Meningococcal disease in India, 2005–2011: A Surveillance Study

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ABSTRACT

Aims & Objectives: Meningococcal disease is known to cause varying clinical prognosis ranging from asymptomatic to fatal infection. Factors contributing to the two conditions are unknown. Limited data available on meningococcal disease from India, prompted us to carry out the present surveillance study from hospitals in India during 2005–2011. Data from the different districts was obtained from the IDSP (Integrated Disease Surveillance Project), National Centre for Disease Control (NCDC). Samples were diagnosed for meningococcal meningitis using microscopy of CSF and latex agglutination. **Results:** The percentage positivity of the samples rose from nil to 13.6% in 2005, reached a maximum of 18.2% in 2006, declined to 15.7% in 2007, 11.6% in 2008 and finally came down to 4.4% by November 2009, 1.6% in 2010 and 1.5% in 2011. In the samples comprising both CSF and blood (for culture and/ or serology), positivity rate was much higher ranging from 20% to 30.5%, when compared with single samples like CSF alone (positivity 17.6 to 24.9%) or blood alone (positivity 5.3% to 10.5%) during the peak epidemic period (2005–2007). **Interpretation:** Using sample combinations like CSF and blood (for culture and/or serology), we were able to pick larger number of samples who were meningococcal disease positive as compared to the cases where single samples of CSF or blood were obtained.

Keywords: Meningococcal Disease; Surveillance; Microscopy; Latex agglutination

INTRODUCTION

Meningococcal disease refers to infection of the cerebral meninges, caused as a result of bacterial or viral agents and is known to cause an immense mortality and morbidity worldwide. Globally reports suggest an annual incidence of 1000 cases/100,000 population.[1] Africa in 1996, reported the world's largest outbreak that led to more than 20,000 deaths.[2]

The mortality rate for the disease is 10–15%. The meningococcal bacterium can harbour harmlessly in nearly 10% of the population, which is referred to as 'carrier state' and may lead to a continuously circulating bacterium in the population. Clinical prognosis can range from asymptomatic, insidious to fatal infection. Factors that make the bacterium virulent/disease causing are not known.[3,4]

Meningococcal bacterium comprises 13 sero groups of which most A, B, C, W135, X and Y are responsible for majority of the infections worldwide.[5,6] The different subgroups of meningitis display varied levels of pathogenicity and epidemic potential. Sero groups B and C occur in Europe and North America. The epidemic is incompletely described in Asia. A region of Africa is referred to as the 'meningitis belt', due to the high number epidemics with large number cases reported from the area. The infection occurs in temperate region with a seasonal upsurge in winter and spring season.[7,8]

In India, the disease has been reported in most parts with sporadic outbreaks occurring time and again. Majority of the outbreaks and cases occur due to Sero group A, though there have been few reports due to sero-group B and C. The first outbreak from India was reported in 1883, in Rajasthan, but was not confirmed due to the absence

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of lab facilities to detect the same. Thereafter, there have been outbreaks from Delhi, Gujarat, Andhra Pradesh, Orissa, Madhya Pradesh, Meghalaya and Tripura.[9–14]

Laboratory diagnosis of meningococcal disease is carried out by culture. Latex/Co-Agglutination test is used for detection of the meningococcal antigen.[15] Drug sensitivity is determined by Agar Dilution/MIC method using Muellor Hinton Blood Agar as the prototype disk diffusion test.

There has been a paucity of reports from India on meningococcal disease. The present surveillance study was carried out from samples received at National Centre of Disease Control (NCDC), Delhi from various hospitals during 2005–2011.

METHODOLOGY

Source of data

Samples were collected from public and private hospitals from India. The data from the different districts was obtained from the IDSP (Integrated Disease Surveillance Project), at National Centre for Disease Control (NCDC). Samples from both public and private hospitals were collected during 2005–2011.

Type of data

Blood and CSF samples were obtained from the patients considered as suspected/probable as per the Standard Case Definition of Meningitis issued by the World Health Organization (WHO). Demographic and clinical details were obtained for each patient who belonged to suspected/probable category.

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RESULTS

Samples tested during 2005 were 625, out of which 85 tested positive. In the following year in 2006, 10,500 samples were tested out of which 194 tested positive for meningitis. During subsequent years, the number

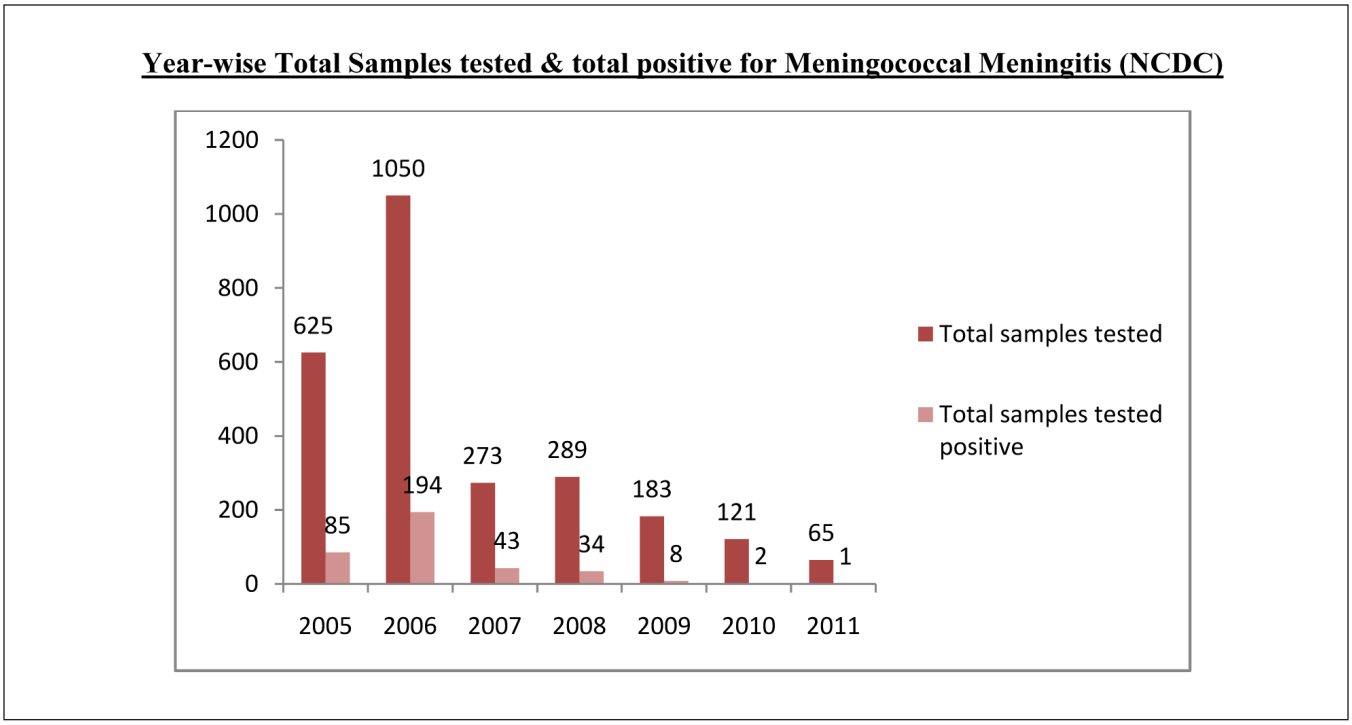

Figure 1: Bar graph showing the total number of samples tested and the total number of samples positive for meningococcal disease during 2005–2011.

of samples tested at NCDC reduced to 289 in 2008, 183 in 8, 121 in 2010 and 64 in 2011. The number of samples tested positive was 34, 8, 2 and 1 in the year 2008, 2009, 2010 and 2011 respectively Figure 1. The percent positivity of the samples rose from nil to 13.6% in 2005, reached a maximum of 18.2% in 2006, declined to 15.7% in 2007, 11.6% in 2008 and finally came down to 4.4% by November 2009.

Percentage positivity observed in the samples received at NCDC is shown in Figure 2. The positivity rate was 13.6% during 2005 and 18.5% in the year 2006. The percentage

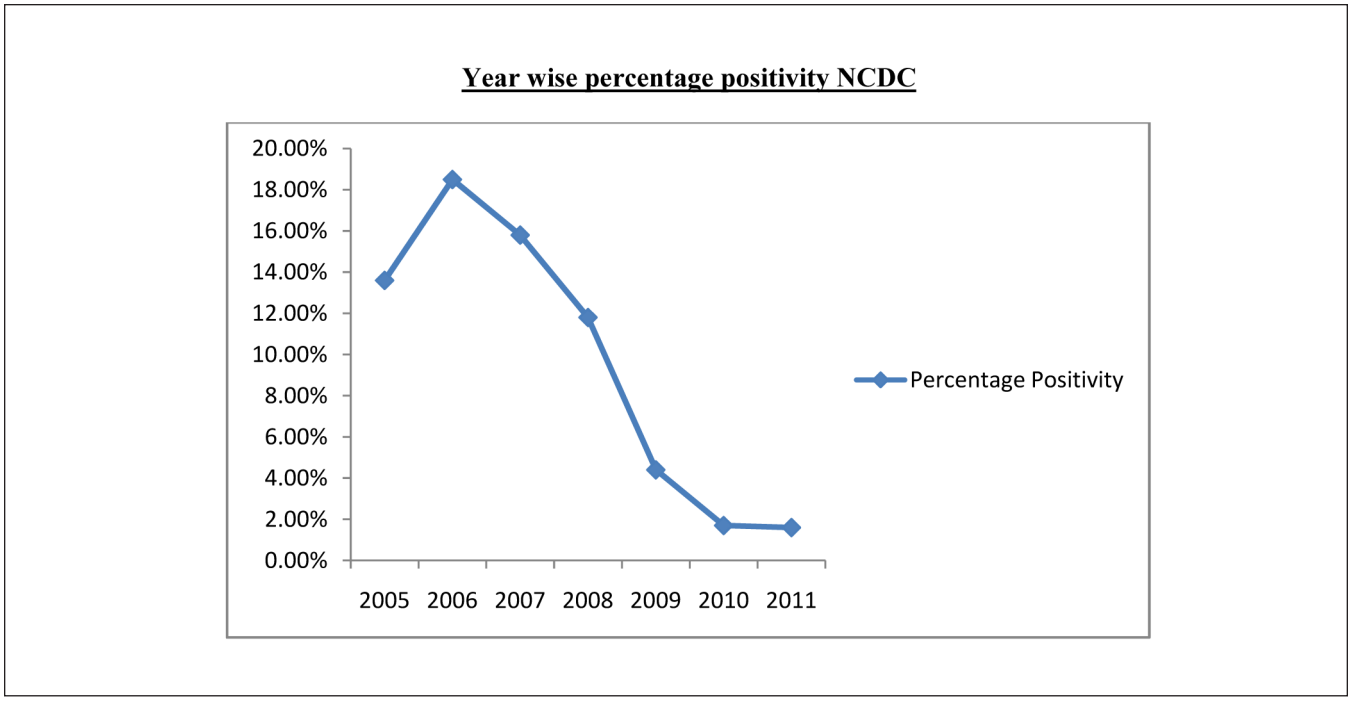

Figure 2: Line graph showing the percentage positivity for meningococcal disease for samples tested during 2005–2011.

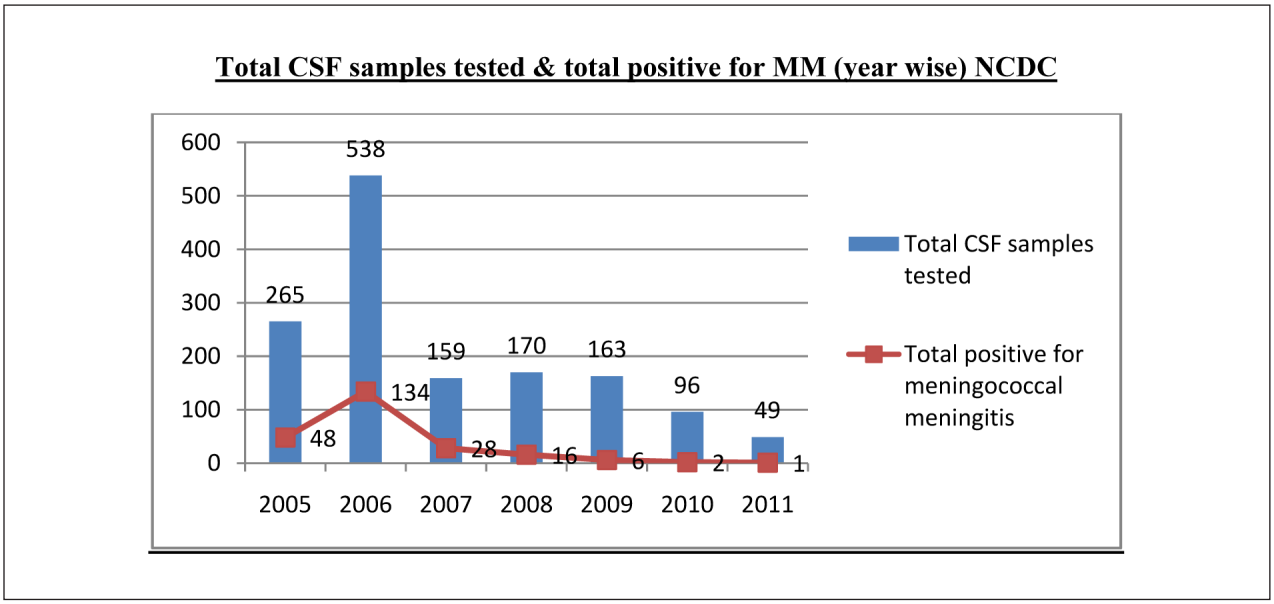

Figure 3: Bar graph showing total number of CSF samples tested and line graph showing the total samples positive for meningococcal meningitis 2005–2011.

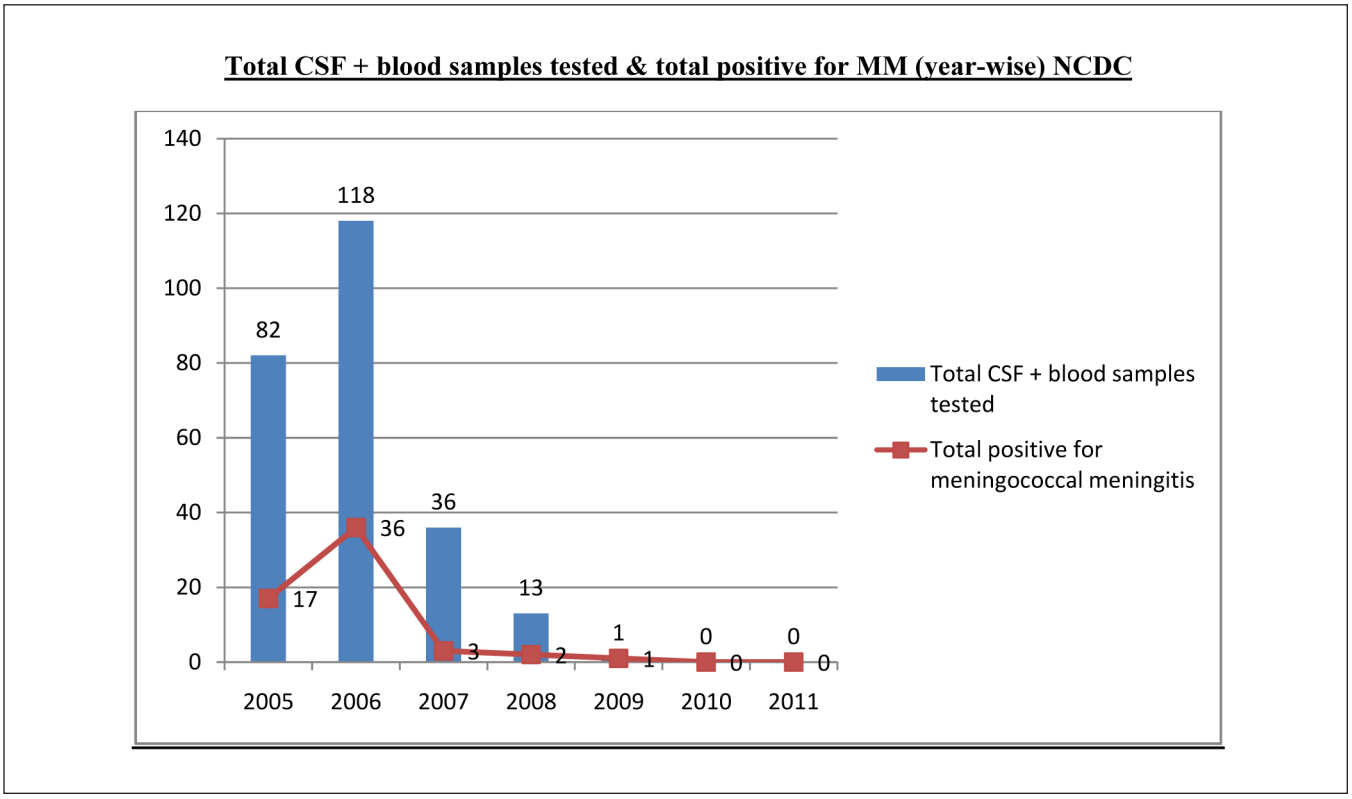

Figure 4: Bar graph showing total number of CSF samples + blood samples tested and line graph showing the total samples positive for meningococcal meningitis 2005–2011.

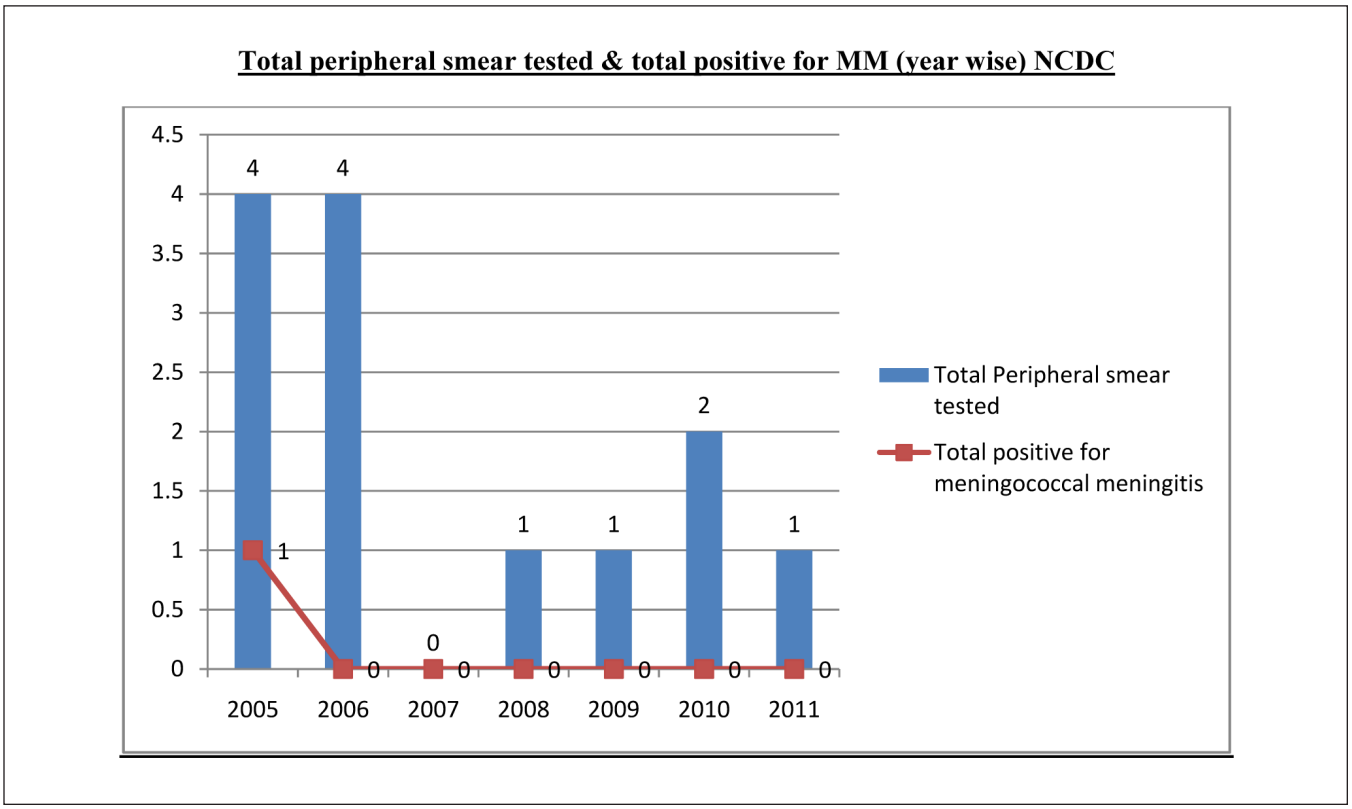

Figure 5: Bar graph showing total number of peripheral smear samples tested and the line graph showing total samples positive for meningococcal meningitis 2005–2011.

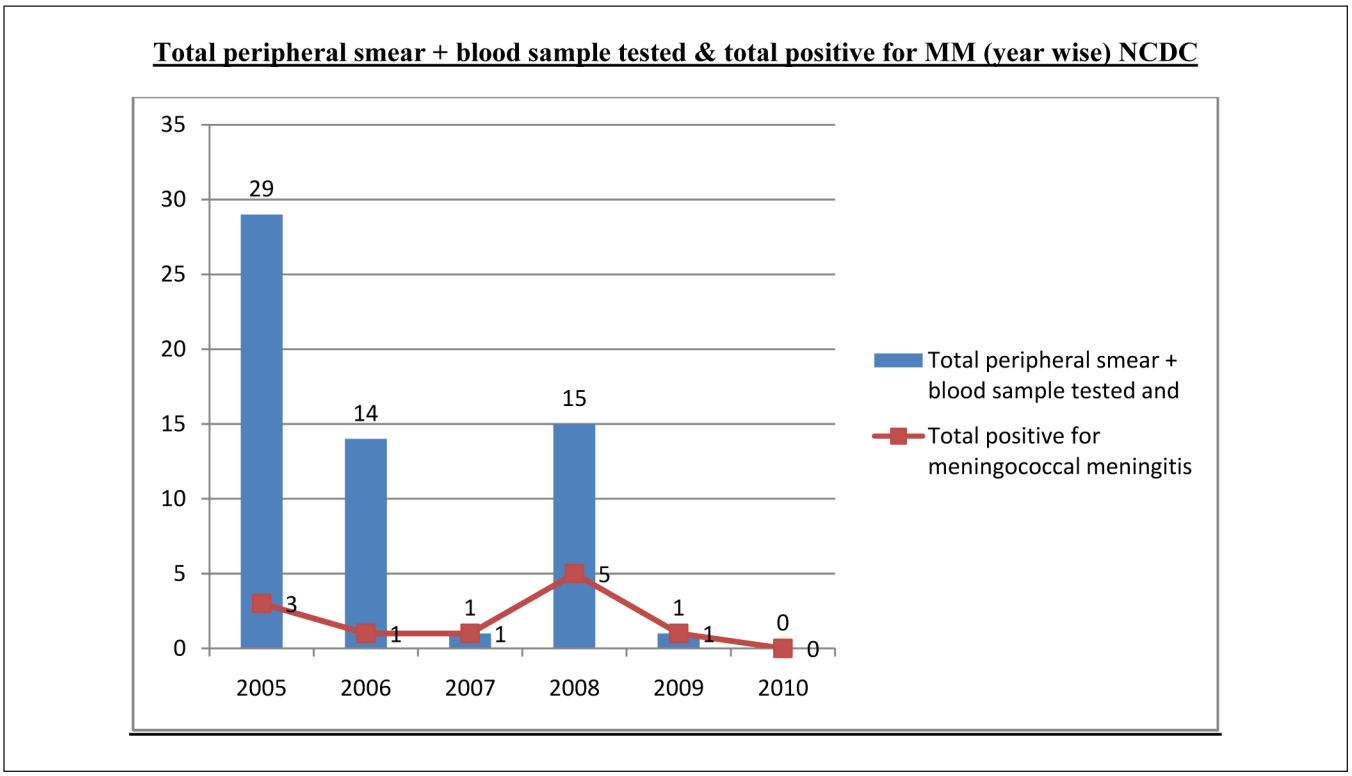

Figure 6: Bar graph showing total number of peripheral smear samples + number of blood samples tested and line graph showing total samples positive for meningococcal meningitis 2005–2011.

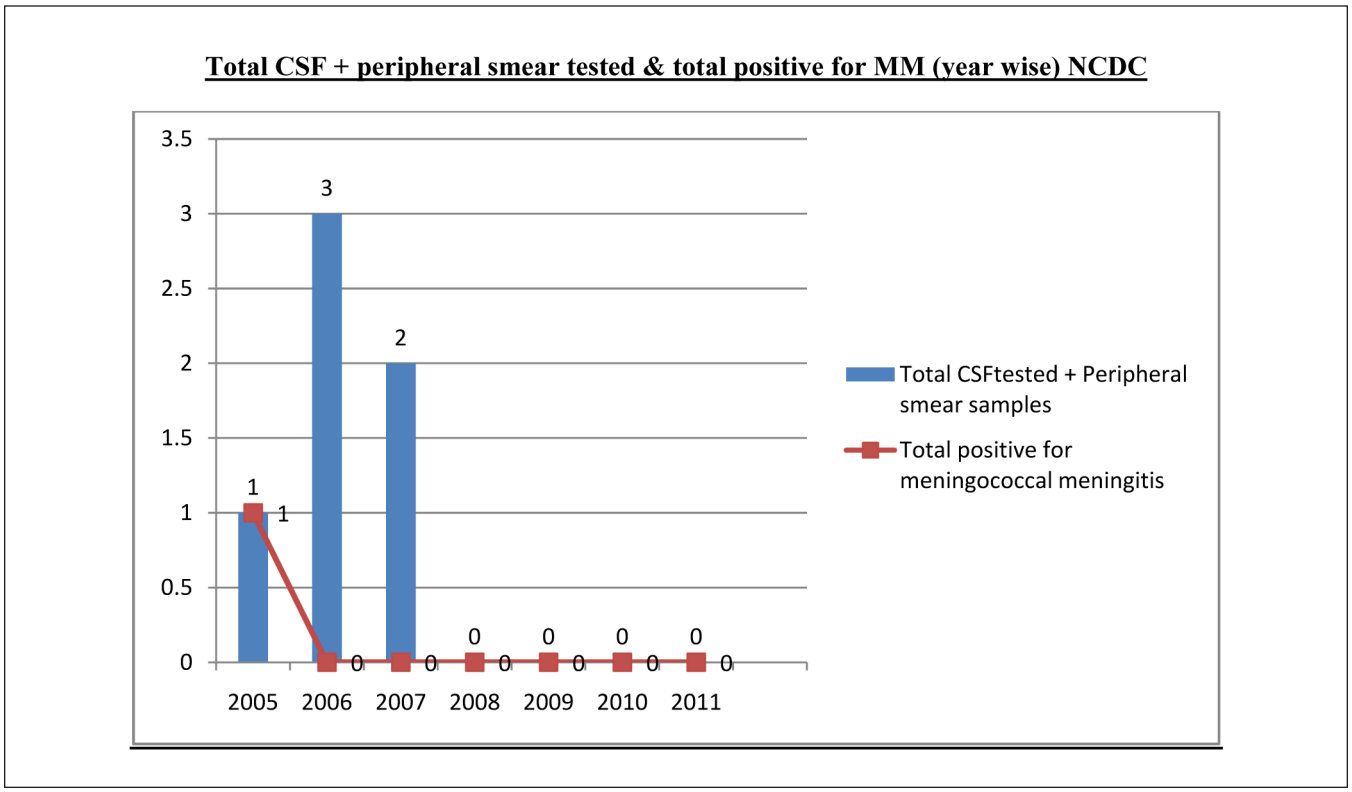

Figure 7: Bar graph showing total number of CSF samples tested + number of peripheral smear samples tested and line graph showing total samples positive for meningococcal meningitis 2005–2011.

positivity decreased in subsequent years with 15.8% in 2007, 11.8% in 2008, 4.4% in 2009, 1.7% in 2010 and 1.6% in 2011.

Total samples tested for Cerebrospinal fluid (CSF), was 265 in 2005, it increased to 538 in 2006 and has fallen down subsequently, with 159 cases in 2007, 170 in 2008 and 163 in 2009. Percentage positivity was 18.1%, 25% in 2006, 17.5% in 2007, 9.4% in 2008 and 3.6% in 2009. Among the blood samples that were tested for meningococcal meningitis, the positivity rate was 20.7% in 2005, 30.5% in 2006, 20% in 2007, 15.4% in 2008 and 100% in 2009.

The epidemic reported the maximum number of positive cases during Jan-April, with the maximum frequency

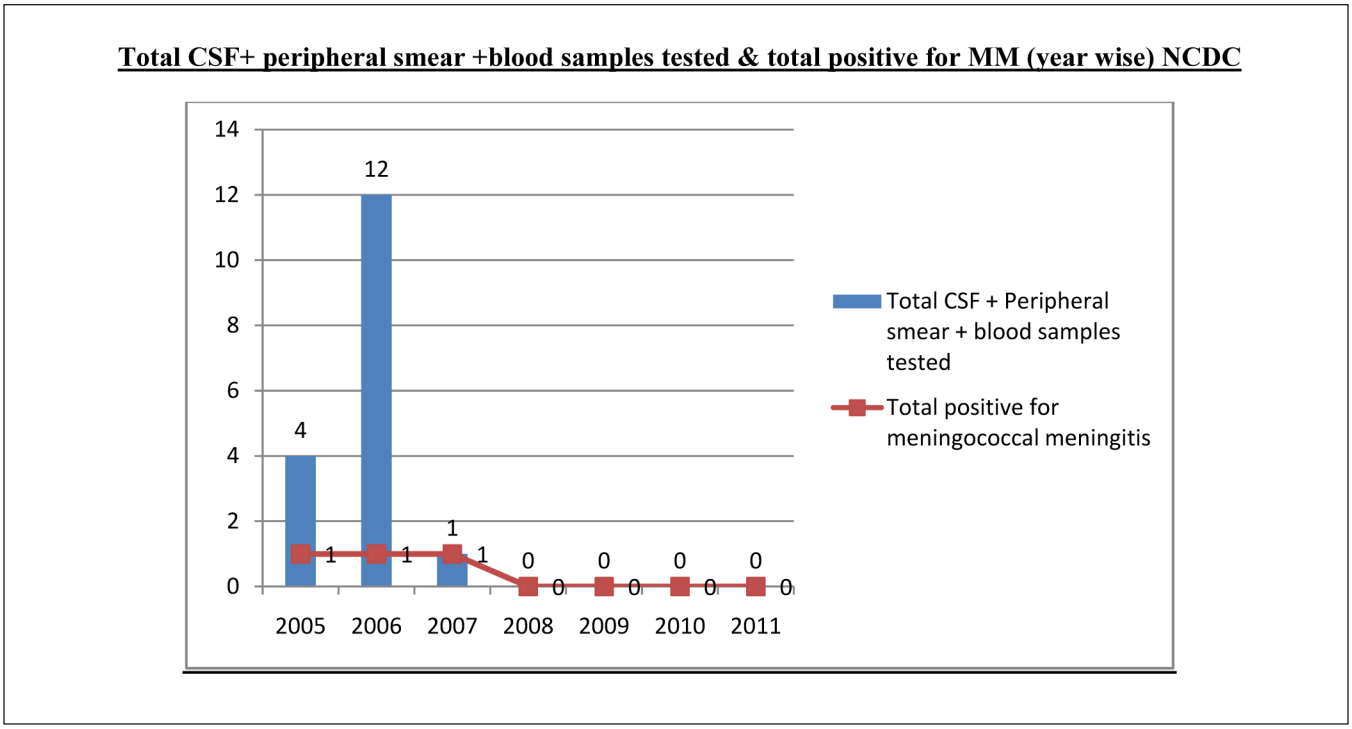

Figure 8: Bar graph showing total number of CSF samples tested + number of blood samples tested and line graph showing total samples positive for meningococcal meningitis 2005–2011.

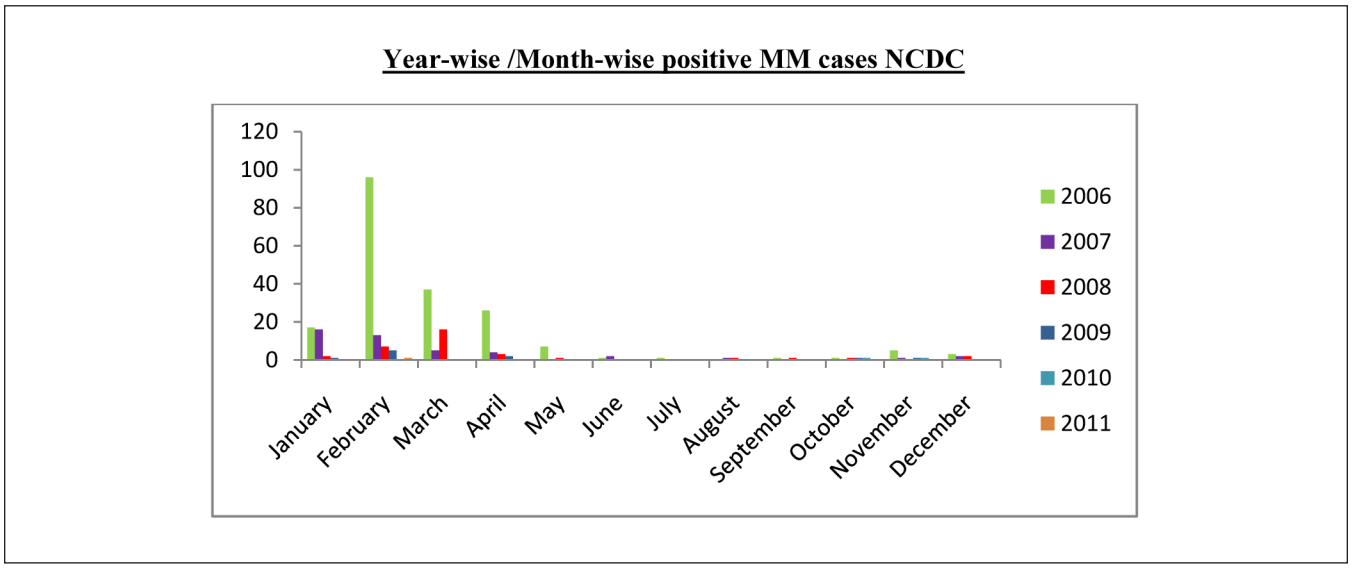

Figure 9: Bar graph showing year-wise/month-wise positive meningococcal disease cases at NCDC during 2006–2011.

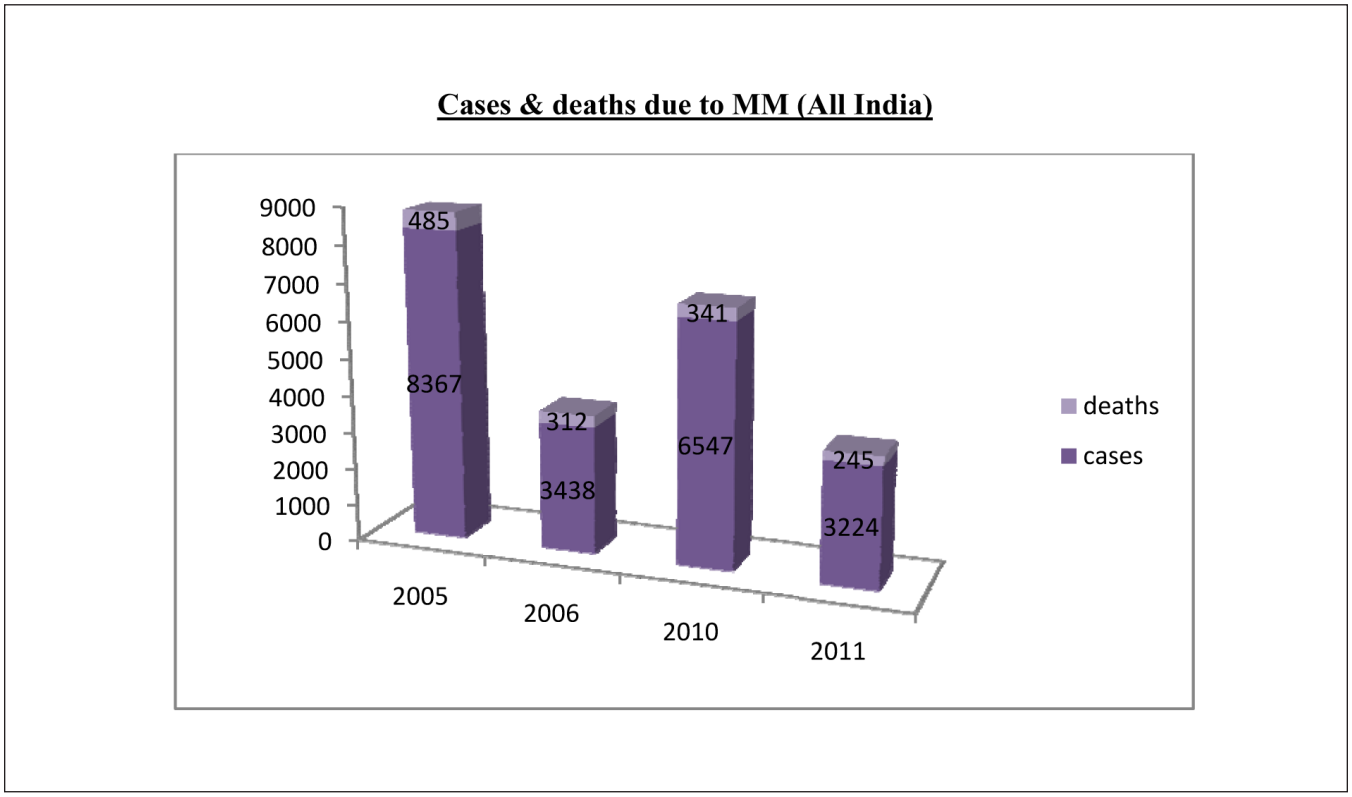

Figure 10: Bar graph showing year-wise/month-wise positive meningococcal disease cases at NCDC during 2005–2011.

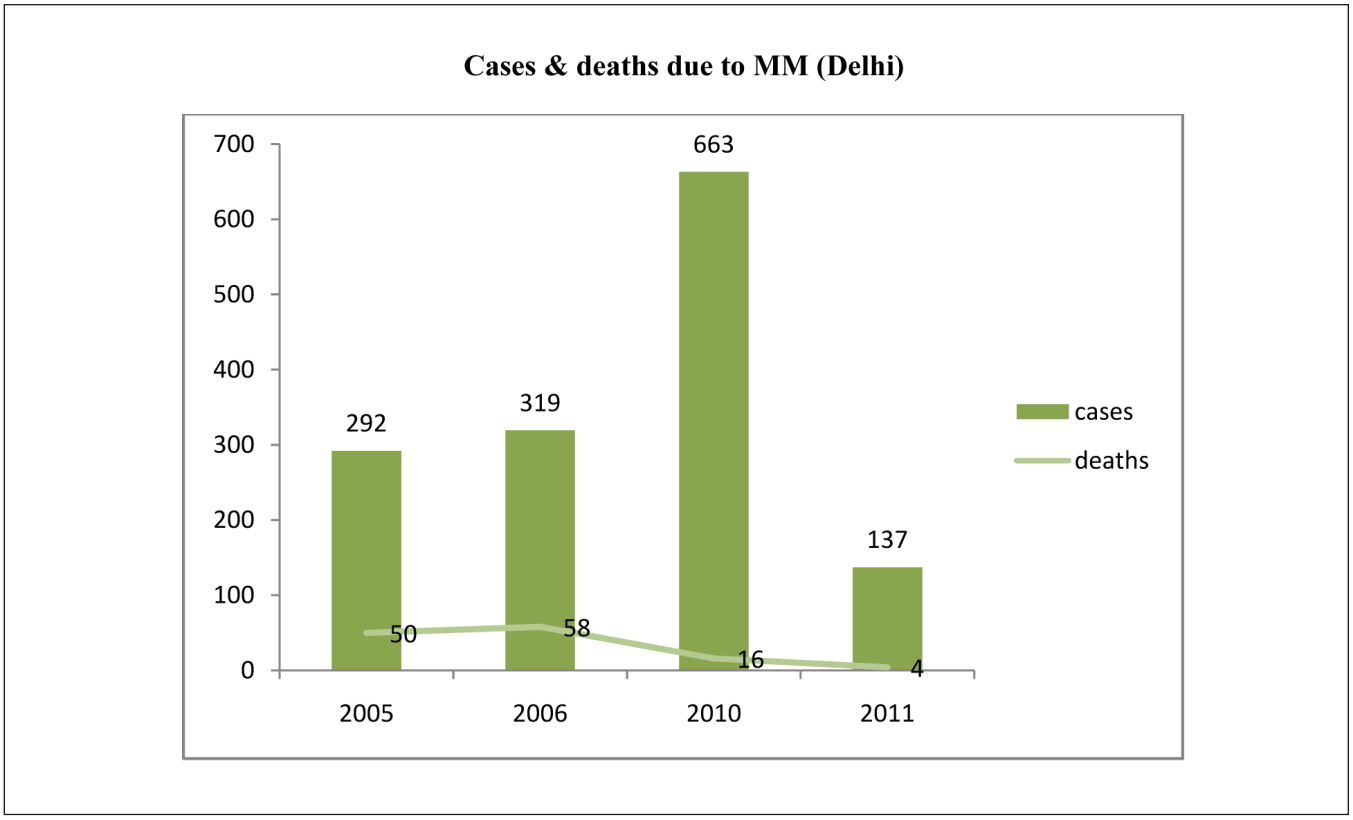

Figure 11: Bar graph showing year-wise number of cases and deaths due to positive meningococcal disease cases at NCDC during 2005–2011.

of cases reported during 2006. The months March, April, January and May also reported high number of cases Figure 9. Fewer positive cases were reported in May, November and December months. Other months reported even lesser positive cases.

DISCUSSION

The percent positivity of the samples rose from nil to 13.6% in 2005, reached a maximum of 18.2% in 2006, declined to 15.7% in 2007, 11.6% in 2008 and finally came down to 4.4% by November 2009.

Another observation made was that by using a combination of samples like CSF and blood (for culture and/ or serology), the positivity rate was much higher ranging from 20% to 30.5% than when single samples like CSF alone (positivity 17.6 to 24.9%) or blood alone (positivity 5.3% to 10.5%) were tested during the peak epidemic period (2005 – 2007).

The outbreak that occurred in Delhi during April 2005–2008, resistance against Cotrimoxazole, Ciproflaxin, Ofloxacin, Tetracyclin and Vancomycin was observed in majority of the isolates.

The cases exhibited a seasonal variation with epidemics majorly occurring in the months of January to May, with maximum number of cases occurring in February and March, i.e. in the dry period. The cases were also observed during rest of the time were very less.

Evidences suggest the epidemics usually occur in the dry and humid areas of the country as discussed by Sinclair D *et al.*14 Similar is the picture in African countries. With the number of outbreaks that have occurred in the past in the Indian subcontinent, it is evident that the country suffers from the epidemic, with majority reports from crowded cities such as Delhi.

In conclusion, usage of a combination of samples such as CSF and blood provided us with an advantage in being able to pick larger number of samples which otherwise could have been missed in single samples.

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