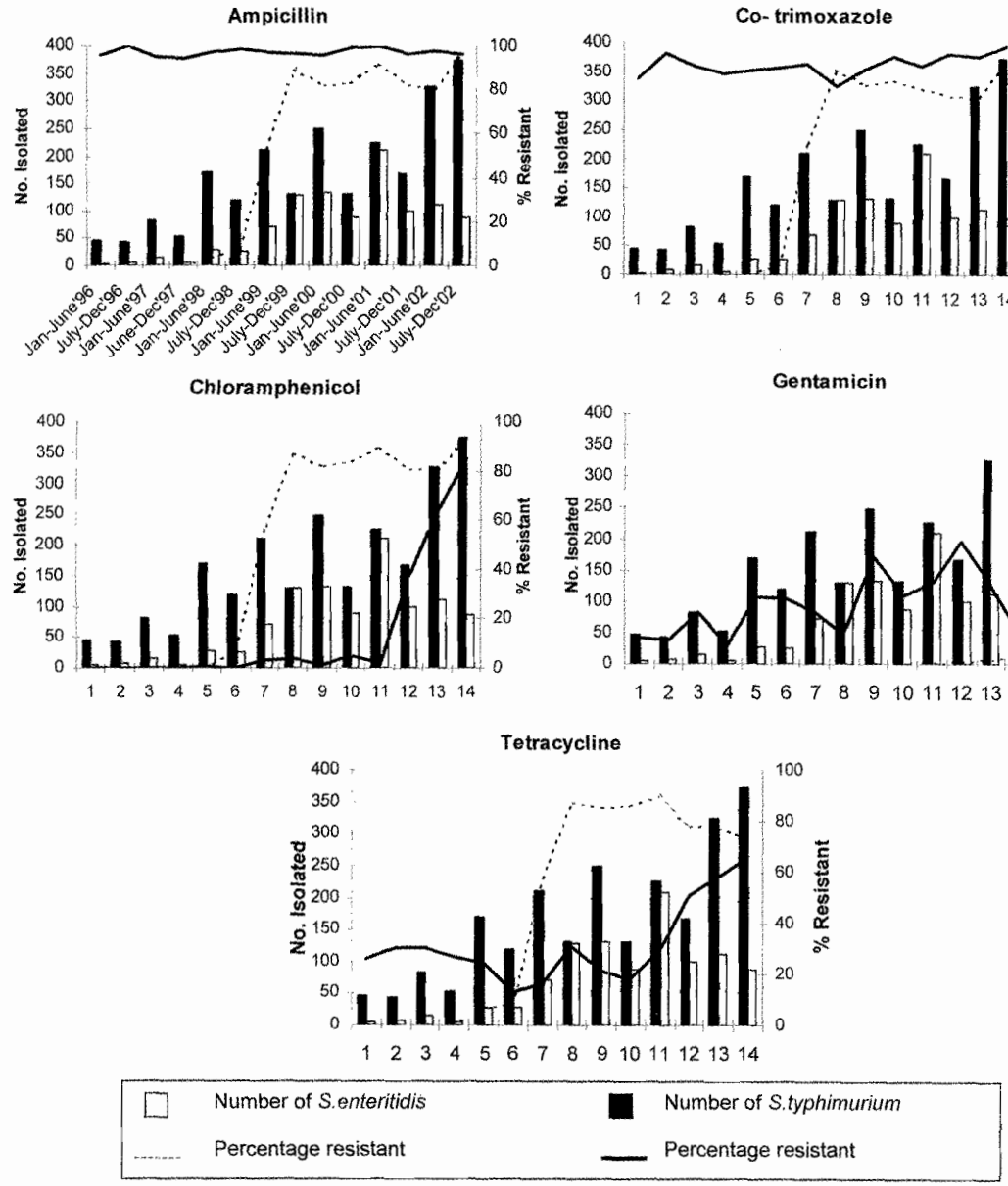
Figure 5: Antibiotic resistance for non-typhoidal *Salmonella* isolates, 1996- 2002.

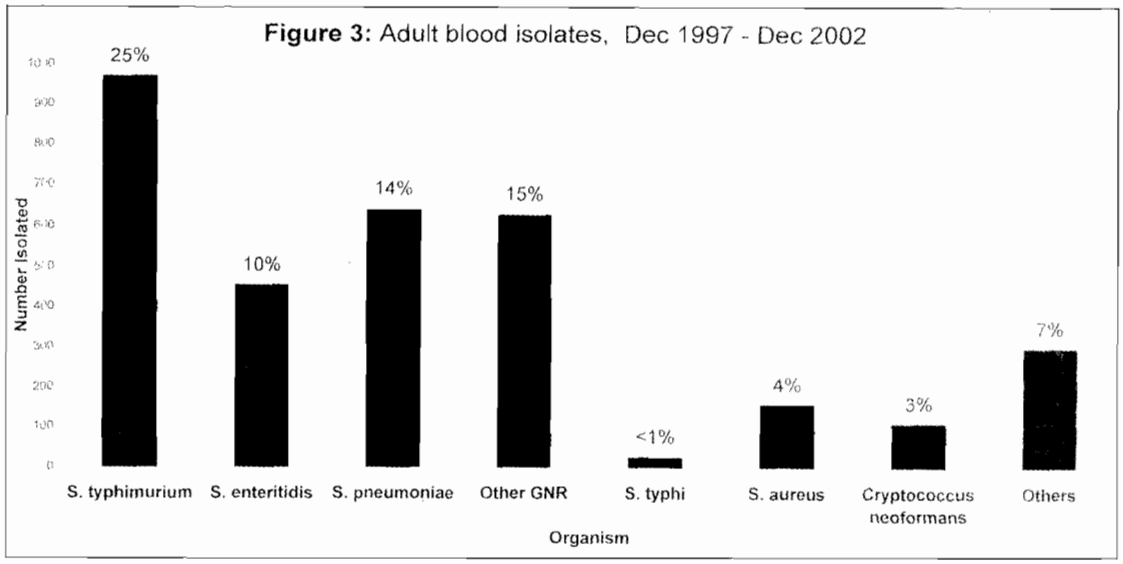


has since risen to 80%. *H. influenzae* type b (Hib) isolates remain sensitive to gentamicin and cefriaxone. Invasive infections due to *N. meningitides* are relatively rare at QECH – there have been 196 isolates from both adult and paediatric patients over 6 years. *N. meningitides* isolates are sensitive to penicillin, chloramphenicol and erythromycin. They show some resistance to gentamicin (22%) and high levels of resistance to cotrimoxazole (86%).

Discussion

These surveillance data from QECH over six years provide important information of the prevalence of common invasive bacterial pathogens and of antibiotic resistance in urban Blantyre. As clinical management decisions such as choice of antibiotic need to be made before the results of bacterial culture are available, these data are useful in developing clinical guidelines for first-line therapy at the hospital. However, the data may not be representative of the entire country – for example, the urban setting usually has higher levels of antibiotic resistance than rural setting because of more frequent use and increased availability of antibiotics. The relative prevalence of different bacteria may also vary with season. This is particularly the case with NTS bacteraemia, more frequent during the rainy season in adults and children.[4,5] This seasonal pattern with NTS is also evident from our data (see Figure 5). A hospital – based prevalence survey of bloodstream infections in adults showed the commonest bacteria to be *S. pneumoniae* at Lilongwe Central Hospital during the dry season [6], while similar surveys at LCH and QECH during the wet season found NTS to be the commonest cause of bacteraemia in adults.[4,7] Previous reports from QECH show that the majority of bacteraemia in adults is HIV – related. [8,9]

Our data do not indicate the importance of *Mycobacterium tuberculosis* as a common cause of bloodstream infection in adults at QECH (17%) and LCH (19%). [6,7] This is because blood culture for M. tuberculosis is not routine. Studies of children have found mycobacteraemia to be rare at LCH[10] and at QECH (unpublished data, EM Molyneux). The prevalence of *Cryptococcus neoformans* as a cause of bloodstream infection in adults was also similar in the two major hospitals [6,7] and compares to that found in our surveillance data (Figure 3).



Over the period of surveillance for this report, *C. neoformans* was the commonest CSF isolates in adults but was very rare in children.

The commonest bacterial cause of meningitis in adults and children is *S.pneumoniae*. This is consistent with earlier report which includes some of the reported data in this study. [8,11] *H. influenzae* was the second common cause in children but rarely causes meningitis in adults. It will be interesting to examine the impact of the introduction of the conjugate Hib vaccine as routine immunisation for Malawian infants from early 2002 on subsequens surveillance data at QECH. Data from South African children suggest that there will be a significant reduction of invasive Hib disease. [12] If Hib conjugate vaccine is effective in Malawi, NTS is likely to become the second commonest cause of childhood bacterial meningitis.[11] *N. meningitides* is not a common cause of meningitis at QECH.

NTS is the commonest cause of bacteraemia in children admitted to QECH.[13] This is consistent with data from elsewhere in tropical Africa.[14-16] NTS bacteraemia is more common during the rainy season and there is a strong association of NTS bacteraemia with malaria and anaemia.[16] The association of HIV with NTS bacteraemia is very marked in adults[9,17] but in children the impact of HIV on NTS bacteraemia is less clear.[16] *S. pneumoniae* was the second commonest cause of childhood bacteraemia in this report. In USA and South Africa, the incidence of pneumococal bacteraemia is increased twenty to forty-fold in HIV-infected children. [18,19] The HIV status of most children reported in this study is not known. The efficacy of the recently developed pneumococcal conjugate vaccine has been studied in HIV-infected and HIV-uninfected South African children[20] and results will soon be published.

Increasing resistance of common bacteria to the readily available antibiotics is a major concern. The first-line treatment for adults and children at QECH with suspected bacteraemia, septicaemia or meningitis has been chloramphenicol plus penicillin. *In vitro* resistance for *S. pneumoniae* to penicillin and chloramphenicol has remained relatively steady over time (around 20%) and isolates are usually resistant to one or other of the antibiotics but very rarely to both. Penicillin is ineffective against NTS but until recently, almost all NTS isolates were sensitive to chloramphenicol. The recent rapid rise in resistance of *S. enteritidis* and *S. typhimurium* to chloramphenicol in 1999 and 2001 respectively (Figure 5) has resulted in a clinical management dilemma. Gentamicin is being used increasingly in addition to chloramphenicol for proven or suspected invasive NTS disease but intracellular penetration is poor. Thus, it may not be as effective an antibiotic against NTS even when there is *in vitro* sensitivity. Ciprofloxacin is an effective alternative but only oral preparation is available and this is problematic for administration and possibly absorption in very ill patients.

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