

Typhoid fever in Tonga

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Introduction

Typhoid fever is endemic in Tonga.^{1,2} It has experienced high incidence and several epidemics of typhoid fever over the last century. These were the reasons Tonga was selected for typhoid vaccine trials in 1960s.³ A study of a village in Tonga in 1995 showed an incidence rate of 316/100,000 for typhoid.⁴

The Government of Tonga is aware of the negative social, economic and health consequences of typhoid fever. However, despite local initiatives to control typhoid and several overseas consultants, significant outbreaks of the disease continued to recur more frequently during the last twenty years

In view of the worsening situation, this paper will review the literature and the existing Ministry of Health database to examine the trend of typhoid fever in Tonga over a period of twenty years (1978-1997) with an aim of examining how the disease evolved over these years in order to suggest a more effective prevention and control strategy.

Background

The Kingdom of Tonga consists of 150 islands which is a total of 697 km² scattered over 46,620 km² of the South Pacific Ocean. The total population is estimated to be 100,000. This population is predominantly Polynesian. The Tongan society is highly structured and stratified with a formalized system of relationships which determine many aspects of obligation and opportunity.

There are three main groups of Islands. They include Tongatapu (main Island), Vava'u and Ha'apai. Tonga has a primarily subsistence agricultural economy with dependency on remittance from Tongans overseas. One hundred percent of its population is served with safe water systems and 80% with adequate sanitary facilities.⁵ However, despite these, over-population, land shortages, migration, lack of natural resources plus other social, cultural and environmental factors have contributed to poor health.

Epidemiology of typhoid

The emergence of old and new communicable diseases is an important public health problem in both industrialized and developing countries worldwide.⁵ In many developing countries the most striking epidemics are the recurrence of diseases like typhoid fever.^{3,4} Numerous studies revealed that the most common factors responsible for many typhoid outbreaks include: increased number of chronic carriers of *Salmonella Typhi*,^{6,7,8} lack of micro-biological food controls, and the high consumption of food, sea foods and drinks contaminated with *Salmonella Typhi*.^{9,10} The increase of typhoid also coincides with increased rainfall, rapidly deteriorating economic and social conditions manifested in high rates of unemployment, migration to and from affected areas¹² and decreased government investments in sanitation and health.^{6,11,12}

Studies have revealed that despite other public health measures, the identification of unrecognized healthy carriers should be a priority strategy.¹³ Other studies also suggested that effective prevention strategies include the maintenance of high environmental sanitation, proper and effective surveillance systems, active search for fever during outbreaks, isolation of infected persons and moreover the administration of mass typhoid vaccination programmes.¹¹

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Table 1. Incidence of typhoid fever in Tonga, 1956-1997*

Year	No. of cases	Rate/100,000 population	Year	No. of cases	Rate/100,000 population
1956	298	534	1977	31	34
1957	117	202	1978	15	16.3
1958	58	97	1979	52	52.2
1959	106	171	1980	51	54.6
1960	215	338	1981	45	47.7
1961	167	253	1982	21	22.1
1962	233	338	1983	8	8.3
1963	288	411	1984	3	3.1
1964	208	289	1985	28	28.9
1965	239	323	1986	38	40.1
1966	190	250	1987	18	18.8
1967	51	65	1988	93	97.3
1968	29	37	1989	12	12.5
1969	43	53	1990	8	8.2
1970	68	83	1991	1	1
1971	119	143	1992	13	13.2
1972	141	167	1993	13	13.2
1973	100	117	1994	40	40.6
1974	116	133	1995	65	65.6
1975	35	40	1996	14	14.3
1976	41	46	1997	16	16.3

* Reference 16

Other studies also indicated that dramatic reductions in the incidence of typhoid fever was mainly due to greater awareness of food hygiene, effective vaccination¹⁴, priority action to identify chronic unrecognized carriers^{6,7}, implementation of health promotion and education campaigns especially during the summer months when food-borne diseases are most predominant¹⁵. Also, the prevention and control of population mobility and migration to and from affected areas during typhoid epidemics should effectively be controlled.

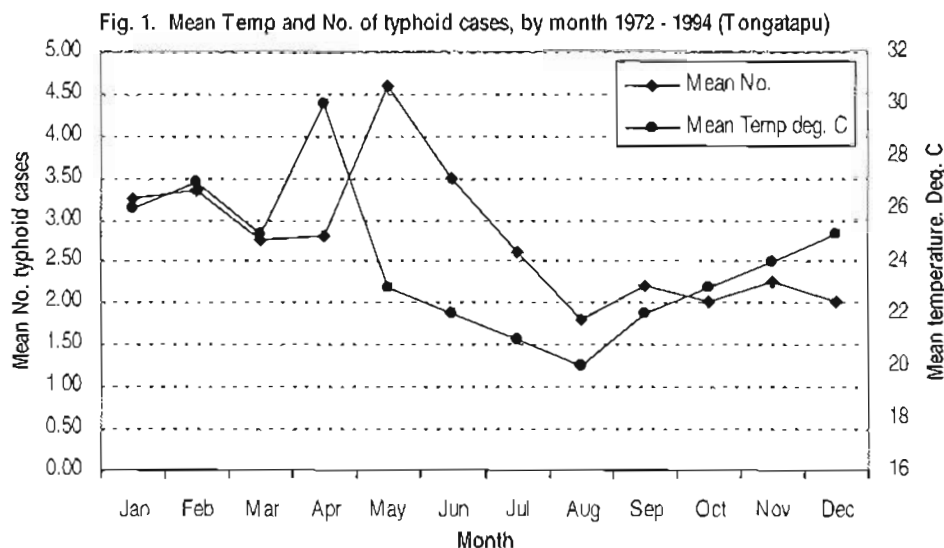
A review of the literature will help to facilitate the development of and an improvement of national framework and action strategies to address typhoid fever in Tonga. This study is a review of the infectious disease database at Communicable Diseases section of the Ministry of Health, Tonga.¹⁶ Other epidemiological information was also gathered from the various reports of the Ministry of Health and by WHO consultants who visited Tonga during the last

twenty years. The routinely collected data recorded was incomplete and very limited

Ministry of Health database after 1978

During the last twenty years the incidence averaged 28.7 per 100,000 population with periodic outbreaks continuing to occur throughout the country.¹⁵ Table 1 shows cyclical fluctuations of the incidence rate in the early and late 1980s, and 1994/95.

According to WHO reports¹⁷, the most extensive and thoroughly investigated outbreak occurred during 1988 and 1995 on the main Island of Tongatapu. In 1988 most typhoid cases were recorded during the period May and June. The incidence rate of typhoid was higher in females than males and most patients were children and adolescents up to 19 years. About 45% of the total number of



typhoid cases originated at the Tokaikolo makeshift settlement at Tofoa (a village in Tongatapu).

The 1988 outbreak in Tongatapu was preceded by increased incidence in the outer Islands that include 'Eua, Vava'u and Ha'apai⁴. The increase in the 1988-1990 incidence of typhoid fever was probably due to faecal-oral transmission through close contact of susceptible individuals with carriers or due to contaminated food¹⁶.

Table 1 also showed that the incidence of typhoid increased dramatically during 1994 and 1995. The rate increased from 40.6 per 100,000 population in 1994 to about 65.6 per 100,000 population in 1995. According to the Tonga Ministry of Health Report⁵, this was sparked by a healthy carrier that worked as a housemaid at a local businessman's residence. There is clear evidence that most confirmed typhoid cases occurred during the month of May and June when most public festivities occur e.g. annual events such as Church Conferences, Children's Sunday, Mothers' Day, Fathers' Day. The critical part of these events is the mass production of abundant food. Foods are prepared in households before delivery to the feast areas. Again, the period from May to August in Tonga (Fig. 1) is the driest period of the year, hence a correlation between the increased incidence of typhoid and those months. Other WHO Reports^{8,16} also indicated that both the months of January and February every year showed relatively higher incidence of typhoid than the other months, except May and June. This increase is mainly due to the increase in people travelling between villages, towns and islands during Christmas, New Year and the Prayer Week (first week of January).

Typhoid in Tonga before 1978

In the years 1956-1965 the average incidence of typhoid was 289 per 100,000.¹⁸ During the years 1967-1970 a five fold decline in incidence was recorded. The average inci-

dence during this period was 60 per 100,000. However, 1971-1974 an increase of incidence was seen, up to 140 per 100,000. After 1974 a decline was recorded for the second time. The incidence averaged 39 per 100,000 (see Table 1).

The decreased incidence from 1964 was due to better diagnosis and treatment as well as the introduction of monovalent typhoid vaccine. The vaccine trials were done in Tonga³, followed by a special WHO typhoid programme in 1964.

Typhoid fever control efforts

In 1988 a WHO Epidemiologist¹ evaluated the typhoid epidemic control procedures in Tonga. As a result guidelines including measures for controlling the disease and improving food hygiene were developed. In 1990 a WHO consultant examined the methods of typhoid fever transmission and surveillance which was believed to be the shortfall. An active surveillance system was developed and a comprehensive typhoid fever control plan was adopted in Tonga^{1,2}. During the same year another WHO consultant evaluated the typhoid problem in Tonga². This report emphasized the importance of integration of food safety into the typhoid fever prevention and control programmes. Consultants again visited Tonga during 1991 to review and follow up recommendations proposed by previous visiting consultants³.

Discussion

The incidence of typhoid in Tonga has markedly declined since 1956, but the rates are still high compared to countries similar to Tonga.¹ So far faecal-oral transmission of typhoid infection through the contact of susceptibles with carriers or via contaminated food rather than water, contributed to this high incidence and typhoid endemicity in Tonga.

The experience with typhoid in Tonga showed similar patterns of epidemiology, prevention, control, treatment and management of typhoid in other countries. According to the present knowledge, it seems that sanitation, water supply, safe food handling and immunization are considered to be the most powerful tools in the control and prevention strategies of typhoid fever. However, in spite of the local adoption and implementation in Tonga of the recommendations by different experts, the incidence of typhoid still remains high in Tonga (average rate: 28.7 per 100,000 population) during 1978-1997.

There is no doubt that the various contributions by international agencies to prevent and control typhoid fever in Tonga is appreciated. However this paper argues that after reviewing the various reports perhaps a more culturally democratic approach to the control of this disease would be more effective. This means that the Tongans should have been empowered during the last twenty years to be responsible totally for the control of typhoid instead of the obvious dependency on expatriate consultants funded by external sources.

It seems that through these years, Tongans were told what to do, based on the prescription by the overseas experts and consultants. When these experts left the country, they created a vacuum which attracts another expatriate job seeker. The small geographic and population size of Tonga should expedite the awareness of typhoid and its contributing factors. However, the high incidence suggests that control of typhoid needs political commitment to and government action on socio-economic determinants of health.

Since the main contributing factor to the endemicity of typhoid fever is faecal-oral transmission, the prevention and control strategies should aim specifically at identifying the unknown chronic healthy carriers, as well as organising community based health education campaigns to break the transmission cycle of the disease. Such local campaigns should be community owned, locally organised and implemented. For example anti-flies campaigns can easily be organised. In the long run such campaigns will be cheaper and it will also reduce the problems and difficulties related to surveillance of chronic typhoid carriers. This strategy requires commitments from government as well as families, communities, relatives, friends and individuals in villages. Further, it will also require the support from every hospital, clinic and health centre in Tonga

Finally, it is envisaged that local qualitative and quantitative research by Tongans to identify the sociocultural as-

pects of typhoid should be conducted. Further research in other areas of the control and prevention of the disease should also be implemented. An important area for research is the economic impact of typhoid on tourism, food export and local productivity.

Conclusion

Tonga's socioeconomic developments will continue to be affected if government continues to be haphazard about control of typhoid fever. This paper suggests that a new vision for typhoid control needs to be developed. Such a vision should emphasize community development rather than the current medical model. Tonga has the potential to locally control, own and provide leadership in its national typhoid prevention and control programmes. Local experiences have indicated that nationals have depended too much on overseas advice by experts and consultants and this has resulted in the status quo.

Therefore, in order to reduce the incidence of typhoid fever in Tonga, this paper suggests the following recommendations.

1. That Tongans be empowered to own control and manage local prevention and control programmes on typhoid fever through a community development approach.
2. That the Ministry of Health consolidate current activities related to the control and management of typhoid and then develop a new vision and national intervention strategies dependent on local expertise and human resources.
3. That if the Government of Tonga seeks external funding to support prevention and control programmes that all phases of such a programme be locally led, managed and controlled.
4. That the Government of Tonga utilizes local public health experts and consultants who may be available either locally or overseas and who would better understand the Tongan culture and traditional practices that contribute to the prevention and control of typhoid fever.
5. That special plans and strategies be developed by the Government to address the socio-economic determinants of health in Tonga. For example, the Government should develop short and long term plans to improve

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- housing, employment, environmental health and income so that people can improve their health and well-being through empowering processes.
6. That the Ministry of Health considers the importance of decentralizing good quality health care services from central hospitals to health centres to also cater for all services including typhoid care services. In other words, more doctors be placed at the health centres and health officers be transferred back to the hospitals. This restructuring will also facilitate activities and attract resources to address and identify healthy carriers in the villages.
 7. Since there is limited information available on typhoid in Tonga, more research should be conducted by nationals on social and cultural issues related to typhoid. These studies will not only benefit local prevention and control programmes, but will also provide learning experiences and ownership by Tongans, of such studies.
 8. That the Government considers the importance of developing short and long term local and overseas training plans for local personnel to be further developed in the field of communicable diseases especially the management and control of typhoid fever. This strategy will further empower Tongans to be self-reliant and control prevention programmes more effectively.
 9. Since the main mode of transmission of typhoid infection is faecal-oral, with predictable seasonal variations, specific target campaigns should be organised locally by the Ministry of Health to break the transmission chain of the disease. Use of low cost and environment friendly technology should be employed e.g. fly traps, village inspections and women's committees.
 6. Cabello F, Springer AD. Typhoid fever in Chile 1977-1990 - an emergence disease, *Revista Medica de Chile* 125 (4) : 474-82, 1997
 7. Cote TR, Convery H, et al. Typhoid fever in the park - epidemiology of an outbreak at a cultural interface, *Journal of Community Health*. 1995; 20 (6) . 451-458.
 8. Cuboni G. *WHO Report on a field visit to Tonga (15-24 August 1988)*.
 9. Downey D, Anzimit JC, Ellis Pegler RB. Salmonella Typhi infection in adults is not limited to travellers returning from the tropics. *New Zealand Medical Journal*. 1996; 99 (804) : 443-6.
 10. Stano G. Epidemiology of the spread of salmonellosis in the region of Bari, Italy, *Giornale di Batteriologia, Virologia Ed Immunologia*. 1982; 75 (7-12) . 369-72.
 11. Xercavins M, Llovet T, et al. Epidemiology of an unusually prolonged outbreak of typhoid fever in Terrassa, Spain. *Clinical Infectious Diseases* 1997, 24(3) 506-510.
 12. Winkelstein W, Jr. Observation on the history of epidemiology in Western New York, 1843-1960. *American Journal of Epidemiology*. 1997 146 (11) : 896-906.
 13. Carmeli Y, Schapiro JM, Alkan M. Immigration of Ethiopians with typhoid fever to Israel . apparent lack of influence on the local population, *Clinical Infectious Diseases* 1994; 19 (6) : 1144-6.
 14. Yew FS, Goh KT, Lim YS. Epidemiology of typhoid in Singapore. *Epidemiology and Infection*. 1993; 110 (1) . 63-70.
 15. Rios M, Garcia JM, Cubedo M, Perez D. Time series in the epidemiology of typhoid fever in Spain. *Medicina Clinica*. 1996, 106 (18) 686-9.
 16. Lutui T. *Report to WHO on typhoid in Tonga. Ministry of Health Tonga* 1999.
 17. Mahoney DB. *WHO Mission Report on Hazard Analysis Critical Control Point (HACCP) in Typhoid fever Control in Tonga (6-17 July 1992)*.
 18. Ministry of Health *Health Problems in the Kingdom of Tonga in the Years 1956-1982*. Tongatapu, 1984.

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References

1. Markwart. K. *WHO Report on a field visit to Tonga (7-12 April 1990)*.
2. Kopecky. K. *WHO Mission Report on Epidemiological surveillance and Disease Control, Tonga (30-31 January 1991)*.
3. Tapa S, Cvjetanovic B. Controlled field trial on the effectiveness of one and two doses of acetone-inactivated and dried typhoid vaccine, *WHO Bulletin*, 52(1) . 75-80, 1975.
4. Tangitau A. Typhoid in a Tongan Village. *Pacific Health Dialog*, 3(2) 1997, 208-210.
5. *Tonga Ministry of Health Annual Report, 1996*.