ORIGINAL ARTICLE

Salmonella bacteraemia among healthcare workers and their dependents

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Abstract

Objectives: To determine the incidence and resistance pattern of Salmonella infection in healthcare workers and their dependents.

Methods: The retrospective analysis was conducted at Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, and comprised records of employees and their dependents with bacteraemia from January 2007 to December 2011. Person-years were calculated using data from the human resources department. SPSS 19 was used for statistical analyses.

Results: Of the total 2532 records available, 82(3.23%) patients were identified with Salmonella bacteraemia. Of them, 34(41.5%) patients were in age group 1-10, 15(18.3%) in 11-20, 26(31.7%) in 21-30, and 7(8.5%) were above 30 years. Besides, 48(58.5%) were males. Salmonella typhi was found in 44(53.7%) patients, Salmonella paratyphiA in 35(42.7%) and Salmonella species in 3(3.7%) patients. The yearly incidence of Salmonella infection in the study population ranged from 206 to 596 per 100000 person-years. Ciprofloxacin resistance was noted to be 56 (68.2%) followed by Ampicillin 29 (35.3%) and Co-trimoxazole 24 (29.2%). No strains were resistant to Cefiximeor Ceftriaxone.

Conclusion: The yearly incidence of Salmonella bacteraemia ranged from 200 to 600 per 100000 person years. There was significant quinolone resistance among the isolates.

Keywords: Salmonella, Bacteraemia, Cirpofloxacin. (JPMA 64: 748; 2014)

Introduction

Salmonella infection is endemic in tropical and subtropical areas. In humans it can cause a number of conditions including gastroenteritis, enteric fever, bacteraemia and the chronic carrier state. Salmonellatyphi (S. typhi), Salmonellaparatyphi A(S. paratyphi A), Salmonellaparatyphi B (S. paratyphi B), Salmonellacholeraesuis (S.choleraesuis) are the main species which infect humans. S. typhi causes typhoid fever and S. paratyphi causes paratyphoid fever. Both of these fevers are collectively called enteric fever.

According to the World Health Organisation (WHO), over 21 million cases of typhoid fever are reported annually in the world, with 200000 deaths. The highest incidence of typhoid infection is in south-central Asia and south-east Asia regions (more than 100/100 000 persons per year).[1] The incidence of Salmonella infection in Pakistan is 412 per 100 000 person-years, according to the WHO; amongst the highest in the world.[2]

Salmonella in hospital employees and different groups of population is reported periodically throughout the world, and many outbreaks have been published in the developed and developing countries.[3-5] Healthcare workers may be at greater risk of acquiring different infections compared to the general population. Typhoid is more prevalent in developing countries due to poor sanitary conditions, whereas in the developed countries it is a sporadic disease and occurs mainly in returning travellers.[6]

Like other microorganisms, increasing drug resistance is a challenge in treating Salmonella infection. Ciprofloxacin is no more the 'drug of choice' due to the development of resistance secondary to its injudicious use in developing countries; particularly in the Indian subcontinent.[7,8] Decreased susceptibility is also reported from the developed countries.[9] Multidrug resistance (MDR) is also on the rise, particularly in Asian countries including the sub-continent.[10]

The objective of our study was to determine the incidence of salmonella infection and resistance pattern in healthcare workers and their dependents at a tertiary care hospital in Lahore, Pakistan.

Subjects and Methods

The retrospective review was conducted at Shaukat Khanum Memorial Cancer Hospital and Research Center, Lahore. Employee and employee dependent records with bacteraemia from Salmonella species were identified from hospital's electronic database from January 2007 to

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December 2011. Person-years were calculated using data from the human resources department. Statistical analysis was done with SPSS 19.

Results

Of the total 2532 records available, 82(3.23%) patients were identified with Salmonella bacteraemia. The overall mean age of the patients was 16±12.0 years. There were 48(59%) males 34(41%) females. The year-wise data was analysed to assess the pattern of the disease (Table). The predominant organism was S.typhi in 44(53.7%) patients. Age-wise, 34(41.5%) patients were in the age group 1-10, 15(18.3%)in 11-20, 26(31.7%)in 21-30 and 7(8.5%)were above 30 years. The yearly incidence ranged from 206 to 596 per 100000person-years (Figure-1). Resistance against Ciprofloxacin was the highest in 5 years in 56 (68.2%) patients followed by Ampicillin in 29 (35.3%) and Co-trimoxazole in 24 (29.2%) patients. No strains were found to be resistant to Cefixime and Ceftriaxone. Yearly resistance pattern was also worked out (Figure-2).

Table: Yearly distribution of Salmonella species and total number of blood cultures performed among healthcare workers and their dependents.

Year	Total blood cultures performed	Number of blood cultures with growth of Salmonella species		
2007	332	17/332 (5.12%)	S. typhi	4
			S. paratyphi	13
			Salmonella species	0
2008	350	17/350 (4.85%)	S. typhi	11
			S. paratyphi	6
			Salmonella species	0
2009	309	8/309 (2.58%)	S. typhi	5
			S. paratyphi	1
			Salmonella species	2
2010	486	15/486 (3.08%)	S. typhi	10
			S. paratyphi	4
			Salmonella species	1
2011	1055	25/1055 (2.36%)	S. typhi	14
			S. paratyphi	11
			Salmonella species	0
Total	2532	82/2532 (3.23%)	S. typhi	4 4 / 8 2
(53.7%)				
			S. paratyphi	3 5 / 8 2
(42.7%)				

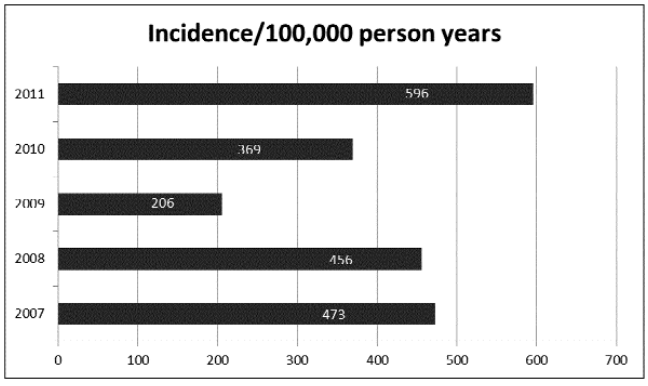

Figure-1: Incidence of Salmonella bacteraemia per 100,000 person-years over 5 years in employees and their dependents.

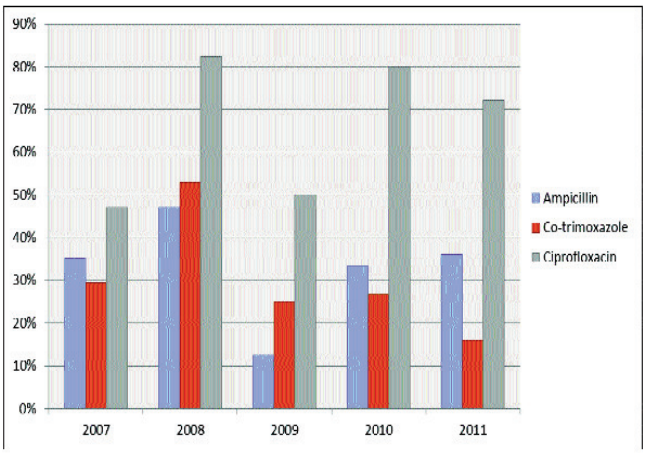

Figure-2: Percentage of Salmonella isolates resistant to antibiotics by disc diffusion method.

Discussion

We are unaware of any prior work in Salmonella infections amongst healthcare workers or their dependents in Pakistan. Most of the affected patients were children younger than 10 years (41.5%). The overall incidence of Salmonella bacteraemia was 596/100000 person-years. In a study conducted in Pakistan, the incidence of typhoid bacteraemia in children <2 years of age was 443.1 per 100000 child-years. The overall incidence rate of typhoid for children <5 years was 405.1 per 100000 child-years.[11] In a recent population-based surveillance in Kenya, S.typhi bacteraemia was reported in 247 cases per 100 000 person-years of observation with highest rates in children 5-9 years old (596 per 100000) and 2-4 years old (521 per 100000).[12] In comparison to this study, the overall incidence of our study was much higher, possibly due the limited nature of the study population and higher ability to capture all positive cases due to a single source provider (the employee health clinic of the hospital).

S. typhiwas the most common species isolated (53.7%), in comparison to other local[13] and international[14] studies where incidence of S.typhi was 72% and 75% respectively. In a multinational population-based cohort study conducted over 8 years total of 622 salmonella bacteraemias were reported, non-typhoidal isolates were 490 (79%), and 132 were typhoidal salmonella cases. Out of these 132 S.typhi and S.paratyphi were 85 (64%) and 47

(36%) respectively. The distribution of S.typhi and S.paratyphi in this study population corresponds to our study group. Incidence of typhoidal Salmonella bacteraemia was higher in younger age group with highest incidence in age group 20-29 years whereas in our study population this age group had second highest incidence. Ciprofloxacin resistance was only 3% in this study whereas Ampicillin had highest resistance (21%). Ampicillin resistance is almost comparable, but ciprofloxacin resistance is much higher in our study population.[15]

Previous local studies showed variable resistance to different antibiotics. In a study resistance to co-trimoxazole (57.5%) was the highest followed by ciprofloxacin resistance (48.75%).[16] In 2005, a study showed high incidence of MDR with no strains resistant to ciprofloxacin.[17] But our study showed a significant quinolone resistance.

Salmonella outbreaks in healthcare workers have been reported internationally in an outbreak in an England hospital S.Virchow was found in one patient, nine staff members and food handler's baby.[18] Similarly in Jordan in 1989 a large outbreak of Salmonella was reported in a hospital where contamination of mashed potatoes was responsible for the outbreak. In this outbreak, 183 of 619 (19.6%) persons were affected; 150 of the total affected persons were hospital employees.[19]

Since all hospital employees and dependents are provided care via the employee health clinic at our hospital, it provided an opportunity to study the incidence of this illness amongst this population.

There were limitations of our study. The study was conducted at a single centre and these results are not generalisable. Besides, since it was a retrospective review, we could not identify the source or risk factors for acquiring Salmonella infection in this group of population.

Conclusion

The incidence of Salmonella bacteraemia in our study population appeared to be higher than reported in the general population. The majority of cases were in children and were typhoidal Salmonellae. Significant quinolone resistance was also noted.

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