A 4-Year Retrospective Study on the Sero-Positivity of Typhoid among Patients Attending General Hospital Mubi.

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ABSTRACT
Typhoid fever constitutes significant health problems in developing countries. This study examines the trend of typhoid fever retrospectively over a 4-year period among patients attending general hospital Mubi, Adamawa State. Medical records of clinically diagnosed patients with confirmed *Salmonella* infections were reviewed for the said period. Laboratory diagnosis for typhoid cases in this hospital was based on Widal agglutination tests. The test was performed with standardized *Salmonella enterica* serovar Typhi O and H antigens and values of titre equal or greater than 1:160 for O and H agglutinins were regarded as positive. The result showed an overall prevalence rate of 81.5% (2011-2012) and 82.3% (2013-2014). Highest cases of typhoid fever was reported among females (97.7%) than males (69.8%) in the year 2011-2012 and among males (84.8%) than females (79.0%) in the year 2013-2014 but with no statistical difference (P=0.466). The age group 30-60yrs are the most infected in both 2011-2012 (86.2%) and 2013-2014 (85.0%) but with no statistical difference with that of other age brackets (P=0.118). Statistically, the yearly distribution of typhoid fever showed no significant difference (P=0.298). However, monthly distribution of typhoid fever in the years under review showed significant variations. The number of positive cases recorded in all the years under study was significantly higher in August (P=0.000), but with no statistical difference with those recorded in June (P=0.062) and July (P=0.078). More so, November and December recorded significantly lower cases (P=0.001) than all other months.

Keywords: Salmonella, Typhoid fever, Retrospective, Mubi.

INTRODUCTION

Enteric fever popularly called typhoid or paratyphoid fever is a systemic infection caused primarily by *Salmonella enterica* subsp enterica serovars Typhi and Paratyphi A, B, or C. They are non-lactose fermenting, non-spore-forming Gram negative motile rods which ferment glucose with acid and gas production. Most species produce hydrogen sulphide (H_2S) but not urease. Major symptoms of the infections include persistent high fever with low pulse rate, severe headache, nausea, mental confusion, abdominal tenderness and pain. One of the commonest consequences of the infection is ileal perforation which even in childhood is associated with high morbidity and mortality (Ekenze *et al*., 2008; Umeh and Agbulu, 2009).

In developing countries, typhoid fever is an important health problem where it is reported to claim 600,000 lives every year (Ambati *et al*., 2007). It is endemic in Asia, Africa and Latin America where there are poor sanitation conditions. It is transmitted from person to person through food and water contaminated with faeces and urine from typhoid case or carrier (Ghosh *et al*., 2010). Clean water, good sanitation, personal and domestic hygiene help to prevent the spread of typhoid and paratyphoid.

In Nigeria, typhoid fever is among the major widespread diseases affecting both young children and young adults as a result of many interrelated factors such as inadequate facilities for processing human wastes and indiscriminate use of antibiotics (Akinyemi *et al*., 2012). Enteric fever is not only endemic in Nigeria, but constitute a great socio-medical problem because they are responsible for many cases of pyrexia, high morbidity and mortality (Rine *et al*., 2013).

The epidemiological data on the distribution pattern of typhoid fever in Nigeria is uncertain but appears to show geographical variation. Although some studies reported the preponderance of the disease in male than female (Kam, 1996; Okome-Nkoumou *et al*., 2000; Akinyemi *et al*., 2005), another reported the preponderance of the disease in female than male (Afroz *et al*., 2014). While one other study showed that age, sex and social class are not risk factors for enteric fever (Zailani *et al*., 2004).

Treatment of *Salmonella* infection constitutes a major challenge to clinician because the organism is not only resistant to first line antibiotics, but also exhibits multi drug resistance phenotype against fluoroquinolones and third generation cephalosporins. This phenomenon may limit the possibilities for effective treatment of human infections (Afroz *et al*., 2014). The high risk populations for *Salmonella* infections include young, elderly, pregnant woman, immune compromised and HIV infected individuals (Van der Klooster *et al*., 1997; Doffinger *et al*., 2005).

In Mubi metropolis of Adamawa State, Nigeria, inadequate water supplies is a serious socio-economic problem that has caused the inhabitants to resort to untreated well water and borehole water for domestic water supplies. These water sources are usually cited closely to septic tanks or refused dump sites which are responsible for water-borne infections such as enteric fevers (Tula *et al*., 2013). Therefore, this study was undertaken to examine the trend of typhoid fever among patients that have attended Mubi General Hospital from 2011 to 2014.

MATERIALS AND METHODS

Study Area

Mubi comprises of the Mubi North and Mubi South Local Government Area of Adamawa State. It is situated in the North Eastern part of Nigeria, between latitude 10° 05' and 10° 30'N of the equator and between longitude 13° 12' and 13° 19'E of the Greenwich meridian. The climate is tropical with average climate of about 32-35^{o}C in dry season and relative humidity ranging from 28-45%mm and an average rainfall of about 1056mm (Adebayo and Tukur, 1999),which usually start around May and last for almost 6 months, to October. The people of Mubi area are subsistence farmers, cattle rearers and livestock farmers. However, a few are civil servants and business men and women.

Mubi North and Mubi South has an international boundary with the Republic of Cameroon to the west, and surrounded by three Local Government Areas of Adamawa State; Maiha, Michika and Hong Local Government Area to the south, north and east respectively.

Study design

A 4-year retrospective cohort study on Typhoid fever was conducted in Mubi metropolis, Adamawa State, Nigeria, between 2011 and 2014. Mubi General Hospital was used as study area. The hospital serves as referral centres for both in-patients and out-patients in Mubi senatorial district which comprises of Madagali, Michika, Hong, Maiha, Mubi north and Mubi south local government areas. Medical records of clinically diagnosed patients with suspected cases *Salmonella* infections were reviewed for the 4-year period. Laboratory diagnosis for typhoid cases in this hospital was based on Widal agglutination tests. The test was performed with standardized *Salmonella enterica* serovar Typhi O and H antigens and values of titre equal or greater than 1:160 for O and H agglutinins were regarded as positive.

Statistical analysis

Non parametric Mann-Whitney statistics was used to compare the difference in age brackets, sex and distributions within the years under study. All statistical analyses were carried out using the SPSS 17.0 window based program. Significance difference was defined as $p \leq 0.05$.

RESULTS:

The result of this retrospective study showed an overall sero-positivity rate of 81.5% (2011-2012) and 82.3% (2013-2014). Based on sex, highest cases of typhoid fever was reported among females (97.7%) than males (69.8%) in the year 2011-12 and among males (84.8%) than females (79.0%) in the year 2013-2014, however, this difference is not significant (P=0.466) (Table 1).

The result in Table 2 showed prevalence rate based on age group. The age group 30-60yrs are the most susceptible to typhoid fever in both 2011-2012 (86.2%) and 2013-2014 (85.0%) but does not differ significantly with that of the other age groups (P= 0.118). While he yearly distribution of typhoid fever does not show significant difference (P=0.298), monthly distribution of typhoid fever in the years under review showed significant variations. The number of positive cases recorded in all the years under study was significantly higher in august (P=0.000), but with no statistical difference with those recorded in June (P=0.062) and July (P=0.078). More so, November and December recorded significantly lower cases (P=0.001) than all other months (fig.1).

Table 1: Prevalence rate of typhoid fever in relation to sex among patients attending General Hospital Mubi from 2011-2014.

	2011-2012			2013-2014		
Sex	No. Tested	No. Positive	Prevalence (%)	No. Tested	No. Positive	Prevalence (%)
Male	5496	3838	69.8	4961	4206	84.8
Female	3952	3863	97.7	3802	3005	79.0
Total	9448	7701	81.5	8763	7211	82.3

Table 2: Prevalence rate of typhoid fever in relation to age group among patients attending General Hospital Mubi from 2011-2014.

	2011-2012			2013-2014		
Age group	No. Tested	No. Positive	Prevalence (%)	No. Tested	No. Positive	Prevalence (%)
<15	2764	2294	83.0	2176	1783	81.9
15-30	3048	2323	76.2	3088	2541	82.3
31-60	2361	2036	86.2	2208	1877	85.0
>60	1275	1048	82.2	1291	1010	78.2
Total	9448	7701	81.5	8763	7211	82.3

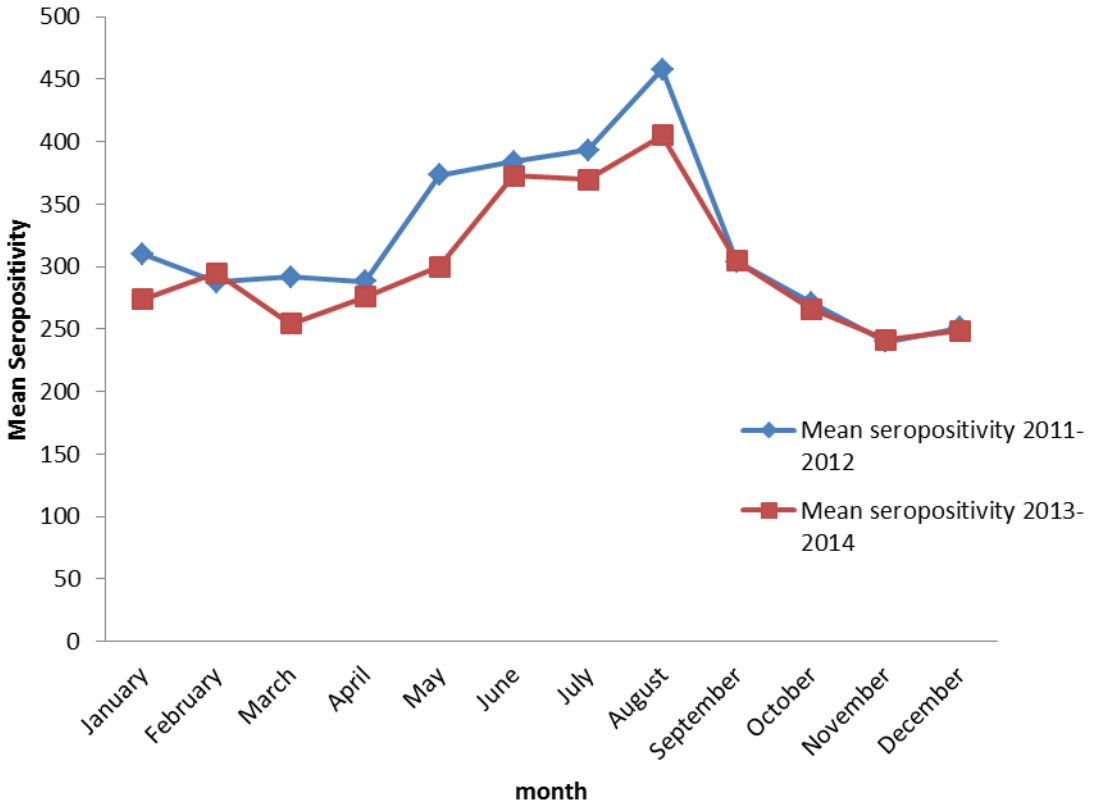

Fig. 1: Seasonal variation in seropositivity rates for 2011-2012 and 2013-2014.

DISCUSSION

Typhoid fever is a known cause of significant morbidity and mortality worldwide, especially in countries with growing population and poor sanitary conditions (Tuhina *et al*., 2014). Result obtained from this study showed high rate of typhoid fever infection with significant seasonal variation that peak in august for the period under review.

The findings that males were more infected with typhoid bacilli as previously reported from Lagos (Akinyemi *et al*., 2012; Ajayi *et al*., 2015) collaborates with our findings for 2013-2014, but was contrary to our findings of 2011-2012. Also, our finding was similar to those observed in a study conducted in northern Nigeria where more males were implicated but the sex-related difference in infection rates did not vary significantly ($P < 0.05$) (Ameh and Opara, 2004). In line with our 2011-2012 result, a previous study reported that females had more typhoid and paratyphoid infections than males (Umeh and Agbulu, 2009; Afroz *et al*., 2014). The authors inferred that the roles played girls child in performing most household chores such as fetching water from polluted streams could be the reason for such a result.

Findings in this study revealed that subjects within the age groups; <15 and 31-60 had the highest infection rate with typhoid fever, however the values do not significantly differ with rate obtained for other age groups. This finding corroborated the report of similar study carried out by Rine *et al*. (2014) and Afroz *et al*. (2014).

A report from north-central Nigeria had implicated young adults within the 11 to 20 years and 21 to 30 years age groups to be the most vulnerable members of the community (Ameh and Opara, 2004). In other parts of the world, typhoid fever, has been known to be a disease of the school-aged children and young adults and milder in infants (CDC, 2005).

Report from a previous study also showed that the most vulnerable age group is between 10-14yrs. This could be attributed to less restrictive nurturing, increased in consumption of unhygienic food and water, bathing and swimming in ponds, etc (Ghosh *et al*., 2010; Saha *et al*., 2003). Similarly, in India, the age group at highest risk of infection by typhoid fever has been established to be between 2-3 years of age (Saha *et al*., 2003; Sur *et al*., 2009).

Lack of statistical difference in relation to age group as shown in our study indicates that typhoid fever is not correlated with age difference. This observation was buttressed by previous reports which indicated that typhoidal antibodies were not correlated with age and sex; implying that both sexes and age groups are equally predisposed to enteric fevers (Zailani *et al*., 2004; Umeh and Agbulu, 2009).

The monthly distribution of typhoid fever showed a significant variation with the peak in August, followed by July and June. This finding was similar to previous report which showed a higher prevalence from July to October each year (Afroz *et al*., 2014). Another previous study revealed that typhoidal antibodies in most age groups occurred more in wet season than in the dry season, and supports the fact that microbial contamination of foods and water are more likely in the warmer seasons when bacterial pathogens multiply very rapidly (Ebele *et al*., 2010).

Salmonella infection remains a major public health concern worldwide, contributing to the economic burden of both industrialized and underdeveloped countries through the costs associated with surveillance, prevention and treatment of disease (Shu-kee *et al*., 2015; Crump *et al*. 2004). Complications caused by typhoid fever such as typhoid psychosis, septicemia, intestinal perforations, hepatosplenomegaly and haemorrhage have been documented to increase mortality in areas characterized by inadequate sanitation, poor hygienic practices and drug abuse (Akinyemi *et al*., 2012).

Moreover, the emergence of MDR *Salmonella* strains poses a great challenge in terms of effective treatment of the infections caused by these strains. Several preventive measures have been proposed to stop the spread of *Salmonella* infection, and the restriction of indiscriminate use of antibiotics in food animals is by far one of the most effective measures (Shu-kee *et al*., 2015).

While bacteriological culture remains the gold standard for definitive diagnosis of typhoid fever, lack of its immediate availability during the acute febrile illness, particularly in areas where culture facilities are either poor or not available, may limit its use.

CONCLUSION

The ultimate goal for the eradication of typhoid fever is to put in place adequate and concrete preventive measures either by individuals, communities or government. The hallmark of any preventive intervention may include provision of portable drinking water, proper sewage disposal system and improved personal and community hygiene. However, when the disease ensues, mortality could be reduced with early diagnosis, prompt resuscitation, use of potent antibiotics, and emergency operative treatment when perforation and peritonitis occurred unexpectedly.

Limitation of the study

Only typhoid febrile agglutination test (Widal test) was used to assess the prevalence of typhoid fever in the study area. Various reports showed that this test is often positive in patients with infections caused by other bacteria, because of cross-reacting antibodies or previous immunization (vaccination) against typhoid.

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