



## A STUDY OF ANTISTREPTOLYSIN (ASO) TITER IN NORMAL HEALTHY CHILDREN OF THE AGE GROUP 5-15 YEAR

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### ABSTRACT

**Introduction:** Rheumatic fever is an inflammatory disease that may develop after an infection with streptococcus pyogenes bacteria, Believed to be caused by antibody cross reactivity that can involve heart, joints, skin and brain. Measurement of Anti Streptolysin O (ASO) antibodies to specific streptococcal antigens is therefore necessary for the diagnosis of the preceding group A streptococcal infection.

**Aims and Objectives:** To determine the upper limit of normal (ULN) of antistreptolysin O (ASO) titers in normal healthy children in the age group of 5-15 years.

**Material and Method:** A cross sectional study was done on normal healthy children aged 5 -15 years age group divided into 2 groups, group I (5-10 years) & group II (10-15 years). after taking informed consent from the parents ASO titre was done .

**Results:** out of 120 children included in the study, 60 children in group I and 60 Children in group II. The mean ASO titers for group I was 121.23 and group II was 138.63 ( Table 3) with a standard deviation of 51.58 and 29.50, respectively. There was a statistical difference ( $p < 0.05$ ). The upper limit of normal in our study group was greater in group I (226.20 IU). But the upper limit of normal for the entire group was 212.25 IU. So the upper limit of normal in school age children in our study population can be considered as 212 IU.

**Conclusion:** ASO titer of 212 IU of this study can be considered as the upper limit of normal value.

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### INTRODUCTION

The Group A beta hemolytic streptococcus (streptococcus pyogenes) has remained a significant human pathogen for centuries. Group 'A' beta hemolytic streptococcus associated disease and its sequelae continue to have devastating effects on public health and national economy as they mainly affect children and young adults. This organism causes a wide variety of infections in humans, ranging from mild upper respiratory tract and skin infections, to severe suppurative and invasive conditions like necrotizing fasciitis and toxic shock syndrome. The major concern is post infectious non-suppurative sequelae like acute Rheumatic fever and post-streptococcal Glomerulonephritis which continue to occur worldwide despite efforts by clinicians, scientists and public health officials to comprehend their pathogenesis and devise ways of disease control.

It is estimated that approximately 7 sore throat episodes occur per child per year, with 13.5% of these being caused by Group A beta hemolytic streptococcus<sup>1</sup>. The global burden of RHD in the 5-15 yr old children was estimated to be 0.8-5.7/1000 with a median of 1.3/1000<sup>2</sup>.

On the basis of 1.5 per cent mortality per year, global deaths from RHD were estimated to be 233,000-294,000/year<sup>3</sup>. Although Acute Rheumatic Fever and Rheumatic Heart Disease have declined in many parts of the world, they continue to be a major cause of cardiovascular morbidity and mortality in India. The mortality in Rheumatic fever/Rheumatic heart disease in India was 32.5/1000 person years<sup>4</sup>. If one assumes an attack rate of Acute Rheumatic Fever of 0.3-3% of all streptococcal sore throats, then there would be between 50,000 to 500,000 new cases of Acute Rheumatic Fever every year<sup>5</sup>. The overall prevalence of RHD estimated to be about 1.5-2/1000 in all age groups, in India (total population about 1.21 billion) suggests that there are about 2.0-2.5 million patients of RHD in india<sup>6</sup>. A Recent Indian Council of Medical Research (ICMR) including 176,904 school children in 10 different, mostly urban locations of India found the prevalence to range from 0.2 to 1.1/1000 for RHD and 0.0007 to 0.2/1000 for Rheumatic Fever<sup>7</sup>. This tremendous national health burden affecting children and young adults, leads to significant social and economic losses. There is an urgent need for wider application of methods of primary prevention, in the form of optimal diagnosis and management of the simple group A beta hemolytic streptococcal sore throat.

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The diagnosis of group A beta hemolytic streptococcal infections is not always possible by clinical history or recovery of the organism. Positive throat cultures are obtained only in about 11% at the time of presentation of Acute Rheumatic Fever. Moreover, mere presence of the organism in the throat can also indicate a carrier state which is seen in 3.7%-20% of children in India<sup>8,9</sup>. Antistreptolysin O (ASO) test is an internationally standardized test and is widely used in detection of Group A streptococcal infection with 80-85% of patients of Acute Rheumatic Fever having elevated titer. Antistreptolysin O titer has been shown to vary with age<sup>10</sup>, geographical location, season and site of infection<sup>11</sup>. If single determination of antistreptolysin O titer, it is important to know the upper limit of normal of antistreptolysin O titer<sup>12</sup>. Normal titer levels may only reflect appropriate titer for adults. Because children will have a higher normal value, this study is under taken to determine the upper limit of normal (ULN) of antistreptolysin O in normal children in the age group of 5-15 years in and around Chennai area

**MATERIALS AND METHODS**

This study was conducted over a period of 1 year from July 2014 to Aug 2015 in Sree Balaji Medical College and Hospital. ASO test was done during this period. 120 healthy children in the age group of 5-15 years attending our hospital master health check-up were selected. Normal healthy children in the age group of 5 - 15 years were included in the study. Children with signs and symptoms of sore throat and Children who have been treated with antibiotics within 2 weeks prior to the test were excluded from the study. The data was collected in a predesigned proforma meeting the objective of the study. Under Aseptic precaution venous blood sample was collected and sent to the central laboratory of our hospital. Descriptive statistics was done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t test. Categorical variables were analysed with the Chi-Square Test. Statistical significance was taken as P < 0.05. The data was analysed using SPSS version 16 and Microsoft Excel 2007.

**RESULTS**

A total of 120 children were selected for the study. ASO titer was measured. The children were categorized into two groups. Group-I included 60 children in the age group of 5-10. Group-II included 60 children in the age group of 11-15 years for determination of age related ASO titers. A total of 77 (64%) children were males and 43 (36%) were females. When Gender status was cross matched against age distribution, in the 5-10 years age group majority of the subjects were males (n=41, 68.33%) and in the 11-15 years age group majority of the subjects were males (n=36, 60.00%) as shown in "Table 1". The ASO titers of two groups are in "Table 2". The mean ASO titers for group I was 121.23 and group II was 138.63 "Table 3" with a standard deviation of 51.58 and 29.50, respectively. There was a statistical difference (p <0.05). The upper limit of normal in our study group was greater in group I (226.20 IU). But the upper limit of normal for the entire group was 212.25 IU. So the upper limit of normal in school age children in our study population can be considered as 212 IU "Table 4". In this study we can safely conclude that the results are statistically significant indicating that there is enough evidence to suggest that mean

ASO titre levels vary consistently and significantly in relation to age in school children at 5% significance level. This upper limit of normal value of 212 IU can be considered as baseline ASO titre and will be helpful in the interpretation of elevated ASO titres in cases of suspected rheumatic fever.

**Table 1** Age and gender wise distribution of study population

Gender Distribution	5-10 years	%	11-15 years	%	Combined	%
Male	41	68.33	36	60.00	77	64.17
Female	19	31.67	24	40.00	43	35.83
Total	60	100	60	100	120	100

**Table 2** ASO titers in two groups

ASO Titers	Group I		Group II		Combined	
	5-10 years	%	11-15 years	%		%
< 100 IU	29	48.33	13	21.67	42	35.00
100-124 IU	8	13.33	0	0.00	8	6.67
125-149 IU	3	5.00	5	8.33	8	6.67
150-174 IU	9	15.00	40	66.67	49	40.83
175-199 IU	5	8.33	1	1.67	6	5.00
200-250 IU	6	10.00	1	1.67	7	5.83
Total	60	100	60	100	120	100

**Table 3** ASO Titers - Mean values of the two groups

ASO Titers	Group - I	Group -II	Combined
	5-10 years	11-15 years	
N	60	60	120
Mean	121.23	138.63	129.93
SD	51.58	29.50	42.74
P value Unpaired t test	0.0256		

**Table 4** ULN of ASO titer in two groups

ASO Titers	Group I	Group II	Combined
	5-10 years	11-15 years	
Minimum Value	50	65	50
1st Quarter	81	127.25	95.75
Median	102.5	152	152
3rd Quarter	174.25	152	152
Maximum Value	241	209	248
Upper limit of Normal	226.20	177.73	212.25

**DISCUSSION**

After declaring the year 1984 as the year of Rheumatic child, infections due to Group A beta hemolytic streptococcus (GABHS) are still prevalent in India. Acute Rheumatic Fever and Rheumatic Heart Disease have declined in many parts of the world, but they continue to be a major cause of cardiovascular morbidity and mortality in India. The mortality in Rheumatic fever/Rheumatic heart disease in India was 32.5/1000 person-years<sup>4</sup>. If one assumes an attack rate of Acute Rheumatic Fever of 0.3-3% of all streptococcal sore throats, then there would be between 50,000 to 5,00,000 new cases of ARF every year<sup>5</sup>. The overall prevalence of RHD estimated to be about 1.5-2/1000 in all age groups, in India (total population about 1.21 billion) suggests that there are about 2.0-2.5 million patients of RHD in India<sup>5</sup>. A Recent Indian Council Of Medical Research (ICMR) including 1,76,904 school children in 10 different, mostly urban locations of India found the prevalence to range from 0.2 to 1.1/1000 for RHD and 0.0007 to 0.2/1000 for Rheumatic Fever<sup>6</sup>. ASO test is a standardized and widely accepted test performed to confirm the diagnosis of the preceding GABHS infection.

## A Study Of Antistreptolysin (Aso) Titer In Normal Healthy Children Of The Age Group 5-15 Year

The geometric mean titer of Group-I and Group-II was 121.23 and 138.63 respectively. Similarly the ULN value was 226.20 and 177.73 respectively. There was a statistical difference ( $p < 0.05$ ). The upper limit of normal for the age group 5 to 15 years was 212.25 IU. Similarly there were other studies done in India as shown in "Table 5". The ULN of ASO titers in children in our study was less compared to other studies except the study done in Ujjain were the ULN of ASO titer is less compared to our study.

**Table 5** Upper limit of normal value of ASO titer in children in Indian studies

	Authors	Year	Location	ASO I.U.
1.	M.G. Kamarkar <i>et al</i> <sup>13</sup>	90-91	Mumbai	244
2.	M.G. Kamarkar <i>et al</i> <sup>13</sup>	01-02	Mumbai	305
3.	Sunil Sethi <i>et al</i> <sup>14</sup>	2003	Chandigarh	239
4.	K.B.Mahendrappa <i>et al</i> <sup>15</sup>	2004	Mysore	242
5.	Madaan R <i>et al</i> <sup>16</sup>	2015	Ujjain	200

### CONCLUSION

ASO titer of 212 IU of this study can be considered as the upper limit of normal value. This would prove helpful in the interpretation of elevated ASO titers in cases of suspected GABHS infections and its sequelae. This value is applicable to the paediatric population in and around Chennai. Because specific ULN and GMT may vary for children living elsewhere, establishment of standard values in other areas will require additional studies.

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