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### Conclusion:

Tonsillectomy is associated with decreased levels of IgA but not IgG in patients with gingivitis. Serum levels of IgG and IgA are positively correlated with the age of the patient with gingivitis.

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surgery. Tonsils and gingivitis (Alt-wairqi *et al.*, 2020). IgM antibodies are produced during the acute phase of infectious diseases and their levels in the serum decrease 1-3 months after infection, but IgG antibodies appear in chronic infections and their levels increase in cases of recurrent infections (Radman *et al.*, 2020). Interestingly, (Wagar *et al.*, 2021). discovered that the levels of IgG and IgA in the serum of patients with chronic tonsillitis were increased while the levels of IgM did not change significantly. It not only reduces the function of the immune system but can also improve the immune response (Sainz *et al.*, 1992). On the contrary, our results showed that serum IgA and IgG levels were significantly reduced in patients undergoing tonsillectomy. In one study, it was also shown that tonsillectomy would not suppress the development of the patient's immune system, and the incidence of upper respiratory tract infection did not increase in patients with tonsillectomy compared to healthy controls. A previous study showed that IgA levels were lower in patients with tonsillectomy, which is consistent with our study (Kawasaki *et al.*, 2018). In addition, a study conducted in Turkey reported an increase in the percentage of T lymphocytes and a decrease in the percentage of T lymphocytes. A month after tonsillectomy (kincioullar *et al.*, 2002). Further investigation showed that tonsillectomy initially reduced both humoral and cellular

immunity, but immunity returned to normal after a long period and also concluded that these immune responses are stimulated in patients with tonsillitis as well as tonsillectomy without any negative effect on the immune system after this stimulation is abolished (Sato *et al.*, 2017). In Figure 3, the ROC (Receiver operating characteristic) curve showed a moderate sensitivity to IgA of 62% in patients with tonsils removed compared to patients without tonsils due to its lower levels after the operation compared to before the operation. (Radman *et al.*, 2020).

The study that was conducted showed a positive correlation between the levels of IgA and IgG in tonsil patients due to their low levels in these diseases and also after the operation, and it was consistent with the researcher's study (Kawasaki *et al.*, 2018). Our study showed a negative correlation between the operation interval IgG and IgA due to the decrease in the levels of IgG and IgA months after the operation, and it was consistent with the study of the researcher (Kaygusuz *et al.*, 2009). And he explained that tonsillectomy does not harm the immune functions of children, such as the humoral and cellular immunity of patients who have recovered compared to the immune status in the early stage after a period of one month after the operation.

### Discussion:

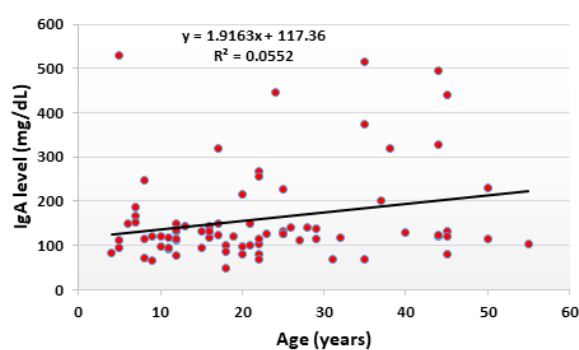
The researchers showed (Abraham et al., 2019) ((Al-Tameemi et al., 2020) that tonsillitis is more common in people under the age of 18 years compared to adults. These results are consistent with the current study. Tonsillitis is referred to as an acute infection in the palatine tonsils (Yap et al., 2017), where it was mentioned that it is more common in adults aged less than 18 years, and this is identical to the current results, where adults aged less than 18 years showed a high infection rate. Besides, the results were similar to those of Dakil & Hamim (2016) where patients under the age of 10 had the highest incidence of tonsillitis compared to other ages. While it did not match (Agrawal et al., 2014), which found that patients between the ages of 11 and 20 years were the most affected by tonsillitis, The researcher suggested (Vijayashree et al., 2014). While studying acute tonsillitis in children, there are many reasons that lead to acute inflammation, including a weak immune system in children, overcrowding in schools, and poor ventilation indoors. In his study (Saad et al., 2011), the prevalence of tonsillitis was higher in males (51%), compared to females (49%). These results are consistent with our current study where the prevalence of tonsillitis in males was shown to be 55.88% compared to 44.12% in females, while it was inconsistent with the researcher's result (Saad et al., 2011). where

the prevalence of tonsillitis was higher in females than in males. These differences can be attributed to variation in immune status, environmental factors, and the study group. The current study showed no differences between tonsillitis patients and those with gingivitis in rural and urban areas and those related to sample size. balanced care in rural and urban areas. IgG is the dominant immunoglobulin in human serum, and IgA is the predominant globulin in mucous secretions. The plasma cells of the tonsils produce all classes of immunoglobulins but mostly IgG and IgA. However, the question remains whether the removal of the tonsils and adenoids causes a defect in the immune system (Nasrin et al., 2012b), where tonsillectomy stimulates an immune response that can avert major immunodeficiency in a short period of time in children under three years of age (Yan et al., 2019). The current study was compatible with the study (Nasrin et al., 2012a) Radman et al., 2020). While it was inconsistent with researchers (Sainz et al., 1992; Yan et al., 2019), they showed an increase in IgG levels and IgA in patients with chronic tonsillitis and elevated IgG and IgA antibody levels after tonsillectomy may be the reason for this difference. is that the course of the disease in patients was more chronic. All studies reviewed from 2009 to 2020 showed a non-significant difference between the levels of humoral immune indices IgG, IgA, C3, and C4 before and after

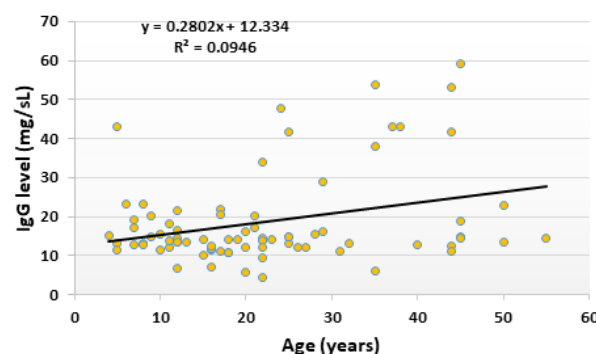
0.308;  $p = 0.006$ , respectively) as shown in Table -3 and Figures 4 and 5.

**Table- 3. Correlation of IgA and IgG level with patients' age**

Variable	IgA		IgG	
	Coefficient	p-value	Coefficient	p-value
Age	<b>0.235</b>	<b>0.037</b>	<b>0.308</b>	<b>0.006</b>
Time interval	-0.05	0.776	-0.079	0.655
IgG	<b>0.868</b>	<b>0.001&gt;</b>		



**Figure -4. Scatter plot and regression line between IgA level and patients' age**



**Figure-5 . Association of IgA and IgG with gender and residence**

Although the median IgA level in females was higher than that of male (130.5 mg/dl versus 116.39 mg/dl), the difference was not significant. Other-

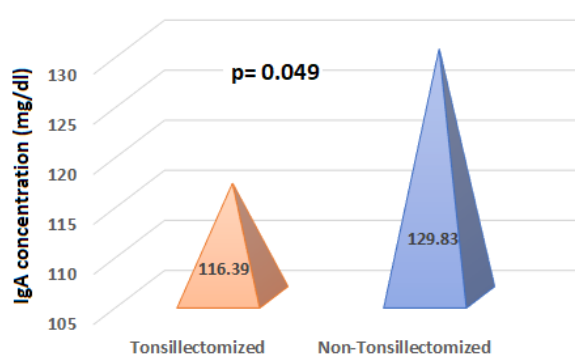
wise, IgA and IgG level were comparable between different groups with no significant differences (Table-2).

**Table -2. Association between IgG and IgA and gender and residence.**

Variables	IgA level, mg/dL (Median, range)	IgG level, mg/dL (Median, range)
<b>Gender</b>		
Males	(49.4-446.75) 116.39	(6.05-47.59) 13.95
Females	(68.21-529.1) 130.5	(4.43-59.18) 14.36
p-value	0.075	0.363
<b>Residence</b>		
Urban	(68.21-529.1) 121.86	(4.43-47.59) 14.41
Rural	(49.4-514.13) 126.18	(6.05-59.18) 13.55
p-value	0.933	0.587

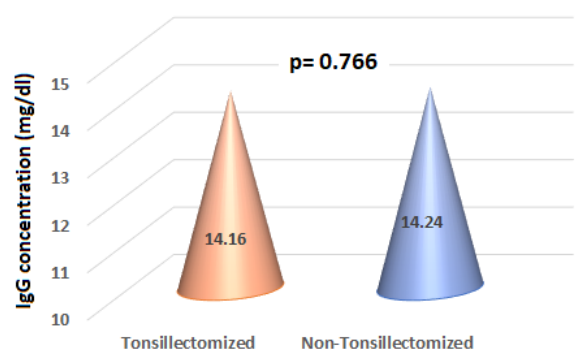


tonsillectomies patients (median= 129.83 mg/dl, range= 49.4-514.13 mg/dl) as shown in figure-1.



**Figure -1: Median level of IgA in tonsillectomies and non-tonsillectomies patients**

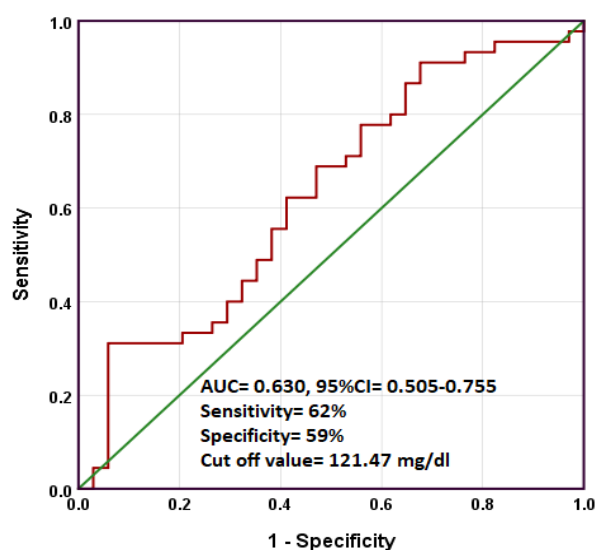
On the other hand, serum concentration of IgG in tonsillectomies patients was 14.16 mg/dl (range=6.05-47.59 mg/dl) which did not differ significantly from that of non-tonsillectomies patients (median= 14.24 mg/dl, range= 4.43-59.18mg/dl) as shown in figure -2.



**Figure 2: Median level of IgG in tonsillectomies and non-tonsillectomies patients**

### **Discriminative Value of IgA level in Distinguishing between tonsillectomies and non-tonsillectomies patients.**

Receiver operating characteristic (ROC) curve was used to evaluate the discriminative value of IgA in the context of discrimination between tonsillectomies and non-tonsillectomies patients. The area under the curve (AUC) for IgA level was 0.630, 95% CI= 0.505-0.755. The test's sensitivity and specificity were 62% and 59%, respectively, at a cut-off value of IgA level = 121.47mg/dL (Figure 3).



**Figure -3. Receiver operating characteristic curve for IgA level in discriminating between tonsillectomies and non-tonsillectomies patients.**

Correlation of IgG and IgA with age and time interval of tonsillectomy

The IgA and IgG levels show significant positive correlation with the patient's age ( $r = 0.235$ ;  $p = 0.037$  and  $r =$

the consultative clinic of Balad General Hospital in the microbiology laboratory , and information was taken from each patient such as age ,gender ,type of food ,number of times the mouth was cleaned and date of tonsillectomy, in addition to the symptoms of gingivitis such as swelling ,puffiness the formation of pockets and unwanted odor.

Collection of serum included:

Each subject had five milliliters of venous blood drawn using sterile disposable syringes and sterile gel tubes. The blood was then allowed to clot at room temperature for 20 minutes, centrifuged for 15 minutes at 3000 rpm, and the sera were removed and added to Eppendrof tubes, which

were then stored at 20C for ELIZA's sandwich technique to determine the subjects' IgG and IgA levels.

### Results:

#### Demographic characteristics of the study population

The age of non-tonsillectomies patients was significantly higher than the tonsillectomies patients ( $27.64 \pm 12.39$  years versus  $15.12 \pm 10.14$  years). The males were numerous and the females were fewer in the tonsillectomies (55.88% and 44.12%, respectively) versus non-tonsillectomies (22.22% and 77.78%, respectively). No significant difference was demonstrated in the residence between the two groups as indicated in Table -1.

**Table-1: Demographic features of the study population.**

Variable	Tonsillectomies (n=34)	Non-tonsillectomies (n=45)	p-value
Age, years <i>Mean<math>\pm</math>SD</i> <i>Median</i> <i>Range</i>	$15.12 \pm 10.14$ 11.5 4-45	$27.64 \pm 12.39$ 22.0 8-55	0.001>
Gender <i>Male</i> <i>Female</i>	(55.88%)19 (44.12%)15	(22.22%)10 (77.78%)35	0.002
Residence <i>Urban</i> <i>Rural</i>	(52.94%)18 (47.06%)16	(57.78%)26 (42.22%)19	0.420

#### Serum Level of IgG and IgA

These levels were found to be non-normally distributed. Accordingly, they were expressed as median and range, and analyzed with non-para-

metric Mann Whitney test.

The median IgA level in tonsillectomies patients was 116.39 mg/dl (range=66.67-529.1 mg/dl) which was significantly lower than that of non-



### Introduction:

The state of one's mouth plays a significant role in general health and serves as a precursor to various diseases. The oral cavity acts as the main entrance point for microorganisms entering the digestive system because numerous varieties of Gram-negative and Gram-positive bacteria reside in the mouth and are undesirable in the ordinary settings of a healthy individual. Additionally, the mouth is the main site where the natural flora is found. .(Guan *et al.*, 2022)

Gingival disease is an inflammatory condition brought on by immune dysfunction that affects the soft and hard tissues supporting the teeth. It is started by bacteria that have colonized the mouth, but gingivitis is a complex illness that also depends on oral health, genetics, lifestyle, food, blood pressure, and body weight. (Sen *et al.*, 2021).

The immune system's response to various antigens that enter the body through the mouth and nose is significantly influenced by the tonsils, one of the secondary lymphoid organs. They are located at the start of the upper portion of the digestive and respiratory systems . . (Nasrin *et al.*, 2012) )

The tonsils contain both B-cells and T-cells, but B cells predominate because they fight foreign antigens both locally and Cellularly systemically (Sebastiá *et al.*, 2004).

Tonsillitis and swollen tonsils can

both be treated surgically with a tonsillectomy. The immune system depends on the tonsils, therefore eliminating the immunological barrier following a tonsillectomy changes how the immune system works, especially in children. (2009) Kaygusuz *et al.* The principal globulin, IgG immunoglobulin, which is present in large amounts in blood and can permeate all tissues, is crucial to the way antibodies defend against periodontitis. By turning on the complement system and the opsonization complement system, IgG promotes phagocytosis and the removal of oral microorganisms. (Liukkonen *et al.*, 2020) .

Antibodies to pathogens like bacteria in the periodontal tissue can be a marker of periodontitis because IgG levels rise after infection and are elevated for years following. IgA is the primary immunoglobulin present in mucosal secretions, such as those from the urogenital tract, digestive system, prostate, and respiratory epithelium. It is also present in tears, saliva, perspiration, and other mucosal secretions. The blood also contains trace amounts of it. (Kulshrestha *et al.*, 2013; Merchant *et al.*, 2022).

### Material and methods:

A cross-sectional study conducted in Balad city from the period from 1/11/2021 to 15/4/2022 . A total of 79 gingival swabs were collected from patients with different ages as well as patients had gingivitis inflammation with post- tonsillectomy by dentist in

## Association of tonsillectomy with serum IgG and IgA in patients with gingivitis

Samera A.Salim\* , Reyam F.Saleh\*\* , Ayad M .Gaidan\*\*\*

\* University of Tikrit / College of Sciences , Department of Biology  
Samera A.salim@ su.edu.iq

### Abstract:

One of the most prevalent dental illnesses is gingivitis. It is a long-lasting inflammatory condition brought on by bacterial buildup in the tartar layer that develops in periodontal pockets behind the gums, harming the alveolar bone and the ligaments that support the teeth and ultimately leading to tooth loss.

The immunological aspect of the study included a number of 79 serum samples. The average level of IgA in patients who had tonsils removed and had gingivitis was 116.39 mg/dl (range 66.67-529.1 mg/dl), which is much lower than that of unremoved patients 129.38 mg/dl, range = 49.4-514.13 mg/dl. Serum levels of IgG and IgA are positively correlated with the age of patients with gingivitis.

**Key words:** Gingivitis, tonsillectomy, IgG, IgA

### العلاقة ما بين استئصال اللوزتين

### مع الكلوبيولينات المناعية IgG و IgA لمرضى التهاب اللثة

سميرة أكرم سالم\* , أ.م. د. ريام فارس صالح\*\* , أ.م. د. اياد مقداد غيدان\*\*\*

\*\*\* جامعة تكريت - كلية العلوم - قسم علوم الحياة

### الخلاصة:

يعد التهاب اللثة من أكثر أمراض الأسنان انتشاراً، إذ إنها حالة التهابية طويلة الأمد ناتجة عن تراكم البكتيريا في طبقة الجير التي تتطور في الجيوب اللثوية خلف اللثة، مما يضر بالعظم السنخي والأربطة التي تدعم الأسنان ويؤدي في النهاية إلى فقدان الأسنان.

اشتمل الجانب المناعي للدراسة على عدد 79 عينة مصل. كان متوسط مستوى IgA في المرضى الذين تم استئصال اللوزتين والتهاب اللثة 116.39 مجم / ديسيلتر (النطاق 66.67-529.1 مجم / ديسيلتر)، وهو أقل بكثير من مستوى المرضى غير المستأصلين 129.38 مجم / ديسيلتر، النطاق = 49.4-514.13 مجم / ديسيلتر. ترتبط مستويات IgG و IgA في المصل ارتباطاً إيجابياً بعمر مرضى التهاب اللثة.

الكلمات المفتاحية: التهاب اللثة، استئصال اللوزتين، الكلوبيولينات المناعية.