

ABSTRACT

Introduction

Pneumonia, meningitis, sepsis (PMS) in children below the age of 5 years poses a great threat as a debilitating and a life threatening disease especially in a developing country like Sri Lanka. PMS can happen due to bacteria, virus and other organisms. One of the main cause of PMS is pneumococcal (pnc) bacteria which causes very severe disease. Morbidity and mortality is very high with pnc PMS often resulting in lifelong sequel. Antibiotics resistance of the S.pneumoniae further highlights the need to prevent the disease with an effective vaccine. However, it is proven that pnc vaccine can reduce the incidence of non pnc PMS also. The cost of treatment is perceived to be high for treatment of pnc and non pnc PMS with expensive antibiotics and long stay in hospital. The cost of society/ parents when such disease is contacted with their children is also substantial. There is a current debate in the ministry of health Sri Lanka over the introduction of pneumococcal vaccine as a preventive measure. Against this background, this study was conducted to ascertain the cost effectiveness of the pneumococcal vaccine over no vaccination strategy in a district of Sri Lanka.

Methodology

The study was conducted in the district of Colombo to measure the disease burden and the economic burden of pnc and non pnc PMS prior to calculate the cost effectiveness of introducing PCV7 to the EPI in Colombo district.

Using the South Asian Pneumococcal Alliance (SAPNA) data base maintained by the epidemiological unit, Ministry of Health the proportion between the pnc and non pnc PMS was determined. The proportions of each disease entity within the pnc and non pnc PMS cases were also estimated. Furthermore, outcome of each disease entity, namely

cured, sequel and death were also calculated. With the help of a community survey involving all Colombo district the incidence of all case PMS was determined. Application of earlier proportion on community survey results yielded the incidence rate of pnc and non pnc PMS cases. Moreover, cost of treatment of PMS, incremental cost of vaccine when introduced into the existing EPI was also calculated.

Using above findings incidence of pnc and non pnc PMS was calculated for a cohort of children in the Colombo district. For the same cohort, cost of treatment, DALY and vaccine cost was calculated for “vaccinated” and “not vaccinated” scenarios. The cost effectiveness was calculated by building a decision analysis model using the Tree Age Pro software. In the cost effectiveness calculation vaccinated and not vaccinated scenarios were compared in terms of cost and effectiveness (DALY).

Results

The proportion of pnc PMS to all cause PMS was 3.7%. The proportion of pneumococcal pneumonia (21.6%), meningitis (37.3%) and sepsis (41.1%) were significantly different ($p < 0.0001$) from the proportions of non pnc pneumonia (67.0%), meningitis (19.6%) and sepsis (13.4%). The case fatality rate of pnc PMS cases was 4% compared to the 2.4% in non pnc PMS cases.

The community based survey yielded all cases incidence rate as 2.3% for the district. The calculated pnc PMS and non pnc PMS incidence was 83.3 per 100,000 and 2167 per 100,000 respectively.

The treatment cost was calculated for direct medical, direct non medical and indirect costs. Total median costs for pnc PMS cases (Rs.18040) was higher than the total median cost for non pnc PMS cases (Rs.12495). Vaccine cost was the only incremental cost that was considered and it was calculated as Rs. 55, 756,797 for a cohort of

children less than 5 years in Colombo district according to 2001 census data. The efficacy of the vaccine for pnc and non pnc PMS was considered as 90% and 20% respectively. The incremental cost effectiveness ratio was found to be 7397 Rs per DALY averted. It was much lower than the per capita income of the country rendering the vaccine strategy as a very cost effective intervention compared to the no vaccination strategy.