

Development of a composite malaria burden index using principal component analysis for comparative assessment of tribal and non-tribal districts in Chhattisgarh: Reg No: 435

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ABSTRACT

Background: Malaria remains a significant public health problem globally and in India. Despite accounting for only 2.29% of India's population, Chhattisgarh contributes a disproportionately high share of malaria cases and deaths in the country. Traditional surveillance indicators often provide fragmented information on disease burden. A composite index integrating multiple indicators may provide a more comprehensive assessment of malaria burden and help identify high-risk areas for targeted interventions. **Objectives:** To develop a composite Malaria Burden Index (MBI) using Principal Component Analysis (PCA) and to compare the malaria burden between tribal and non-tribal districts of Chhattisgarh. **Methods:** A secondary data analysis was conducted using district-level malaria surveillance data for 2024 obtained from the National Vector-Borne Disease Control Programme (NVBDCP) database. Five key malaria indicators were included: Annual Parasite Incidence (API), Annual Blood Examination Rate (ABER), Slide Positivity Rate (SPR), Annual Falciparum Incidence (AFI), and Slide Falciparum Rate (SFR). Districts were categorized as tribal or non-tribal according to the Ministry of Tribal Affairs classification. PCA was performed using IBM SPSS Statistics (version 25) to construct the composite MBI based on the correlation matrix. The first principal component (PC1) was retained as the MBI. **Results:** The first principal component (PC1) had an eigenvalue of 4.739 and explained 94.78% of the total variance and was retained as the Composite Malaria Burden Index. Based on these scores, districts were categorized into low, moderate, and high malaria burden groups. High MBI scores are concentrated in the southern tribal districts, particularly Bijapur, Narayanpur, and Dakshin Bastar. Most non-tribal districts fall into the low or moderate burden categories. **Conclusion:** The Composite Malaria Burden Index provides an integrated measure for assessing malaria burden at the district level. The findings highlight a disproportionately higher burden in tribal districts of Chhattisgarh, emphasizing the need for intensified malaria control interventions in these high-risk areas.

KEYWORDS

Incidence; Parasites; Public health; Cost of Illness; Malaria