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Original Article

Epidemiology of Typhoid Fever in Iran during Last Five Decades from 1962-2011

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Abstract

Background: Typhoid fever is one of the most important infectious diseases transmitted by contaminated food and water. This study aimed at epidemiological features of disease during the last five decades, over the period from 1962-2011.

Methods: A retrospective cross-sectional study was conducted using typhoid fever national surveillance data.

Results: The highest incidence of typhoid fever was registered in 1965 with 133.4 /100,000 cases/year and the lowest in 2011 with 0.52/100,000 cases/year. Typhoid fever incidence in Iran had three phases. Before the year 1969, with high incidence >100 (phase 1), the period between1969-1996 with medium (10-100), (Phase 2) and the phase 3 has inaugurated from 1996 until now with low incidence rate less than 10 /100,000. Kermanshah Province was the most infected area. Most cases were occurred in warm months in 2010. Of 196 (31%) cases were under 15 years old whom were more affected. 53.6% of total cases in 2010 were female and 56.6% stayed in rural area. In 2010, 27.8% cases were confirmed. Among positive cases, the sources of culture were 46.8% stool, 37.2% blood, 14.6% urine and 1.2% bone marrow. Following treatment, 97.8% of cases were recovered completely and in 1.6% of cases had experienced complications and only 0.6% of confirmed cases have been died.

Conclusion: As a result of development in socio-economic condition in Iran, the typhoid fever incidence has been dramatically declined from high (133.4/100,000 cases/year) in 1965 to low (0.52/100,000 cases/year) in 2011.

Introduction

The annual incidence of typhoid fever is estimated to be about 16 million illnesses and 600,000 deaths (1). The World Health Organization has estimated that typhoid fever caused 21,650,974 illnesses and 216,510 deaths during 2000 (2). Although typhoid fever is not common in industrialized countries, it is an important health issue in developing countries. For example, very high typhoid fever incidence has been found in India and Pakistan (3), south-central Asia and south-east Asia, Africa, Latin America (1-4). Typhoid causes high mortality rate in some region like Tanzania, quite often complicated with malaria co-infection leading to diagnostic difficulties and high mortality (4). A population based surveillance indicates moderate typhoid fever incidence in Egypt which was 59/100,000 case/year (5), and in Philippines 26.9/100,000 (6), in Mekong delta region of Vietnam reported high incidence rate of 195/100,000 case per year (7).

Typhoid fever, an infection caused by *Salmonella* enteric serovar typhi and serovar paratyphi A. Ingestion of contaminated food and water is the most common route of disease transmission (8-10). The widespread prevalence of multidrug-resistant strains is a great concern (11). Emerging

multidrug-resistance Salmonella typhi is on increasing and most of antibiotics such as fluoroquinolones and azithromycin have been become ineffective (12-14).

Iran is one of the endemic areas for typhoid fever and it was a major public health problem in the past. This study carried out on epidemiology of typhoid fever in Iran during five last decades from 1962-2011.

Methods

A retrospective, cross-sectional study was carried out by using typhoid fever national surveillance system collected data during fifty years from 1962-2011. All suspected, probable and confirmed cases data and results of sporadic and outbreak investigation have been reported by questionnaire to the department of foodborne and waterborne in Center for Communicable Disease Control from all provincial health centers. Collected data were analyzed using SPSS.16 software.

Results

Analyzed data showed that the highest incidence of typhoid fever was registered in 1965 with 133.4/100,000 cases/year and the lowest incidence has been reported in 2011 with 0.52/100,000 cases/year. There is a sharp peak on increasing cases in 1980, simultaneously to beginning the war between Iran and Iraq (Fig. 1). Kermanshah Province was the most infected area before, during and after the war between Iran and Iraq (Fig. 2). The medium phase of typhoid fever incidence has been started since 1969 with 71/100,000 cases/year and the low incidence phase has been began since 1996 with 9.4/100,00 cases/year (Table 1, Fig. 1). In warm months including June and July was occurred most of cases in 2010 (Table 2). Of 196 (31%) cases were under 15 years old whom were more affected than others age groups (Table 2). 53.6% of total cases in 2010 were female and 56.6% living in rural area (Table 2). For laboratory identification 61% of cases have been referred to sample taking and 39% of them had no sample (Table 2). In 2010, the results of 175(27.8%) samples were positive, so 27.8% cases were classified as confirmed cases (Table 2). Among positive cases, in 46.8%, stool was the source of culture and in 1.2% bone marrow was positive (Table 2).

The treatment of cases in 97.8% resulted in complete recovery and in 1.6% there were complication and only 0.6% of cases died (Table 2).

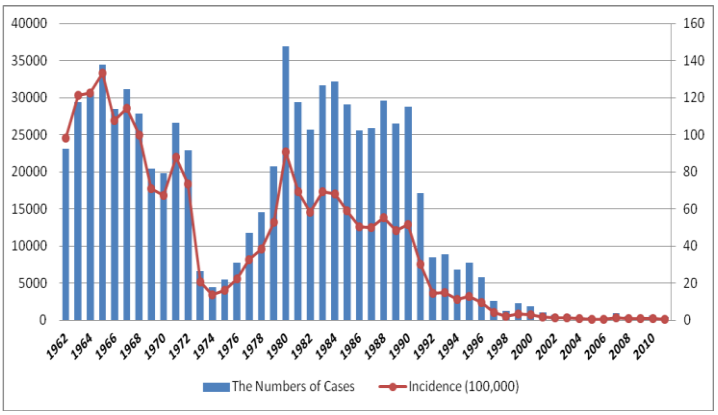

Fig. 1: Incidence of Typhoid fever in Iran from 1962-2011

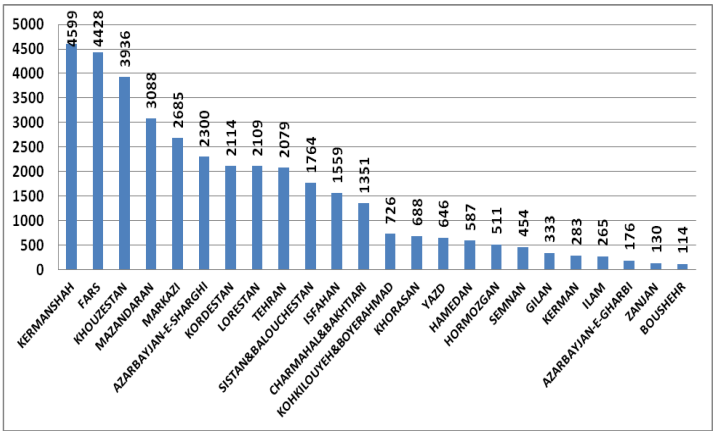

Fig. 2: Distribution of Typhoid fever in Iran by provinces, 1980 (Total cases 36925)

Discussion

Typhoid fever was one of the most important infectious diseases in the past in Iran which caused higher mortality and morbidity and has been occurred in sporadic or epidemic form, throughout country. It was prevalent mostly in rural areas due to low coverage of safe drinking water supply, so similar to other countries; typhoid fever can be an important indicator for development of socio-economic condition of communities. World Health Organization has classified counties to three groups by typhoid fever incidence rate. Regions with high incidence >100/100,000 cases/year include south-east Asia, south-central Asia, regions of medium incidence (10-100/100,000 cases/year) consist of rest of Asia, Africa, Latin America and the Caribbean, and Oceania except for Australia and New Zealand. Countries with low incidence of typhoid fever (<10/100,000 cases/year) include Europe, North America and the rest of developed world (2). The history of typhoid fever in Iran had three phases during last five decades. The years before 1969 include phase 1 with high incidence rate of >100/100,000 cases/year. The period from 1969-1996 include phase 2 with medium incidence rate (10-100/100,000 cases/year), and finally the phase 3 has been inaugurated from 1996 until now with low incidence rate less than 10/100,000 cases/year.

Decreasing rate of typhoid fever incidence in Iran as a great socio-economic indicator implies that developmental project such as safe drinking water supply system were successful and can be concluded the best health achievement. To date, 100% of urban area and more than 90% of rural area are covering with safe drinking water supply systems. In spite of reporting cases from all of provinces with history of many epidemics, the western provinces bordering Iraq were more affected (Fig. 2). Typhoid fever outbreaks not only had been increased during the war between Iran and Iraq in bordering area, but also it occurred among refugees and displaced people. In 1991 there was an increasing mortality rate due to typhoid fever among Iraqi-Kurdish refugee camps in Iran (15). Legal and illegal cross-border traffics resulted in distribution of resistant isolate from neighboring countries to western provinces like West Azerbaijani (16), meanwhile, increasing antimicrobial resistance complicates therapy for travel-related typhoid fever (17,18).

In this study we selected one year as a sample for determine of the epidemiological characteristics of typhoid fever. Similar to other countries, hot months had higher incidence (19), and in 2010 June and July had high incidence (Table 2). Children were vulnerable group (20) especially in areas with malnutrition and co-infection with other infectious disease (4). In this study age group under 15 years old was more affected (Table 2). More than 60% of these were referred to laboratory and near to half of them were confirmed by positive cultures. Stool culture dominancy indicates delay in laboratory diagnosis because stool will be positive in second week after onset of disease (Table 2). Although typhoid fever has multiple and severe cardiopulmonary and intestinal complications (21), our study showed that during 2010 only 1.6% of cases have been involved with complications, however proper treatment cases resulted in low mortality rate less than 0.6% (Table 2).

Conclusion

As a result of development in socio-economic condition and improvement of health indices in Iran, the typhoid fever incidence has been dramatically declined from high (133.4/100,000 cases/year) in 1965 to low (0.52/100,000 cases/year) in 2011.

Ethical consideration

Ethical issues (Including plagiarism, data fabrication and/or falsification, double publication and/or submission, etc) have been completely observed by the authors.

Table 1: Incidence of Typhoid fever in Iran from 1962-2011

Year	No. of Cases	Incidence (I/100.000)	Year	No. of Cases	Incidence (I/100.000)
1962	23117	98.3	**1995**	7690	13
1963	29418	121.3	**1996**	5750	9.4
1964	30677	122.6	**1997**	2630	4.2
1965	34416	133.4	**1998**	1279	2
1966	28502	107.6	**1999**	2261	3.5
1967	31135	114.4	**2000**	1869	2.8
1968	27841	100	**2001**	1084	1.6
1969	20381	71	**2002**	709	1.05
1970	19813	67.2	**2003**	725	1.06
1971	26651	88	**2004**	541	0.77
1972	22883	73.6	**2005**	425	0.6
1973	6618	20.7	**2006**	437	0.61
1974	4472	13.6	**2007**	975	1.34
1975	5448	16.1	**2008**	503	0.68
1976	7776	22.2	**2009**	518	0.69
1977	11793	32.4	**2010**	631	0.84
1978	14551	38.4	**2011**	394	0.52
1979	20718	53			
1980	36925	90.6			
1981	29425	69.5			
1982	25646	58.3			
1983	31613	69.1			
1984	32164	68			
1985	29085	59			
1986	25596	50.5			
1987	25935	50			
1988	29551	55.4			
1989	26468	48.4			
1990	28819	51.5			
1991	17086	30			
1992	8472	14.4			
1993	8885	14.7			
1994	6849	11.2			

Table 2: Results of analysis, typhoid fever in Iran, 2010

	No. of cases (631)	%
Frequency of typhoid fever by months		
January	40	6.3
February	29	4.6
March	25	4.1
April	30	4.7
May	63	10.1
June	91	14.4
July	65	10.3
August	59	9.3
September	66	10.4
October	49	7.8
November	62	9.8
December	52	8.2
Frequency of typhoid fever by age groups		
<15 years old	196	31
16-30 years old	179	28.3
31-45 years old	136	21.5
>45 years old	121	19.2
Frequency of typhoid fever by gender		
Male	293	46.4
Female	338	53.6
Frequency of typhoid fever by residency area		
Rural area	357	56.6
Urban area	274	43.4
Frequency of typhoid fever by cultured samples		
Without culture	246	39
Negative culture	210	33.2
Positive culture	175	27.8
Frequency of typhoid fever by source of positive culture		
Stool culture	82	46.8
Blood culture	65	37.2
Urine culture	26	14.6
Bone marrow culture	2	1.2
Treatment outcome		
Cured	617	97.8
Cured with complication	10	1.6
Death	4	0.6

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