WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTÉ

GES/SR/66.4
CVD/RF/66.7
ORIGINAL : ENGLISH

SURVEILLANCE REPORTS

ANTISTREPTOLYSIN O SURVEYS AS AN INDICATOR OF THE PREVALENCE OF STREPTOCOCCAL INFECTIONS AMONG THE POPULATION OF THAILAND, PAKISTAN AND EASTERN NIGERIA

by

Dr J. Rotta,[a] Mr J. Jelinek,[b] Dr K. Zacek,[c]
Dr J. L. de Vries,[d] Dr P. Chanthranetra,[e]
and Dr G. M. Antal.[f]

[a]Dr J. Rotta, Director of WHO International Streptococcus Reference laboratory at the Institute of Epidemiology and Microbiology, Prague.

[b]Mr J. Jelinek, Statistican, Institute of Epidemiology and Microbiology, Prague.

[c]Dr K. Zacek, Director of WHO Serum Reference Bank at the Institute of Epidemiology and Microbiology, Prague.

[d]Dr J. L. de Vries, Medical Officer, Venereal Diseases and Treponematoses, WHO, Geneva.

[e]Dr P. Chanthranetra, Chief Medical Officer, Sub-Headquarters, Korat, Treponematoses Control Project, Division of Venereal Disease and Treponematoses, Department of Health, Bangkok.

[f]Dr G. M. Antal, Medical Officer, WHO Treponematoses Epidemiological Teamleader.

The incidence of streptococcal infections in an area is ascertained by recording manifest cases of streptococcal disease recognized by clinical, epidemiological and microbiological methods. Microbiological diagnosis chiefly consists of the cultivation of group A streptococci, which play a decisive role in the etiology of streptococcal diseases in man. Bacteriological examination is supplemented by serological determination of streptococcus antibodies; the usefulness of serology is due to a high frequency of A. streptococcus carriership in normal subjects.

In estimating the prevalence of streptococcal infections in a given area, use can also be made of immunological surveys of streptococcal antibody levels as an indicator of previous streptococcal infection. The series of cellular and extracellular products of antigenic nature in group A streptococci gives a number of choices as to the particular antibody to serve as such an indicator. The most suitable method is antistreptolysin O determination: an increase in this antibody after streptococcal infection occurs in a high percentage (80%) of individuals, and the method of its determination is relatively well standardized, so that titration results of different laboratories are comparable. An antistreptolysin O increase usually occurs in the second week following infection and culminates between the third and fifth week. Subsequently the level decreases, but the decrease is slower than the rise. An acceptable average limit of normal antistreptolysin O level is 200 units; however, opinions vary on this point and different authors state different values between 100 and 200 units.[1-8] Increased antistreptolysin O levels in developed countries have been reported in 25%[1-6] and exceptionally even in a higher proportion[9-10] of normal subjects. However, the percentage of enhanced values in normal subjects is influenced by a number of factors, such as the agglomeration of population, environmental conditions which facilitate spread of infection in the community, sampling time, age-groups, etc.

Results of antistreptolysin O surveys can be an advantageous supplement to the data on the incidence of streptococcal infections supplied by notification of cases for official statistics or by special studies in defined areas and time.

As compared with advanced countries, our knowledge of the incidence of streptococcal infections and their sequelae in developing countries is scanty or unsatisfactory altogether. Nevertheless, evidence contrary to the prevalent opinion in these regions has been accumulating. A useful tool in collecting information required for estimating the prevalence of streptococcal infections in developing countries are immunological surveys - in particular of antistreptolysin O. For instance, Pomales-Lebron and Bonilla-Soto[11] tested a representative sample of the adult population of Puerto Rico and found antistreptolysin O values comparable to those in the moderate zone; their findings were confirmed in the same areain 1940, as Morales-Otero and Pomales-Lebron report.[12] Salazar-Mallen, Evans and Balcazar[13] tested antistreptolysin O in two groups of normal subjects, one from the tropical, the other from the moderate zone; the frequency of antistreptolysin O levels above 200 units was 35.7% in the moderate zone and 55.13% in the tropical region.

The WHO International Reference Centre for Streptococcus Typing in Prague tested for antistreptolysin O levels collections of sera from normal individuals of Thailand,[a] Pakistan,[b] and Eastern Nigeria.[c] The collections were stored at the WHO Regional Serum Reference Bank in Prague.

Antistreptolysin O was determined according to Liao,[14] i.e. the degree of haemolysis was determined spectrophotometrically and the titre was calculated according to tables from 50% haemolysis. The sera were used in two-step dilution; into each dilution was added one streptolysin O unit and, after neutralization, rabbit blood cell suspension as the indicator of reaction.

---

[a] Collected by Dr J. L. de Vries (WHO Medical Officer), Dr P. Chanthranetra (Medical Officer, Government of Thailand), and Mr L. Arnau (WHO Laboratory Technician) from April to June 1962.

[b] Collected by Dr K. Zacek, WHO Short-term Consultant, in the spring of 1965.

[c] Collected by WHO Treponematoses Epidemiological Team, assisted by national staff.

Table 1 shows the results in 300 sera from Pakistan collected mainly among the urban population of Dacca. An average of 14% of the specimens displayed a significant increase in the antistreptolysin O level - i.e. above 199 units; the highest proportion, 19.2%, was in the age-group of 11-20 years.

Table 2 presents antistreptolysin O findings in a set of 595 sera from Thailand, of rural origin. Titres over 199 units were determined in 20.7% of the specimens, with highest values being obtained in the age-groups of 11-15 (29.3%) and 16-25 years (31.6%).

Table 3 gives antistreptolysin O values in three areas in Eastern Nigeria. Elevated antibodies were found in 47.4% of the sera, the occurrence being highest among the age-groups up to 15 years.

A comparison of the antistreptolysin O levels in Eastern Nigeria by area and age-group is shown in Fig. 1. There were differences in increased level percentages between the areas, which is evidence of a differing incidence of streptococcal infections within the country at the particular time. In the thinly inhabited northern region, for instance, the percentages of elevated antibodies by age-groups were as follow : 3-5 years, 44.5; 6-10 years, 77; 11-15 years, 89; and 16-25 years, 33%. Apparently a new type (or types) of A. streptococcus had been introduced into the non-immune area shortly before the sampling or persisting high prevalence of streptococcal infections had caused there an enhanced number of individuals with high level of anti-streptolysin O.

The following two figures give inter-country comparisons of these anti-streptolysin O findings. Fig. 2 presents the values in the Thailand and Eastern Nigerian collections, showing the different situations. While the Thailand figures are comparable or lower than antistreptolysin O findings in normal subjects in the moderate zone of Europe and the United States of America, the values in Eastern Nigeria are substantially higher. This is also seen in Fig. 3, showing the percentages of increased levels by age-group in all the three countries. The similarity between the Thailand and Pakistan figures is in sharp contrast with Eastern Nigeria. The different process of spread of streptococcal infection in these countries at the time concerned is reflected

by the differences in age-specific maximum frequency of antistreptolysin O elevations. While in Eastern Nigeria this maximum frequency was around 10 years of age, it was between 15 and 25 years of age in Pakistan and Thailand.

These findings indicate beyond doubt that streptococcal diseases are prevalent also in other parts of the world than only Europe and the United States of America; they very probably are important in the tropics as well. The method of immunological surveys is a useful procedure, capable of furnishing valuable information on the incidence of streptococcal diseases in a given geographic area. These findings should be a stimulus for further studies of their relation to the type of clinical manifestations of streptococcal infections (skin infections) and especially to their possible sequelae (rheumatic fever, rheumatic heart disease, ac. glomerulonephritis).

REFERENCES

1. Todd, E. W. (1932) Brit. J. exp. Path., 13, 248
2. Myers, W. K. & Keefer, C. S. (1934) J. clin. Invest., 13, 155
3. Coburn, A. F. & Pauli, R. H. (1935) J. exp. Med., 62, 129
4. Mote, J. R. & Jones, T. D. (1941) J. Immunol., 41, 35
5. Winblad, S., Malmros, H. & Wilander, O. (1947) Acta. med. scand., 196, 553
6. Lagercrantz, R. (1948) Nord. Med., 40, 2143
7. Hollinger, N.F. (1953) Amer. J. publ. Hlth, 43, 561
8. Asiel, M. (1952) Acta clin. belg., 7, 262
9. Rantz, L.A., di Caprio, J. M. & Randall, E. (1952) Amer. J. Med. Sci., 224, 194
10. Akkeren, B. (1952) Acta path. microbiol. scand., 93, 415
11. Pomales-Lebron, A. & Bonilla-Soto, O. (1960) J. A. Einstein med. Cent., 8, 125
12. Morales-Otero, P. & Pomales-Lebron, A. (1940) Proc. Soc. exp. Biol. (N.Y.), 44, 211
13. Salazar-Mallen, M., Evans, M. & Balcazar, J. (1957) Amer. Heart J., 53, 767
14. Liao, S. J. (1951) J. Lab. clin. Med., 38, 648

TABLE 1. PAKISTAN

Antistreptolysin O titre in sera from a sample of population

Age (years)	Antistreptolysin O (units)			Total	over 199	% over 199
	99 or less	100-199	over 200			
-2	6	2	1	9	1	11.1
3-5	22	4	2	28	2	7.1
6-10	19	13	7	39	7	18.0
11-20	38	21	14	73	14	19.2
over 20	94	39	18	151	18	11.9
Total	179	79	42	300	42	14
%	59.7	26.3	14.0	100		

TABLE 2. THAILAND

Antistreptolysin O titre in sera from a sample population

Age (years)	Antistreptolysin O (units)					Total	over 199	% over 199
	99 or less	100-199	200-299	300-399	over 399			
-2	20	8	1	2	1	32	4	12.5
3-5	65	37	10	7	5	124	22	17.7
6-10	90	73	14	16	5	198	35	17.7
11-15	27	60	19	14	3	123	36	29.3
16-25	9	17	9	1	2	38	12	31.6
over 25	35	31	10	1	3	80	14	17.5
Total	246	226	63	41	19	595	123	20.7
%	41.4	38.0	10.6	6.8	3.2	100		

TABLE 3. NIGERIA

Antistreptolysin O titre in sera from a sample of population

Age (years)	Antistreptolysin O (units)					Total	over 199	% over 199
	99 or less	100-199	200-299	300-399	over 399			
A. NORTH - LOW DENSITY OF POPULATION								
-2	4	-	5	-	-	9	5	55.5
3-5	15	5	5	1	10	36	16	44.5
6-10	5	4	16	5	9	39	30	77
11-15	2	1	9	-	15	27	24	89
16-25	5	3	2	1	1	12	4	33
over 25	32	8	21	3	10	74	34	46
B. NORTH - HIGH DENSITY OF POPULATION								
-2	2	1	2	1	1	7	4	57
3-5	21	11	24	4	7	67	35	52.3
6-10	9	11	23	3	11	57	37	65
11-15	8	14	17	6	17	62	40	64.5
16-25	8	10	4	2	3	27	9	33.3
over 25	29	27	17	3	4	80	24	30
C. SOUTH - HIGH DENSITY OF POPULATION								
-2	-	-	1	1	-	2	2	
3-5	10	8	5	1	2	26	8	33.3
6-10	8	6	6	6	4	30	16	53.3
10-15	7	13	7	6	4	37	17	46
16-25	5	9	3	4	2	23	9	39
over 25	50	34	12	14	8	118	34	28.8
Total	220	165	179	61	108	733	348	47.4
%	30.0	22.5	24.5	8.3	14.8	100		

FIG. 1 FREQUENCY (%) OF ELEVATED ASO IN SERA FROM THREE AREAS OF NIGERIA

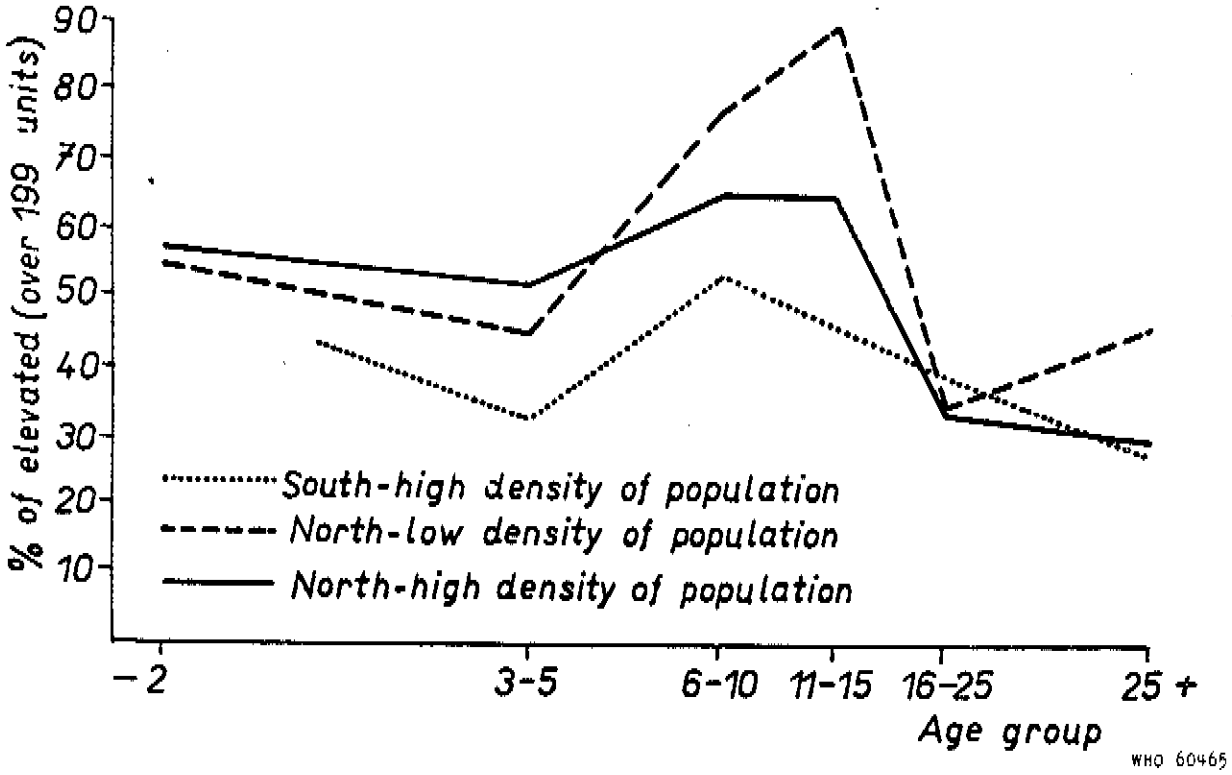

FIG. 3 COMPARISON OF ELEVATED ASO IN SERA FROM NIGERIA, THAILAND AND PAKISTAN