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Original Research Paper

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STUDY OF IMMUNOGLOBULINS IN MIDDLE EAR SECRETIONS IN CHILDRENS WITH SUPPURATIVE OTITIS MEDIA

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ABSTRACT Despite the important role of immunity in the occurrence of suppurative otitis media. Studies on determining the concentrations of immunoglobulins in middle ear secretions are still few. The research aimed to determine whether the concentrations of immunoglobulins IgA, IgG, and IgM in middle ear secretions are important in patients with suppurative otitis media by: studying the level of concentrations of immunoglobulins (IgA, IgM, IgG) in middle ear secretions in patients with otitis media(Acute and chronic) in childrens, and comparison between them. The study was conducted on a sample of childrens attending the ear department at Tishreen University Hospital in Lattakia with a history of purulent otitis media. The number of patients was (57), (27 acute suppurative otitis media - 30 chronic suppurative otitis media). The results of the research showed that there is a statistically significant difference in the concentrations of immunoglobulin IgG (chronic otitis media is higher than acute otitis media), and there is a statistically significant difference in the concentrations of immunoglobulins IgM and IgA (acute suppurative otitis media is higher than chronic suppurative otitis media) in relation to middle ear secretions in childrens.

KEYWORDS : Immunoglobulins, Middle Ear Secretions, Suppurative Otitis Media, Childrens, Acute Suppurative Otitis Media(ASOM) ,Chronic Suppurative Otitis Media(CSOM).

1. INTRODUCTION

Causes of OM include bacterial and viral infections, anatomical-physiological abnormalities of the Eustachian tube and nasopharynx, allergic rhinitis, kindergarten, passive smoking, obesity, defects of the immune system, nutrition, gender, race and age [1].

OM development involves interactions between different bacteria; Viruses with epithelial cells, immune cells, immune mediators and effusion fluids. Moreover, these factors may respond to each other in a complex manner [2].The immune defense of the middle ear depends primarily on secretory antibodies, genetics, and the nasal tube. Recent studies on the middle ear have provided more information about the development of reactive immunity and a characterization of important elements in the mucosa associated with lymphoid tissue and mucosal cytokines [3]

Although the normal middle ear mucosa appears to be devoid of any organizing immune follicles, the middle ear mucosal epithelium participates with other sites of the general mucosal immune system in expressing the local immune response in the middle ear during inflammation [4].

Immune defense of the upper airway mucosa depends mainly on secreted antibodies. The B cells responsible for secreting these antibodies are first stimulated in the organized MALT (mucosal associated lymphoid tissue), such as tonsils, adenoids, and adenoids. From these initial sites, both memory B and T cells migrate to the mucosal effector sites, where they extravasate in a manner that is partly tissue-specific, determined by adhesion molecules on Microvascular endothelial cells [5].

Inducible B cells undergo terminal differentiation in the lamina propria mucosa into immunoglobulins (Ig) that give rise to plasma cells and blast cells B cells have important functions in host defenses, including antigen recognition, antigen presentation, antibody production, and immunomodulation. Of the five main classes of immunoglobulins produced by B cells, three (IgG, IgA, and IgM) are mainly involved. In otitis media Both acute and chronic modulation of the tympanic cavity leads to the production of these antibodies by B lymphocytes [6].

2. MATERIALS AND METHODS

The study was conducted on a sample of children aged (from 12 months to 8years) attending the ear department at Tishreen University Hospital in Latakia with a history of purulent otitis media (acute or chronic) after obtaining informed consent from the parents and waiting a maximum of 3 months for the infection to be treated. Acute purulent middle ear condition, provided that the patient does not suffer from other diseases in the ear, nose and throat. The study period extended for two full years during the years (2021-2023).

2.1. Sample Collection

Middle ear effusion was collected by using a Pasteur pipette attached to a pear to withdraw the secretions It was diluted with phosphate buffer solution (PBS). (Each 1 ml of the secretions was diluted with 7 ml of PBS solution) and placed in dry tubes. The tubes were centrifuged at a speed of 3500-5000 cycle / minute for 10 minutes, and then 500 microliters of the resulting supernatant liquid was taken after filtering the leech and placed in Grade - 20 until the time of the research examination.

2.2 Calibration method

Samples were placed in a Mindray Bs360 automated general chemistry instrument and assayed using the Turbidimetry

METHOD

It is based on the following principle :

For IgG :

Anti-human IgG antibody + IgG⇋Immunocomplex (agglutination)

Determination of the concentration of IgG through photometric measurement of immunocomplex between antibodies of IgG andIgG present in the sample, the absorbency increase is directly proportional to the concentration of IgG

For IgM : Anti-human IgM antibody + IgM⇌ Immunocomplex (agglutination)

Determination of the concentration of IgM through photometric measurement of immunocomplex between antibodies of IgM and IgM present in the sample, the absorbency increase is directly proportional to the concentration of IgM.

For IgA:

Anti-human IgA antibody + IgA⇌ Immunocomplex (agglutination)

Determination of the concentration of IgA through photometric measurement of immunocomplex between antibodies of IgA and IgA present in the sample, the absorbency increase is directly proportional to the concentration of IgA

2.3.Statistics

The levels of IgG , IgM and IgA were analyzed by the unpaired t test both for equal and unequal variance using the variance ratio function of the Stata software to determine the appropriate use of Satterthwaite's correction for the degrees of freedom. The level of statistical significance was at $p < 0.05$ for all the analyses.

3. RESULTS AND DISCUSSION

The levels of immunoglobulin concentrations (IgA, IgM, IgG) were determined in the secretions of the middle ear from patients with acute and chronic suppurative otitis media in children between 12 months and 8 years old, numbering (57) patients (27 patients with acute otitis media, 30 patients with chronic otitis media). Then compare the concentrations of immunoglobulins (IgA, IgM, IgG) in acute and chronic inflammation .

Table1: Descriptive statistics for immunoglobulin concentrations (IgA, IgM, IgG) In middle ear secretions in children with acute suppurative otitis media.

ASOM	N	Range	Mini mum	Maxi mum	Mean	Std. Deviation
IgG	27	109	84	193	124.48	25.559
IgM	27	63	81	144	105.00	14.977
IgA	27	602	911	1513	1250.00	153.251

From Table (1) , it was found that the average concentration of IgG in the middle ear secretions of children reached (124.48) mg/dL with a standard deviation of (25.559) in ASOM, and the average concentration of IgM in the middle ear secretions was (105) mg/dL with a standard deviation of (14.977) in ASOM, and the average IgA concentration in middle ear secretions was (1250) mg/dL with a standard deviation of (153.251) in ASOM .

Table2: Descriptive statistics for immunoglobulin concentrations (IgA, IgM, IgG) In middle ear secretions in children with chronic suppurative otitis media

CSOM	N	Range	Mini mum	Maxi mum	Mean	Std. Deviation
IgG	30	360	133	493	314.00	83.366
IgM	30	61	49	110	77.03	16.724
IgA	30	234	364	598	469.00	63.547

From Table (2), it was found that the average concentration of IgG in the middle ear secretions in children reached (314) mg/dL with a standard deviation of (83.366) in CSOM, and the average concentration of IgM in the middle ear secretions was (77.03) mg/dL with Standard deviation (16.724) in CSOM, and the average IgA concentration in middle ear secretions in adults was (469) mg/dL with a standard deviation of (63.547) in CSOM.

From Table (3), IgG concentrations in CSOM are higher than ASOM with regard to middle ear secretions in children (the difference is statistically significant, P=.000<0.05, and reached 189.519 mg/dL). IgM concentrations in ASOM are higher than CSOM with respect to middle ear secretions in adults (the difference is statistically significant P=.000<0.05 and reached 27.967 mg/dL). IgA concentrations in ASOM are higher than CSOM with respect to middle ear secretions in adults (the difference is statistically significant P=.000<0.05 and reached 781 mg/dl).

Table3: Comparison of IgG, IgM , IgA concentrations in middle ear secretions from patients with acute and chronic suppurative otitis media

	Mean		Std. Deviation			
	ASOM	CSOM	ASOM	CSOM	Sig. (2-tailed)	Mean Difference
IgG	124.48	314.00	25.559	83.366	000.	-189.519
IgM	105.00	77.03	14.977	16.724	.000	27.967
IgA	1250.00	469.00	153.251	63.547	.000	781.000

4. CONCLUSIONS

1- The average concentration of IgG in ear secretions was 124.48 mg/dL in ASOM and 314.00 mg/dL in CSOM.
2- The average concentration of IgM in phone secretions was 105.00 mg/dL in ASOM and 77.03 mg/dL in CSOM.
3- The average concentration of IgA in phone secretions was 1250.00 mg/dL in ASOM and 469.00 mg/dL in CSOM .
4- The T-test revealed a difference in IgG concentrations (CSOM is higher than ASOM) in relation to middle ear secretions in children (the difference is statistically significant P=.000<0.05 and reached 189.519 mg/Dl).

The increase in IgG in CSOM compared to ASOM in middle ear secretions in children is explained by the fact that IgG is the most abundant type of antibody in the blood and cerebrospinal fluid, as it plays an important role in defending against infections, especially chronic bacterial and viral infections. In acute inflammation, large amounts of IgM and IgA antibodies are produced in response to the infection. These antibodies last only a short time, and usually disappear within a few weeks; In chronic inflammation, large amounts of IgG are produced continuously. This can be due to: persistent infections, autoimmune diseases, allergies, and some types of cancer [7].

This result is consistent with the result reached by a study by Su Young Jung, etal, 2021, with the aim of studying the globulin antibodies that contribute to immune reactions in all types of middle ear infections in (255) patients and in various age groups, as it was shown that the concentrations of IgG immunoglobulins in Middle ear secretions are higher in CSOM compared to ASOM [8].

5-The T-test revealed a difference in IgM concentrations (ASOM is higher than CSOM) in relation to middle ear secretions in children (the difference is statistically significant P=.000<0.05 and reached 27.967 mg/dL).

The higher IgM in ASOM compared to CSOM is explained in relation to middle ear secretions; IgM is the first type of antibody produced in response to infection. It is usually produced during the first days of infection, and lasts only a short time, usually a few weeks; In acute inflammation, large amounts of IgM are produced in response to the infection. IgM is the first line of defense against infection, helping to neutralize pathogens and prevent their spread; In chronic inflammation, small amounts of IgM are produced or they are not produced at all, because IgM is a short-lived antibody and cannot persist for a long time[9].

This result is consistent with the result reached by a study by Su Young Jung, etal, 2021, with the aim of studying the globulin antibodies that contribute to immune reactions in all types of middle ear infections in (255) patients and in various age groups, as it was shown that the concentrations of immunoglobulin IgM in Middle ear secretions are higher in

ASOM compared to CSOM [8].

6-6- The T-test revealed a difference in IgA concentrations (acute inflammation is higher than chronic inflammation) in relation to middle ear secretions in children (the difference is statistically significant P=.000<0.05 and reached 781 mg/dL). Higher IgA in ASOM compared to CSOM is explained by the middle ear secretions in children ; That immunoglobulin IgA is a type of antibody that plays an important role in defending against infection in the mucous membranes, such as the nose, mouth, and throat. In acute inflammation, large amounts of IgA are produced in response to infection. IgA is a second line of defense against infection, and helps protect mucous membranes from infection; In chronic inflammation, small amounts of IgA are produced or not produced at all. This is because IgA is a short-lived antibody, and it cannot last long [10].

This result is consistent with the result of a 2007 study by A Lasisi, etal at the University of Ibadan in Nigeria, in which IgA concentrations were measured in both middle ear secretions and blood serum, and showed that IgA levels in ASOM are higher than CSOM with respect to middle ear secretions and thus The secretion is associated with chronicity. It has also been found that IgA has a role in determining the progression of the infection to CSOM [11].

5. Recommendations

1- Monitoring levels of IgG and IgM in ear secretions in acute inflammation may be a useful indicator to assess the possibility of progression to chronicity.
2- Monitoring the level of IgA in the medial secretions may be useful to determine the possible progression of chronicity.
3- Immunoglobulins play an important role in defending against infections in the middle ear. Immunoglobulins (IgA, IgM, IgG) can be used to treat OME in different ways.

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