Rev. Saúde públ., S. Paulo, 24(2): 108-12, 1990

TYPHOID FEVER IN CHILDREN OF LOW AND HIGH SOCIOECONOMIC STRATA: COMPARISON OF HYGIENE HABITS*

Maria de la Luz Alvarez**
Fanny Wurgaft**
Magdalena Araya**
Julio Espinoza**

ALVAREZ, M. de L. et al. Typhoid fever in children of low and high socieconomic strata: comparison of hygiene habits. **Rev. Saúde públ.**, S. Paulo, 24: 108-12, 1990.

ABSTRACT: The relationship between the hygienic habits of children who had typhoid fever (TF) who had recently begun attending school and their family group, is assessed. It is supposed that children, independently of their SES, acquired TF because of inadequate habits which facilitated the oral-fecal cycle. The sample was formed of 40 child-mother dyads: 20 of low SES (group A) and 20 of high SES (group B), the child of each of which had had TF. Results showed that the hygienic habits of children with respect to the oral-fecal cycle, their perception of school toilet cleanliness as well as the mothers' explanation of their children's hygienic habits is very similar in the two groups. The importance of these results is that the SES is seem to be irrelevant in the case of TF but that the hygienic habits of the children are of importance. Public health policy should be modified to include the teaching of proper hygienic habits (oral-fecal cycle).

KEYWORDS: Typhoid, transmission. Habits. Hygiene. Socieconomic factors.

INTRODUCTION

The diseases transmitted through the fecal-oral cycle, such as typhoid fever (TF), are an index of the environment's microbial contamination.

In Chile the incidence of TF is very high as there were 11,533 cases in 1977 as compared to 6,180 in 1976[6]. More than half of all cases (57.2%) occur in Metropolitan Santiago and its surroundings[10,15]. Since 1983 a vaccination programs has been undertaken in the city of Santiago that has resulted in a considerable decrease in the incidence of the disease[3,5,17].

In comparison with other areas of the country, both the incidence and positive seroprevalence incidence of TF are greatest in Santiago[4]. However, this is the city that has the best environmental sanitation in the country. Sewage network coverage was 83.9% in 1982 and that of the drinkable household water network was 92.6%[13]. These numbers are now even higher as the slums are disappearing, their inhabitants having been moved to houses with all the basic services[1]. The city's drinking water is not contaminated with *Salmonella typhi* (ST) or other enteropathogens, but the Mapocho River, "Zanjón de la Aguada" and other canals which receive waste waters, are. During the dry season these untreated waters are diverted for the irrigation of crops, which are later sold in Santiago[10,16].

This may represent the first focus of contamination since the sewage is not treated and reach, the sea as such. The bivalve seafoods on the coast near Santiago are also reservoirs of ST. If waste water and excreta were treated there would be no ST and other enteropathogens to contaminate food [7,9,16]. This situation increases the risk of contagion if people do not have good hygienic habits.

A second focus of TF contagion in Chile could be carriers (most of them women) in the proportion of 694 per 10^5 inhabitants, also very high. Cholelithiasis is prevalent among them[11]. Another focus of contagion may be interfamily contacts with the patient[14].

The disease is endemic in Chile to all the socioeconomic population strata[4] of the which makes it different from that of other countries. These characteristics suggest that contagion from a commun source of contamination may be related to the hygienic habits of both individuals and family groups, who are unable to avoid the disease.

Age distribution is another important feature, since prevalence increases among children from 4 to 8 years old, i. e., shortly after they go to school, thus leaving the protective family environment.

* Supported by International Development Research Center (Canada) (Grant 3 — P.84.0155).
** Instituto de Nutrición y Tecnología de los Alimentos de la Universidad de Chile — Casilla 15138 — Santiago, Chile.

In this investigation we compared the relationship, between the hygienic habits of children belonging to families of low and high socioeconomic status (SES) who recently began to attend school and who had had TF. Our assumption was that children, independently of their SES, acquired TF because of bad hygienic habits that facilitated the oral-fecal cycle.

MATERIAL AND METHOD

Children who had been in the school system for one or two years were chosen for this investigation. In our social milieu, mothers tend to overprotect preschool children and this situation changes when the child starts to go to school. It then begins to exercise responsibility and receive spending money, mostly for sweets. However, during the first few years the child is not so independent that it can move around as freely (i.e., without its parents checking up on it) as it can later in life. This mobility makes it more difficult to obtain details about possible sources of contagion, the child's hygienic habits and those of its friends and peers. In this sense the child between 7 and 9 years old is under close control because, basically, it remains either at home or at school.

The design of this study is a comparison between mother-child dyads of two different socioeconomical strata. The sample was composed up of 40 mother-child dyads, with a child who had had typhoid fever during the 6 months prior to the study: 20 of low (Group A) and 20 of high SES (Group B). Because people who go to hospitals are generally of low SES, samples were obtained from hospitals located in the central and southern areas served by the Santiago Health Service. These families were characterized by low educational level, unstable employment of the head of the household, low wages and modest home. High SES children were selected from private schools. This group were characterized by high incomes, upper-class heads of households and high educational level[2].

The low SES children are usually hospitalized when they have TF so that they may receive the proper treatment. Thus, hospital records already contained all the necessary medical data and much additional background material which made confirmation of the diagnosis and location of the children and their families possible. In the high SES group the great majority of children received private medical care at home for TF episodes. Therefore, the only possibility of detecting them was through the private schools. Once the name and phone number of the case had been obtained the mother was approached and the case confirmed through the laboratory test records the parents had kept.

In both groups the mother voluntarily accepted participation in this study after its scope and purpose had been thoroughly explained to her. This protocol was approved by the Ethics Committee of the Institute of Nutrition and Food Technology.

Requirements for the child's admission to this protocol were: a) diagnosis of TF made on the basis of a bone marrow or blood or stool culture positive for ST, or a positive Widal reaction plus a CBC count compatible with TF. Either a positive Widal test or a CBC count compatible with the disease was not accepted as the sole criterion for inclusion in the protocol (Table 1); b) the disease should have appeared during the last six months, so that the changes in the child's own hygienic habits would not have been influenced by his normal development.

TABLE 1
Laboratory tests for the diagnosis of typhoid fever in children of low (A) and high (B) SES

Test	A n=20		B n=20		Total
	(+)	(-)	(+)	(-)	(N=40)
Blood culture	15	3	10	9	37
Bone marrow culture	1	1	3	0	5
Stool culture	7	5	0	0	12
Widal 1/80	13	3	10	1	27
C B C*	19		14		33

(*) F $p < .05$ between those who were or were not tested, in the low and high SES.

Cases were, consequently, incorporated into the study as they were detected. Fifteen per cent of children in both groups had been vaccinated against TF. The mother's age was significantly yonger in Group A than in Group B ($p<.001$).

Techniques: a) Index cards were used to record information concerning clinical symptoms and laboratory tests. b) Structured interviews were applied to the child and mother. The first included questions concerning the child's hygienic habits when eating and using the toilet, both at home and at school, purchase of foodstuffs and perception of school toilet cleanliness. The second included questions referring to the child's general hygienic habits. Both interviews were applied by the authors (Alvarez and Wurgaft) including a pre-test that allowed for the testing and improvement of the instrument. c) The modified Graffar scale was used to confirm the socioeconomic strata [2].

Data Analysis: The data were analyzed considering each item as to simple variables or by grouping them in indices. The indices were:

a) "Socioeonomic Strata (SES)" : this was composed of 3 variables: schooling, activity of the head of the household and housing. This last var-

iable consisted of 5 indicators (ownership of housing, quality, water supply, sewage, and goods), which formed a subindex, thus giving the housing score. The total of the values of the three variables (schooling, activity and housing) gave a score expressed on a scale from 1 to 6 points, with the rating of 1 being the highest and 6 the lowest. The sample studied gave between 1 and 2 for the high SES group and between 4 and 5 for the low SES.

b) "The Act of Eating", composed of 6 variables (washes hands before lunch, eats with the same spoon as his sibling, eats and/or passis the same fruit, sweet or chewing gum from mouth to mouth at home and at school), has a maximum score of 12 and a minimum of 0, this latter representing the best hygiene.

c) "The Child's use of the Bathroom" (at home, when defecating), composed of 7 indicators (does not dirty the toilet seat, uses toilet paper, does not dirty itself when wiping, flushes the toilet, washes its hands after use of toilet, washes them with soap, dries hands with towel or paper), has a maximum score of 14 points and a minimum of 0, this latter representing the best hygiene.

d) "The use of the school toilet facilities" composed the same 7 indicators as c) above.

e) "Child's perception of hygiene of school toilet facilities" composed of 3 indicators (how the child perceives the cleanliness of the bathroom, the toilet seat and the edges of the toilet bowl). The highest score was 6 and the lowest 0; this latter representing the best hygiene.

f) "Purchase of candies by the child" was made up of 4 indicators (swets industrially wrapped, wrapped or without wrapping at the time of purchase, and frequency of purchase of these items). Maximum score was 8 and minimum 0; the lowest number of points corresponding to the best quality of hygiene.

g) "Material perception of the child's hygienic habits", composed of 5 variables (mouth to mouth food interchange, using the same spoon or fork as other family members when eating, panties soiled with feces, using toilet paper after going to the toilet, nail-biting), has a maximum score of 10 and a minimum of 0; this latter representing the best hygiene.

RESULTS

Analysis of the individual variables as well as of the indexes showed that there were no differences between Groups A and B in relation to hygienic practices during the act of eating, the use of the toilet at home and at school, or the child's perception as to the hygiene of school toilet facilities.

The purchasing habits of the children as regards sweets and related products are shown in Table 2. Children beloging to the low SES purchased significantly more unwrapped sweets and candies than those of high SES. Only 30 per cent of low SES children had an adequate purchaing index as against 75 per cent of those of high SES.

TABLE 2
Childrens habits related to the purchase of sweets and similar products in low (A) and high (B) SES children who had had typhoid Fever (N=40)

Purchase	A (n=20) %	B (n=20) %	F
Items wrapped at the time of purchase *	27.8	23.5	ns
Without wrapper *	66.6	11.8	p<.001
Adequate Purchase Index(0-2 points)	30.0	75.0	p<.01

* Two cases in Group A and three in Group B did not buy anything, whether sweets, biscuits or candies.

The child's hygiene habits as seen by the mother is shown in Table 3. The dirtying of underclothes with feces was significantly more common in low SES children(p<.001), but the general level of behavior expressed by the index showed no differences.

TABLE 3
Some hygienic habits of the child's related to the fecal-oral cycle as seen by the mother in children of low (A) and high (B) SES who had had typhoid fever (N=40)

Indicators	A (n=20) %	B (n=20) %	F
Mouth – to – mouth food interchange	30	35	ns
Underclothes dirtied with feces	80	40	p < .001
Child's Adequate Hygienic Habits Index (0-3 points)	60	65	ns

The mother's perception of hygiene in the child's use of the toilet revealed only one difference: the toilet bowl was significantly dirtier around the edges in Group A than in Group B. The perception of others, behavior, such as splashing urine around the toilet floor and the like, and

flushing the toilet, is very similar, as it is of the right behavior expressed by the Hygiene Index. (Table 4).

TABLE 4
Children's habits in using their home toilet as seen by the mother in children of low (A) and high (B) SES who had had typhoid fever (N=40)

Indicators	A (n=20) %	B (n=20) %	F
Dirty edges of toilet bowl	70	35	p <. 05
Splash urine and the like around toilet floor	65	70	ns
Flush toilet after use	65	50	ns
Adequate Hygiene Index (0-3 points)	55	75	ns

DISCUSSION AND CONCLUSIONS

Contamination by ST takes place through the fecal-oral cycle. The indirect pathways or vectors such as raw green vegetables, drinking water, food handlers, asymptomatic carriers and patients had been investigated in the past [13,14,16,17]. On the contrary, few studies were carried out concerning the contamination that may exist in the subject's environment and reflect his family's hygienic habits.

The aim of this study was the identification of the forums of behavior that facilitate the fecal-oral cycle and which may lead to contagion, either as TF or as enteric infections. For this purpose patients and their families were carefully selected: all children included showed ST positive blood and/or bone marrow and/or stool culture. There were, therefore no doubts as to the diagnosis.

The fact that the mothers of low SES were younger than those of high SES could be considered important from the point of view of health care. However, the results of further comparable group of high SES showed no differences between them. The results of the study of this further group will be presented elsewhere.

Fifteen per cent of the children had been immunized against TF with Ty 21A. This frequency of failure is within the ranges found by Levine and Ferreccio in studies carried out in Santiago[12]. The hygienic habits of these children in relation to the fecal-oral cycle were very similar in both studies.

With regard to the use of bathroom facilities on would expect that in the high SES, whose members have adequate facilities, the proper use of the bathroom would be obvious, but this was not the case. The use of the school toilet did not differ from on group to the other and this is understandable because the general of the condition toilets was deficient in both cases. The children did not wash their hands with soap because it was not available at school. Less than a third of the children considered the school toilet to be clean as compared with their facilitates at home.

Studies on children's purchasing habits had been carried out previously[4] and their results coincide with obtained, in this present study, from children with TF. This refers to the purchase of sweets that had no wrapping at the time of purchase. (Table 2). This finding could be explained by the fact that low SES children were more exposed to the sale of products that had not been checked by the Health Service. These items are sold near schools by street vendors and are exposed to flies and handled both by the seller and the children.

The hygienic habits that the mother perceived in her child were similar in both groups, except when referring to the care that the child took after using the toilet (Table 3). This could mean a lesser effort on the part of the low SES mother in teaching proper personal cleanliness as for example, in avoiding the soiling of underwear. This perception was confirmed when the mother explained how her children used the toilet. The low SES mothers confirmed that their children used the toilet very sloppily and dirtied the bowl's edges more frequently, as compared to the reports of high SES mothers related (Table 4).

All these results show the importance of proper hygienic habits in avoiding diseases, the path of contagion of which is through the fecal-oral cycle[8]. In our study the SES appears irrelevant when habits are poor. With regard to this type of disease Public Health Services should develop programmes, through outpatient clinics, aimed at improving family hygiene practices.

ALVAREZ, M. de L. et al. Febre tifóide em escolares de estratos sócio-econômicos baixo e alto. **Rev. Saúde públ.**, S. Paulo, **24**: 108-12, 1990.

RESUMO: Objetiva-se estudar e avaliar os hábitos de higiene de crianças que já freqüentavam escola por um ou dois anos e que recentemente tiveram febre tifóide. Levantou-se a hipótese de que as crianças, independentemente do nível sócio-econômico, teriam adquirido febre tifóide devido as seus inadequados hábitos de higiene, os quais facilitariam o ciclo fecal-oral. A amostra foi formada por 40 díadas (mae-filho): 20 de baixo nível sócio-econômico (grupo A) e 20 de alto nível sócio-econômico (grupo B) que haviam tido febre tifóide. Os resultados indicaram que os hábitos de higiene das crianças em relação ao ciclo fecal-oral, as observações sobre a limpeza do toalete e as explicações das mães a respeito dos hábitos higiênicos de seus filhos, são muito semelhantes em ambos os grupos. Os resultados sugerem ser irrelevante o nível sócio-econômico, no caso da febre tifóide, mas que os hábitos de higiene são importantes. Sugere-se que as políticas de saúde pública sejam modificadas, incluindo o ensino de hábitos de higiene adequados, principalmente aqueles que se referem ao ciclo fecal-oral.

DESCRITORES: Febre tifóide, transmissão. Hábitos. Higiene. Fatores sócio-econômicos.

REFERENCES

1. ALVAREZ, M. de L. & WURGARFT, F. Changes in hygienic habits in food preparation facilities to use water. *Canad. J. publ. Hlth*, **78**: 43-6, 1987.

2. ALVAREZ, M. de L.; MUZZO, S.; IVANOVIC, D. Escala para medición del nivel socioeconómico en el área de la salud. *Rev. med. Chile*, **113**: 243-52, 1985.

3. ANUARIO DE ENFERMEDADES DE NOTIFICACIÓN OBLIGATORIA. (Ministerio de Salud). Santiago, Chile, 1977-1980.

4. BLACK, R. E.; CISNEROS, L.; LEVINE, M.; BANFI, A.; LOBOS, H. & RODRIGUEZ, H. Case control study to identify risk factors for pediatric endemic typhoid fever in Santiago, Chile. *Bull. Wld Hlth Org.*, **63**: 899-904, 1985.

5. BOLETÍN DE VIGILANCIA EPIDEMIOLÓGICA. (Ministerio de Salud). Santiago, Chile, **9** (11-12), 1981; **10** (12), 1982; **11** (12), 1983-1984; **12** (12), 1985; **13** (12), 1986.

6. CABELLO, F.; AGÜERO, M. E.; FERNÁNDEZ, M. E. Epidemia de fiebre tifoídea en Chile: aspectos ecológicos y microbiológicos. *Rev. med. Chile*, **112**: 826-8, 1984.

7. CRITES, R. W. & UIGA, A. An approach for comparing health risks of wastewater treatment alternatives. Washington, D.C., Environmental Protection Agency, 1979. (Publication EPA 430/9-79-009).

8. EDELMAN, R. & LEVINE, M. Summary of an International Workshop of Typhoid Fever. *Rev. infect. Dis.*, **8**: 329-49, 1986.

9. FEACHEM, R. G.; BRADLEY, D. J.; GARELICK, H.; MARA, D. D. *Health aspects of excreta and wastewater management. Part 1: review and analysis*. Washington, D. C., The World Bank, 1978.

10. FERRECCIO, C. Estudio de la *Salmonella typhi* en cursos de agua de la ciudad de Santiago Santiago, 1983. [Tesis Magister en Salud Pública — Universidad de Chile].

11. LEVINE, M.; BLACK, R.; LANATA, C.; SCHUSTER, A.; RODRIGUEZ, H.; RISTORI, C.; LOBOS, H.; BORGOÑO, J. – M.; VICENT, P.; MORALES, A. Precise estimation of members of chronic carriers of *Salmonella typhi* in Santiago, Chile, an endemic area. *J. infect. Dis.*, **146**: 724-6, 1982.

12. LEVINE, M. & FERRECCIO, C. Vaccines against typhoid fever. [Apresentado ao Simposio Internacional Fiebre Tifoídea, Santiago, Chile, 1987].

13. MONREAL, J. Cobertura de agua potable y alcantarillado 1983; Informe. Santiago, Depto. de Programa sobre Ambiente. Ministerio de Salud, 1983.

14. MORRIS, J. G.; FERRECCIO, C.; GARCÍA, J.; LOBOS, M.; BLACK, R. E.; RODRIGUEZ, H.; LEVINE, M. Typhoid fever in Santiago, Chile: a study of household contacts of pediatric patients. *Amer. J. trop. Med. Hyg.*, **33**: 1198-202, 1984.

15. PALOMINOS, C. & AGUAD, L. Bacteriología clínica. In: Seminario Fiebre Tifoídea en Chile. Santiago, Chile, Ins-tituto Bacteriológico, Edit. Dept. Inmunología, 1978. p. 11-15.

16. SEARS, S. S.; FERRECCIO, C.; LEVINE, M. M.; CORDANO, M. A.; MONREAL, J.; BLACK, R. E.; D'OTTONE, K.; ROWE, B.; SCHUSTER, A.; RODRIGUEZ, H.; LOBOS, H.; BORGOÑO, J. -M.; RISTORI, C. The use of Moore Swabs for isolation of Salmonella typhi from irrigation water in Santiago, Chile. *J. infect. Dis.*, **149**: 640-2, 1984.

17. TORO, A. & RISTORI, C. Enfermedades transmisibles: morbilidad notificada para algunas enfermedades transmisibles, Chile 1977-1986. *Bol. epidemiol.*, **14**(1): 2-7, 1987.

Received for publication: 26/6/1989
Reviewed in: 15/12/1989
Accepted for publication: 2/1/1990