SALMONELLA TYPES FOUND IN SALMONELLOSIS AMONG CHILDREN IN ANKARA

A Study of 115 Strains of Salmonella Isolated from Blood Cultures in Hacettepe Hospital Between September 1957 and September 1960. *

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Introduction

More has been done on salmonellosis in Turkey than on shigellosis. Surveys give an idea of the types of salmonella predominant in big cities such as Istanbul and Ankara. It is not possible to mention individually all the papers dealing with salmonellosis in this country, but for more detailed information, the reader is referred especially to the articles of Akyay,[1] Aksoycan,[2] Alantar and Tümay,[3] Çelik,[4] Erzin and Payzın,[5] Ergene,[6] Payzın,[7] and Tezok.[8]

On the basis of a comprehensive investigation throughout Turkey, and using data gathered by numerous authors on the subject in this country, Akyay[1] reports that up to 1956 a total of 1000 salmonella isolations had been made from people, animals, water and food samples. Eight hundred and sixty-one of these were of human origin and 639 of these 861 were made from blood cultures.

In our laboratory, within a period of three years from the date of our founding, we have been successful in isolating 115 strains of salmonella from blood cultures of patients in our outpatient clinic and in our hospital wards. These 115 strains reflect only single isolations from patients. Repeat isolations from the same child and strains isolated from feces, urine, bones, etc. are not included, nor are clinically and serologically diagnosed and treated salmonellosis cases included in this study.

* Presented before the Fourth National Pediatric Congress, Sept. 28-31, 1960, in Ankara.

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Materials and Methods

Media : For blood cultures 30-40 ml. of Bacto-Tryptose Broth[9] in flasks of 100 ml. capacity were used. (The only difference from the original formula was that it contained 0.1 per cent yeast extract instead of thiamine hydrochloride.) For transfers, tryptose agar was used and it too contained the same amount of yeast extract, in Petri dishes.

Method: 2-5 ml. of blood were introduced into flasks and were incubated at 37 C. for about a week. During the incubation period, three transfers were made onto agar plates at two day intervals. If growth appeared, Gram stained slides were made and Gram-negative strains were first tested with polyvalent salmonella serum on slides. Positive and doubtful agglutinated bacilli were transferred to TSI and Trypton Broth tubes for the determination of basic sugar fermentation reactions and indole production capacities. According to results obtained, on the following day a slide agglutination test was again made using sera of specific groups and thus the types were identified.

All ingredients for culture media were those of Difco products and the sera were Lederle's Commercial Diagnostic Sera. Results obtained were all confirmed by the National Salmonella and Shigella Center. (Dr. Namık Aksoycan, Refik Saydam Central Institute of Hygiene in Ankara.)

Results

The 115 salmonella strains isolated during the past three years were all taken from sporadic cases. There was no epidemic connection among them that we could discover. Yearly and monthly distribution of the strains isolated is shown in figure 1.

From figure 1 it can be seen that all strains isolated belong to two groups of salmonella, that is Group B and Group D. (S. paratyphi-B and typhimurium are from group B, and S. typhi and dublin are from group D.) It is also evident that most of the strains are S. typhi (84), (black spots). This will be discussed later in the text along with opinions of some other microbiologists in Turkey. Other organisms isolated, in order of frequency, were S. paratyphi-B (26), followed by S. typhimurium (4) and S. dublin (1).*

It is also clear that the number of salmonella strains isolated in 1959 and 1960 is practically the same, while that of 1958 is much higher. This is probably explained by small epidemics in the city, since there was no change in materials and methods or the number of blood cultures made during this three year period. The number of blood cultures taken each year is about the same. Since the laboratory

* This was the subject of another article in the Turkish Journal of Pediatrics, Vol. 3:29, 1961, with Aksoycan and Bertan, being the first isolation from a human salmonellosis case in Turkey.

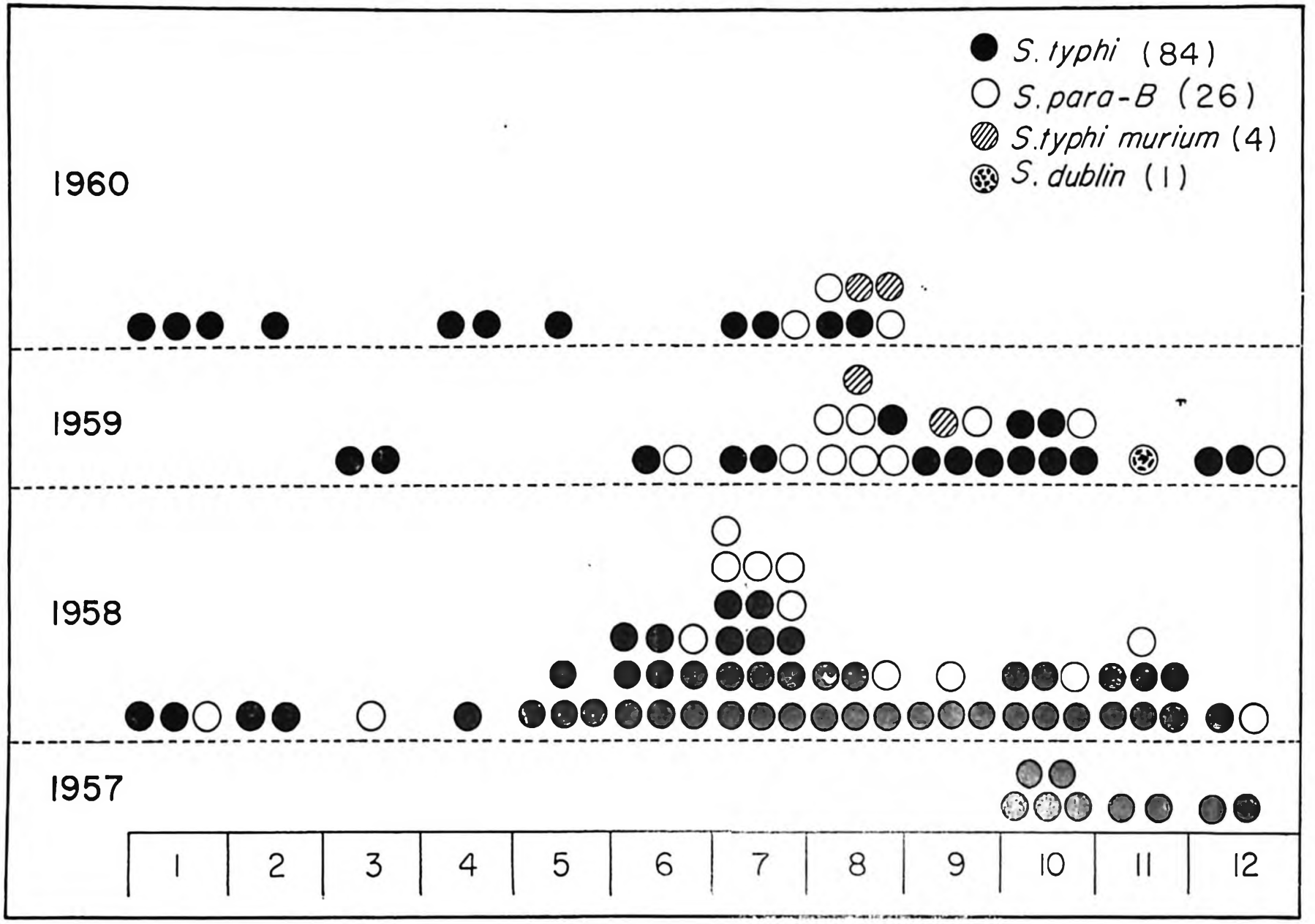

Fig. 1. Distribution of strains isolated by month and year. Each spot is a single strain.

work did not begin until September 1957, no conclusion for that year can be drawn.

The monthly distribution of the isolations is more easily seen in figure 2.

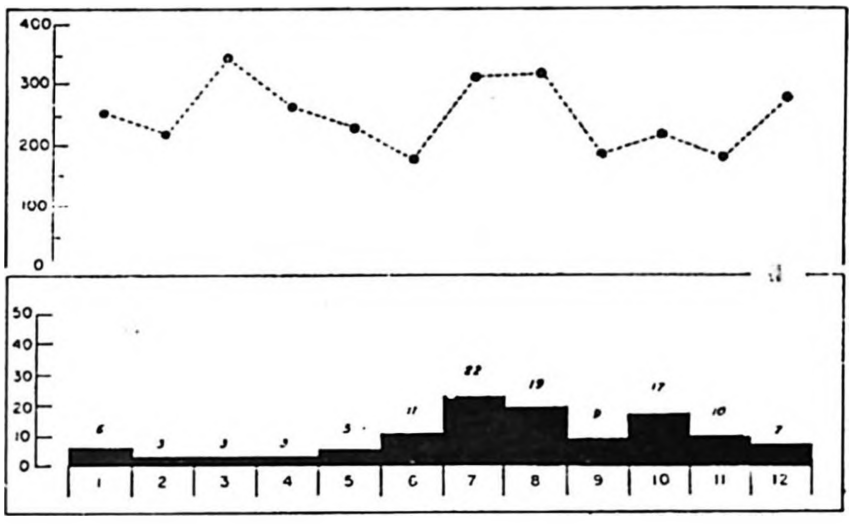

Fig. 2. — Monthly distribution of salmonella isolations for a period of three years. Blocks indicate the total numbers isolated each month, the dotted line shows the total number of blood cultures, the lower left scale is for number of strains, and the upper left scale for the number of blood cultures.

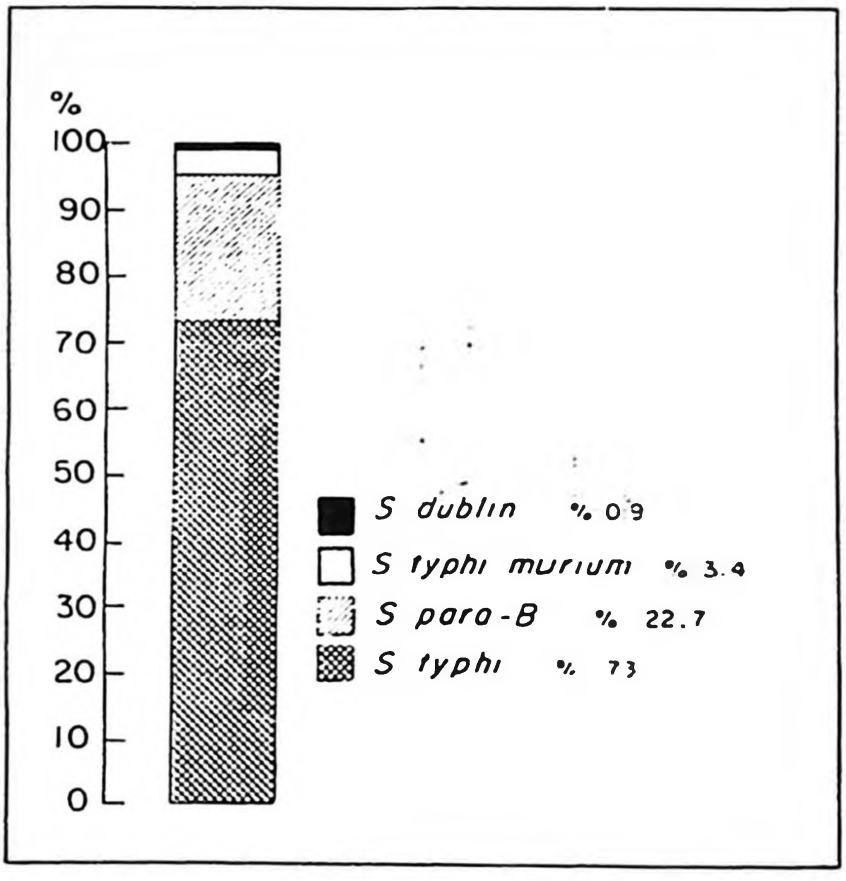

Fig. 3. — Diagram showing the incidence rates computed for 115 strains of salmonella isolated from children in this hospital within the last three years.

From figure 2, it is evident that most of the strains were isolated between June and December, the spring months showing the lowest figure and July having the highest with 22. Secondly, there is a close correlation between the number of strains isolated and the number of blood cultures, except for March and December, where the total number of blood cultures is relatively high and the isolations low.

Figure 1 showed most of the strains to be S. typhi. In figure 3 we summarize the results and give exact percentages of salmonella isolated.

S. typhi occupies the first place, with 73 per cent of the total, then S. paratyphi-B, 22.7 per cent, followed by S. typhimurium, 3.4 per cent, and finally S. dublin, a single strain, 0.9 per cent The total number of S typhi strains is nearly three times as great as the total of the other three strains.

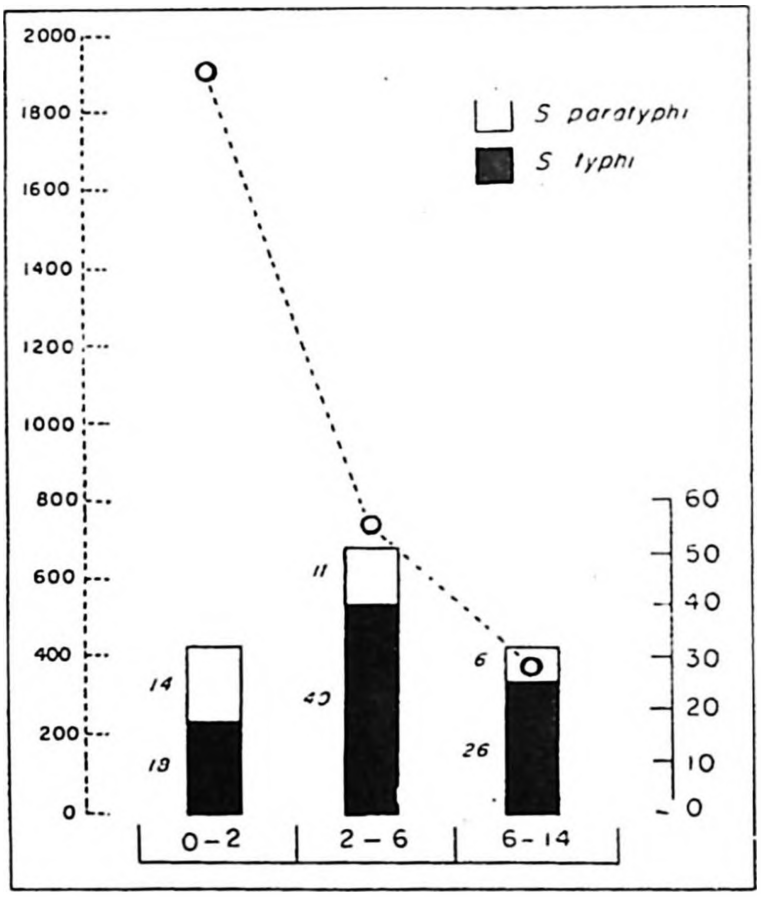

Fig. 4.—The relation between the age groups and the number of strains isolated. The right hand scale indicates the number of strains isolated, the left hand scale indicates the number of blood cultures made for each age group. Blocks indicate the number of bacilli, the dotted line indicates blood cultures. All for three year totals.

Out of 115 strains, 60 were isolated from males and 55 from females. Fourty-four of the 84 S. typhi strains came from males and 40 from females. Similarly, 16 S. paratyphi-B were from males

and 15 from females. There is no evidence of sex differentiation in salmonella isolations.

The correlation between the number of strains isolated and the three main age groups is shown in figure 4.

It is clear that most of the strains (51 out of 115 or 44.3 per cent) were isolated from children 2 to 6 years of age. There were 32 isolations (27. 8 per cent) in the age group 0-2 and in the age group 6-14. From figure 4, it is evident that there was no parallelism between the number of strains isolated and the number of blood cultures made from each of the three age groups. From this we can reason that salmonellosis occurs more frequently among the children in the 2-6 year group than in the 0-2 year or 6-14 year groups in Ankara; however, a final conclusion is not possible on these findings alone.

In contrast to the findings in the other age groups, we find that the 0-2 group shows almost an equal number of S. typhi and S. paratyphi-B strains. Caution is necessary in drawing conclusions from this observation, however. It is our hope that future research will find more trustworthy answers to the questions arising out of this study.

Discussion

Bacteriologists in Turkey have long held to the belief that there were few if any S. paratyphi-A infections among the native population. However, Akyay [1] reported that out of the 1000 strains of salmonella isolated in Turkey prior to 1956, 24 were S. paratyphi-A. All these strains came from human cases and blood cultures. Among the 861 strains of salmonella of human origin, the rate of S. paratyphi-A is 2.7 per cent. Figures 1 and 2 showed that among the 115 strains isolated in our hospital during a three year period, there was not one S. paratyphi-A strain. Since the number of strains isolated is small, it is unwise to disregard the rate of 2.7 per cent however, other workers have reported findings similar to ours. Between the years 1954 and 1957, Aksoycan [10] isolated 57 S. typhi, 126 S. paratyphi-B (Schottmüller) and even the very rare S. reading, S. dublin, S. odense and S. montevideo (all from groups, B, C and D) from rivers and from gastroenteritis cases, and did not find a single strain of S. paratyphi-A. He also reported, in 1959 and 1960, the isolation of 205 strains of S. paratyphi from a stream in Ankara, without finding any S. paratyphi-A. [11] From Aksoycan's reports and our own findings we conclude that in salmonellosis among children in Ankara, S. paratyphi-A plays little or no etiological role, and S. typhi the major role.

The typhoid-paratyphoid ratio is about 1 to 4 in Scandinavian countries, 2 to 3 in Germany, 9 to 1 in Yugoslavia and 8 to 2 in France. Payzın [7] and Aksoycan [8] believe that in Turkey, paratyphoid infections are as numerous as typhoid infections. Akyay[1] reports 647, or 75 per cent, of the 861 salmonella strains isolated from human beings to be S. typhi. Our findings agree with those of Dr. Akyay since we found that the S. typhi strains isolated from children amounted to 73 per cent of the 115 total isolations (figs. 1 and 2). In our opinion, the differences among the findings are due to differences in the sources of isolation, such as water, food samples, stool or blood. Reliable conclusions from the above data cannot be drawn. A greater number of isolations will have to be made.

Salmonellosis is widespread among the children of Ankara; from birth they are exposed to salmonella strains.

Summary

The distribution by age group and season of the year of 115 strains of salmonella, isolated in our hospital over a period of three years, is presented. All strains were isolated from blood cultures of Ankara children under 15.

REFERENCES

1. Akyay, N.: Türkiye'de Salmonella enfeksiyonları, II — Türkiye'de izole edilen Salmonella suşları, Türk İjiyen ve Tecr. Biol. Derg., 16:34, 1956.
2. Aksoycan, N.: Ankara paratifoları hakkında, Türk İjiyen ve Tecr. Biol. Derg., 15:236, 1955.
3. Alantar, İ. H., and Tümay, S. B.: Bizde çocuk ishalleri, kliniği, Toksikoz ve korunma çareleri, Mikrobiyoloji Derg., 4:31, 1951.
4. Çelik, O. Ş.: İstanbulda görülen Tifo epidemisi hakkında tetkikat, Türk Tıp Cem. Mec., 5:228, 1939.
5. Erzin, N., and Payzın, S.: Salmonellaların epidemiyolojisi ve Türkiye'de yayılışları, Türk İjiyen ve Tecr. Biol. Derg., 7:5, 1947.
6. Ergene, N. Ö.; Gıda zehirlenmelerinde Paratifo ve Botulinus basillerinin araştırılması ve yurdumuzdaki yayılışı, Mikrobiyoloji Derg. 1955.
7. Payzın, S.: Muhtelif tiplerdeki salmonella basillerinin Türkiye'de yaptıkları intanlar ve bunlardan çıkarılan pratik sonuçlar, Türk İjiyen ve Tecr. Biol. Derg., 7:47, 1948.
8. Tezok, F.: Türkiye'de Paratifo epidemiyolojisi, 1948. Ankara.
9. Difco Manual of Dehydrated Culture Media and Reagents for Microbiological and Clinical Laboratory Precedures, 9th edit., Detroit, Michigan, 1953.
10. Aksoycan, N.: Ankara'da hastalar ile dere sularından tecrit edilen salmonella'lar ve aralarındaki epidemiyolojisel münasebetler, Türk İjiyen ve Tecr. Biol. Derg., 20:3, 1969.
11. Aksoycan, N.: (Oral Communication), 1960.