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Role of Respiratory Syncytial Virus and Some Bacteria Causes Tonsillitis among Children Under 5 Years Old in Duhok City

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Abstract

Background: Acute infection of the respiratory tract is a prevalent cause of death in children under the age of 5 years, particularly in developing nations. Infection with respiratory syncytial virus is a causative factor for bacterial co-infection with an increase in the incidence of respiratory disease.

Objective: This research was intended to clarify the connection between the Respiratory Syncytial Virus RSV and the tonsillitis-causing bacteria.

Method: In 120 patients with acute and chronic tonsillitis, swabs were obtained from the tonsils to detect pathogenic and commensal bacteria in the throat, and blood samples collected to identify RSV infection by identifying the antibody value in the serum.

The results: Culture results showed that 78.53% of the bacteria isolated belonged to the Gram-positive group and that only 21.47% belonged to the Gram-negative group, (51.98%) were positive for pathogenic bacteria while (48.02%) were positive for commensal bacteria and showed the highest rate of pathogenic bacteria isolated from tonsillitis patients was to Staph. aureus and Strep. pyogenes. Serological testing using ELISA showed that respiratory syncytial virus infection increases tonsillitis co-infection. Type of antibodies showed a change depending on the sex group and the stages of immune response maturity.

Key word: *Respiratory syncytial virus RSV, Tonsillitis, Bacteria, ELISA, Co- infection, IgG, IgM.*

Introduction

Recently, acute respiratory tract infections (ART) have been found to be among children's most common disease. Recent research by the World Health Organization (WHO) has shown that acute respiratory infections are responsible for 22% of child deaths, Under the age of five, which represents more than 2 million children, 99% of these deaths happen in developing nations, the primary cause of which is RSV [(1)].

ARI can be categorized into two kinds depending on its anatomical place: upper respiratory infections and lower respiratory infections. The most prevalent infectious diseases such as rhinitis (common cold), sinusitis, ear infections, acute pharyngitis, and tonsillitis are acute upper respiratory infections. Infections of the ear and pharyngitis lead to more serious problems such as acute rheumatic fever and deafness [(2)].

A community of mucosal dwelling microorganisms (the microbiota) colonizes the healthy URT, which includes both commensals and prospective pathogens kept under host immune system control. There is growing evidence that viral respiratory infections can significantly increase bacterial load [(3)].

In children as well as adults, many viruses and bacteria can cause pharyngitis and acute tonsillitis. About 75% of pharyngitis is caused by viruses [(4)]. Group Aβ hemolytic Streptococci and Staphylococcus aureus are one of the primary causes of tonsillitis, particularly in the event of acute and chronic tonsillitis [(5,6)].

Physiologically, the lower respiratory tract is usually sterile. However, there is a prevalent connection between bacterial infection and respiratory infection,

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and bacterial co-infection development enhances the severity of infection [7].

The RSV virus is one of the most frequently recognized variables in young children with ARI and is the main reasons for hospital admission. Where the elevated incidence of RSV infection is a severe result of increasing the risk of RSV-associated hepatitis infection among children [8].

Studies have shown that some respiratory viruses alter the colonization of bacteria and increase the likelihood of secondary bacterial diseases. The immune response to respiratory viruses may rely on certain bacteria spreading [9].

Antibodies have a major part of protective immunity and that cellular immunity is important for clearing the infection. The protective contribution of antibodies in human disease is probably best demonstrated by the interconnection between Superior levels of maternally acquired antibodies and less serious disease in infants and the ability of high tittered RSV intravenous immunoglobulin (Ig) to decrease the risk of serious disease when administered prophylactically [10]. Therefore, the objective of this study was to detect the role of Respiratory Syncytial Virus and some bacteria in children causing tonsillitis and to identify the relationship between RSV infection and secondary bacterial colonization.

Material and method

The groups in this study consisted of 120 throat swab and serum samples from acute and chronic tonsillitis patients and 30 people were collected as a control group at the Hivi Pediatric Teaching Hospital in Duhok city. For the period from the middle of December (15/12/2018) to the beginning of April (8/4/2019) and for children less than five years age for both sexes. Ethical approval for this study was obtained from Duhok Directorate General of Health, Department of planning, Scientific Research Division. (Approval reference number /27112018-9). The samples were taken with a swab from the tonsils. Were cultured on blood agar, MacConkey agar and chocolate agar and incubated at 37°C for 24-48 hours [11]. The growth diagnosed using biochemical tests and the Vitek 2 compact system 5ml venous blood was collected from all patients. Blood was placed in a test tube and Centrifuge and immediately stored in an Eppendorf tube and frozen at -20C° until assayed for serological diagnosis of RSV (Respiratory syncytial virus) was assayed by ElISA kits which performed according to the instruction of the manufacturing company (Vircell company Spin).

Results

Table (1) Seroprevalence of RSV antibodies, bacterial pathogens and (bacterial & viral) co-infection among patient with Tonsillitis.

Study group	Results													
	Bacteria isolated from Tonsillitis				RSV antibodies						Bacterial & viral infection			
	G+ Isolates		G-Isolates		IgG+		IgM+		IgM+&IgG+		+ve		-ve	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Tonsillitis patient	139	78.53%	38	21.47%	34	28.33%	28	23.34%	34	28.33%	50	41.67%	70	58.33%
Total	177	100	177	100	120	100	120	100	120	100	120	100	120	100
control	44	86.28%	7	13.72%	12	40%	6	20%	3	10%	10	33.33%	20	66.67%
Total	51	100	51	100	30	100	30	100	30	100	30	100	30	100

Among the bacteria isolated, 78.53% belonged to Gram positive group and only 21.47% belonged to Gram negative group. The rate of RSV-IgG and RSV-IgM with RSV- IgG highest than RSV-IgM among tonsillitis patients compared with control group which showed RSV-IgM highest than RSV-IgM with RSV- IgG. Bacteria with RSV co-infection was 41.67%

Table-(2) Distribution of seropositive RSV antibodies in relationship to gender tonsillitis patient by using ELISA technique.

Gender	Seropositive of RSV antibodies					
	RSV-IgM		RSV-IgG		RSV-IgM & IgG	
	No.	%	No.	%	No.	%
Male	16	57.14%	21	61.77%	21	61.77%
Female	12	42.86%	13	38.33%	13	38.33%
Total	28	100	34	100	34	100

The results of serological diagnosis of RSV infection indicate that the highest rate of RSV-IgG 61.77% was found in male tonsillitis patients, while 38.23% was fond in female. The highest rate57.14 % of RSV-IgM was found in male. Also, the highest rate 61.77% of both RSV-IgG and RSV-IgM together was found in male tonsillitis patients

Table (3) the percentage of pathogenic and commensal bacteria isolated from patient with tonsillitis.

Organism	Throat swab	Case yielding that organism	
		No.	%
I. **Pathogenic**			
Staph. aureus	+	46	25.99%
Strep. pyogenes	+	36	20.33%
E. coli	+	5	2.83%
Klebsiella pneumonia	+	2	1.13%
Pseudomonas aeruginosa	+	3	1.70%
II. **Commensal**			
Strep. Viridians	+	28	15..81%
Moraxella catarrhalis	+	28	15.81%
Strep. Pneumonia	+	3	1.70%
Micrococcus ssp	+	10	5.64%
Non-Coagulase – Staph.	+	13	7.36%
Corynebacterium diphtheria	+	3	1.70%
Total		177	100

In this study the rate of pathogenic bacteria was (51.98%) which represent 92 isolates. while commensal bacteria represent 85 isolates with rate 48.02%. The most common types of Pathogenic bacteria Which causes tonsillitis in children are *Staph. aureus* 25.99% and GAβ hemolytic *Streptococcus pyogenes* 20.33% which have been found to be Co-infection in cases of respiratory Syncytial Virus.

Discussion

The development of the immune response in children depends on the early exposure to respiratory viruses and bacteria, where acute viral respiratory infections lead to increase the readiness for bacterial infection [12].

This study included the collection of 120 throat swabs and serum samples from children with respiratory diseases and recorded bacterial co-infections with the RSV which was diagnosed by measuring IgG and IgM and there are different types of gram positive and gram negative microorganisms were detected by throat swab culture of which gram positive bacteria constituted (78.53%) and gram negative one were (21.47%); these findings of bacterial percentage goes with that of [4,5]. These results agreement with[13] Which indicated how severe diseases like infant virus acute respiratory infections can help us better comprehend secondary bacterial infections and long-term respiratory results of predisposition. In a study conducted by [9] they postulate that local bacterial ecosystems modulated the immune response of the host to RSV infection severity.

The results of serological diagnosis of RSV infection indicate that the highest rate of RSV-IgG was found in male tonsillitis patients, while 38.23% was found in females. The highest rate of RSV-IgM was found in male. Also, the highest rate of both RSV-IgG and RSV-IgM together was found in male tonsillitis patients, our results agreed with the results of [14] in terms of numbers of infected males, That was greater than females. This is in line with some research on gender relationships which suggest that the reasonable to compare immune reactions among males and females because many early-stage infections predominate among males [15]. In our study, the limitation includes the small cohort size. Because of this study's restricted cohort size, substantially induced immunological factors following RSV infection Could have been undervalued. Following the outcomes of this research, in-depth research would elucidate real protein correlates against RSV diseases by following a bigger cohort, particularly examining the correlation of clinical seriousness and immunological variables. Thus, in this study gender-specific antibody response profiles against RSV infection are considered as a hypothesis, and should be confirmed by further clinical data in future study.

In the present study, 177 bacterial isolates were obtained (51.98%) of which were pathogenic bacteria and (48.02%) were commensal bacteria. These results were agreed with [16] who obtained (55%) pathogenic bacteria, while (34.2%) were found with similar study in KSA [17].

The microbial content of the infant's pharynx is usually low [18]. The isolate of *Staphylococcus aureus* was proved to be the major causative microorganism of tonsillitis which constituted (25.4%) of total isolates. While the rate of *strep. pyogenes* are20. 33%, which represents 36 isolates. These results agreed with [4,5] and other studies [6,19] have described Staphylococcus is one of the most predominant genera, while [20,21] reported that main tonsillitis factors were *Strep. pyogenes*, followed by *Staph. aureus*.

The structure of airway microbiota is extremely vibrant and various environmental factors have been shown to affect colonization patterns. Vaccinations and antimicrobial use, as well as exposure to tobacco smoke, may result in changes in the airway microbiota [22].

Conclusion

Our results suggest that 41% of respiratory tract viral infections, which caused by RSV are associated with different microbial profiles that causes tonsillitis.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

Conflict of Interest: The authors declare that they have no conflict of interest.

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