorical data and independent sample T-test for numerical data. Level of significance (P-Value) of under 0.05, considered as significant difference.

Results

In this cross-sectional study A total of 33 isolates of the two bacteria were obtained from 100 child giving an overall carriage rate of 33% of the 33 isolates, Streptococcus pneumonia accounted for 11 (carriage rate of 11%) and staphylococcus aureus for 22 (carriage rate of 22%). The subjects were aged between 1 and 12 year. In the study group, 29(29%) of children were under 4 years, from 4_8 years were 45(45%) and > 8- ≤ 12 year were 26(26%) and according to results of colonization staphylococcus aureus colonization was higher 12(54.5%) in age group between 4-8 years and lower 4(18.2%) in age group under 4 year, but indicated no statistically significant between these age groups (p=0.3) as show in table 2. Also according to streptococcus result showed no significant difference In terms of residency, the children in rural area were 32(32%) and in urban area were 68(68%) and staphylococcus aureus colonization of rural and urban area was 6(27.3%) and 16 (72.7%) respectively and streptococcus pneumonia colonization of rural and urban area was 4(36.4%) and 7 (63.6%) respectively; this showed colonization of these bacteria higher in urban area than in rural area; thus, there was no statistically significant difference between them (p=0.8). In terms of gender, 54(54%) of children were female and 46(46%) male with staphylococcus colonization rate in female was 13(59.1%) higher than in male 9(40.9%) and streptococcus colonization in male was 7(63.6%) higher than in female 4(36.4%); thus, there was no statistically significant difference between them (p=0.4). In terms of social level, the children in grade B, C1, C2, D and E were 15(15%), 21(21%), 11(11%), 13(13%), 40(40%) respectively; according to carriage rate of staphylococcus aureus in B, C1, C2, D, E was 3(13.6%), 5 (22.7%), 3(13.6%), 2(9.1%), 9 (40.9%) respectively. There was equal in level B andC2 but higher rate in level E and carriage rate of strep pneumonia was 2(18.2%), 5 (45.5%), 1 (9.1%), 0(0.0%), 3(27.3%) respectively; There was higher rate in level CL and lower rate in D.

Table 1: Socio-demographic characteristics of studied children

		No.	%
Age in year	1-4	29	29
	4-8	45	45
	8-12	26	26
Gender	Female	54	54
	male	46	46
Residency	Rural	32	32
	Urban	68	68
Social level	A	0	0
	B	15	15
	C1	21	21
	C2	11	11
	D	13	13
	E	40	40
Attendance	School	31	31
	No attendance	54	54
	Kindergarten	15	15
Culture	Positive	33	33
	Negative	67	67

Table 2: Relationship between nasal swab culture results and socio demo graphic variables

		Culture			Total No %	P
		Negative	Staph. Aureus	Strep. Pneumoniae		
Age group in year	1-4	23(34.3%)	4(18.2%)	2(18.2%)	29	0.3
	4-8	29(43.3%)	12(54.5%)	4(36.4%)	45	
	8-12	15(22.4%)	6(27.3%)	5(45.5%)	26	
Residency	Rural	22(32.8%)	6(27.3%)	4(36.4%)	32	0.8
	Urban	45(67.2%)	16(72.7%)	7(63.6%)	68	
Gender	Female	37(55.2%)	13(59.1%)	4(36.4%)	54	0.4
	Male	30(44.8%)	9(40.9%)	7(63.6%)	46	
Social level	A	0(0%)	0(0%)	0(0%)	0	0.5
	B	10(14.9%)	3(13.6%)	2(18.2%)	15	
	C1	11(16.4%)	5(22.7%)	5(45.5%)	21	
	C2	7(10.4%)	3(13.3%)	1(9.1%)	11	
	D	11(16.4%)	2(9.1%)	0(0%)	13	
	E	28(41.8%)	9(40.9%)	3(27.3%)	40	
Attendance	School	17(25.4%)	8(36.4%)	6(54.5%)	31	0.3
	No	40(59.7%)	11(50%)	3(27.3%)	54	
	Kindergarten	10(14.9%)	3(13.6%)	2(18.2%)	15	

Table 3: Risk factors for nasal colonization

Variable		Culture		Total	OR (95% CI)
		Positive	Negative		
Age in year	1-4	6(18.2%)	23(34.3%)	29	0.4(0.2-1.2)
	4-8	16(48.5%)	29(43.3%)	45	1.2(0.5-2.8)
	8-12	11(33.3%)	15(22.4%)	26	1.7(0.7-4.4)
Gender	Female	10(30.3%)	22	32	0.9(0.4-2.2)
	male	23(69.7%)	45(32.8%)	68	
Residency	Rural	17(51.5%)	37(55.2%)	54	0.9(0.4-1.9)
	Urban	16(48.5%)	30(44.8%)	46	
Social level	A	0	0	0	0
	B	5(15.2%)	10(14.9%)	15	1.01(0.3-3.3)
	C1	10(30.3%)	11(16.4%)	21	2.2(0.8-5.9)
	C2	4(12.1%)	7(10.4%)	11	1.2(0.3-4.4)
	D	2(6.1%)	11(16.4%)	13	0.3(0.07-1.6)
	E	12(36.4%)	28(41.8%)	40	0.8(0.3-1.9)
Attendance	School	14(42.4%)	17(25.4%)	31	2.2(0.9-5.2)
	No attendance	14(42.4%)	40(59.7%)	54	0.5(0.2-1.1)
	Kindergarten	5(15.2%)	10(14.9%)	15	1.01(0.3-3.3)

Discussion

Nasal carriage is recognized as a major risk factor for the development of both communities acquired and nosocomial infections [16]. The factors influencing the colonization rates are multiple and the association is not entirely clear. Young age, gender, residency, socioeconomic status has been cited as risk factors [18]. In the present study, the overall carriage rate of potential pathogens was 33% with the individual rates being 22% for Staphylococcus aureus and 11% for streptococcus pneumonia. The results mention in table 2 indicated that there were no relationship between the percentage staphylococcus and streptococcus that isolated

from nasal carries and the age of gender, residency, social level and attendance due to all of them (P Value more than 0.05). Nasal carriage rates of bacterial pathogens in healthy children vary widely with studies and geographic area. In comparison this study with other studies that show the prevalence of staphylococcus aureus carriage was 17.3% in nasal cavity of Turkish children [19] (2006) and carriage rate of staphylococcus aureus was 32.1% in healthy children in Korea (2008) [20], In comparison with our study the carriage of Staphylococcus. Aureus was 22% slightly higher than in Turkish children but lower than carriage rate in Korea. In other study that show carriage rate of Streptococcus pneumonia was 22% for asymptomatic children < 12 year in India (2010) [21] whereas in our study the carriage rate of streptococcus pneumonia was 11% lower than in India. This difference may be due to the variation in the geographic area, genetic background, the collection site of the isolates. According to the gender the carriage rate of staphylococcus aureus was 6.7% in male and 5.8% in female children in Ujjain area in India (2010) [22], whereas in our study the carriage rate of staphylococcus aureus was 40.9% for male and 59.1% for female higher than in India. According to residency, the carriage rate of staphylococcus aureus 28% in urban area and 11% in rural area in Ghana (2014) [23], whereas in our study the carriage rate of staphylococcus aureus was 72.7% in urban area and 27.3% in rural area higher than carriage rate in Ghana. This may attribute to sample size and geographic area. According to social level, carriage rate of staphylococcus aureus in grade B, C1, C2, E was 4.5%, 8.2%, 8.2%, 5.2% respectively in Ujjain area in India (2010) [22] whereas in our study carriage rate of staphylococcus aureus in grade B, C1, C2, E was 13.6%, 22.7%, 13.6%, 40.9% higher than in India. According to attendance, the carriage rate of staphylococcus in no attendance, preschool and school attendance was 95.2%, 86%, 91.8% respectively in Ujjain area in India (2010) [22], whereas in our study the carriage rate of staphylococcus aureus in no attendance, kindergarten and school, this mean no statistically significant difference between the colonization and these levels (p=0.5). In terms of attendance daycare centers, the children in school, kindergarten and in home were 31, 15, 54 respectively and carriage rate of staphylococcus aureus was higher in home attendance 11(50.0%) and lower rate in kindergarten 3 (13.6%) and carriage rate of streptococcus was higher in school attendance 6(54.5%) and lower rate in kindergarten; also this mean no statistically significant difference between these group due to (p=0.3). The results mention in table (3) showed the odds ratio which is used to determine the risk factors for nasal colonization. If OR = 1, this mean equal risk for nasal colonization, if OR > 1 this mean high risk of colonization and if OR < 1 this mean low risk for colonization. According to age group, the age 1-4 year had low risk of colonization although not significant as OR: 0.4, 95% CI: 0.2-1.2, whereas the age between 4- ≤ 12 had high risk for colonization as OR > 1. According to residency, the rural area had low risk for colonization as OR: 0.9, 95% CI: 0.4-2.2. According to gender, female had low risk for colonization as OR: 0.9, 95% CI: 0.4-1.9. According to social level, B, CL and C2 had high risk for colonization as OR > 1, whereas level D and E had low risk for colonization as OR < 1. According to attendance, school and kindergarten attendance had higher risk for colonization than no attendance as OR > 1. Attendance was 50.0%, 13.6%, 36.4% respectively, this showed the carriage rate of staphylococcus aureus was lower than in India [22].

Conclusion

This study showed nasal carriage of common pathogenic bacteria that included staph. Aureus and strep. pneumonia but there were no significant relationships between nasal swab result and age, gender, residency, social level and attendance due to all p value was more than 0.05. Decrease age of children, female, children in rural area, social level D, E and no attendance are associated with lower risk for nasal colonization due to all OR < 1.

Conflict of Interest

Not available

Financial Support

Not available

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