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# Population, Health and Nutrition in Central India: A Situational Analysis

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**ABSTRACT**

India is the second most populous in the world, having crossed the population mark of 1 billion in the year 2000. The different geographical regions exhibit different levels of health and nutritional status. Out of 35 states, some are identified as demographically lagging behind, called *BIMARU.* Central India falls in this category and the present paper provides a situational analysis of the region with respect to population growth, socio-economic condition, health scenario and level of nutrition in the region. The level of socio-economic development is relatively poor in this part when compared to other parts of the country. The population growth is higher than the national average. The Infant mortality rate (IMR) continues to be higher in Central India, varying from 70 to 164 across the districts in the region. Regression analysis shows a negative correlation between Human development index (HDI) and infant mortality rate. Considering 18.5 as a cut-off point for screening the individuals into normal and chronic energy deficiency (CED) groups, it is found that the prevalence of CED is lower among the populations of non-backward districts (50.5 %) than that in the backward districts (53.6 %). It is suggested that the overall socio-economic development should be accelerated and infant mortality controlled in order to improve the health and nutritional status of the people in Central India.

## INTRODUCTION

The erstwhile Madhya Pradesh or undivided Madhya Pradesh state as its name implies—Madhya means "central" and Pradesh means "region" or "state" — is the area of present study and called Central India. One new state Chhatisgarh was formed after division of this state in November 2000. The study area is situated between 18° to 36° and 30 minutes of latitude at the north of equator and 74° to 84° and 36 minutes of longitude at east of prime meridian. The geographical area according to the Surveyor General of India is 443,446 sq kms, the population was 66,135,862 as per the 1991 census in the region. This region is demographically lagging behind in the country.

Inadequacies in nutritional intake or under-nutrition can be considered a major source of many adverse effects on the growth and health of individuals (Gordon *et al.,* 1968). Knowledge of the nutritional status of a community or a region is necessary to have a comprehensive idea about

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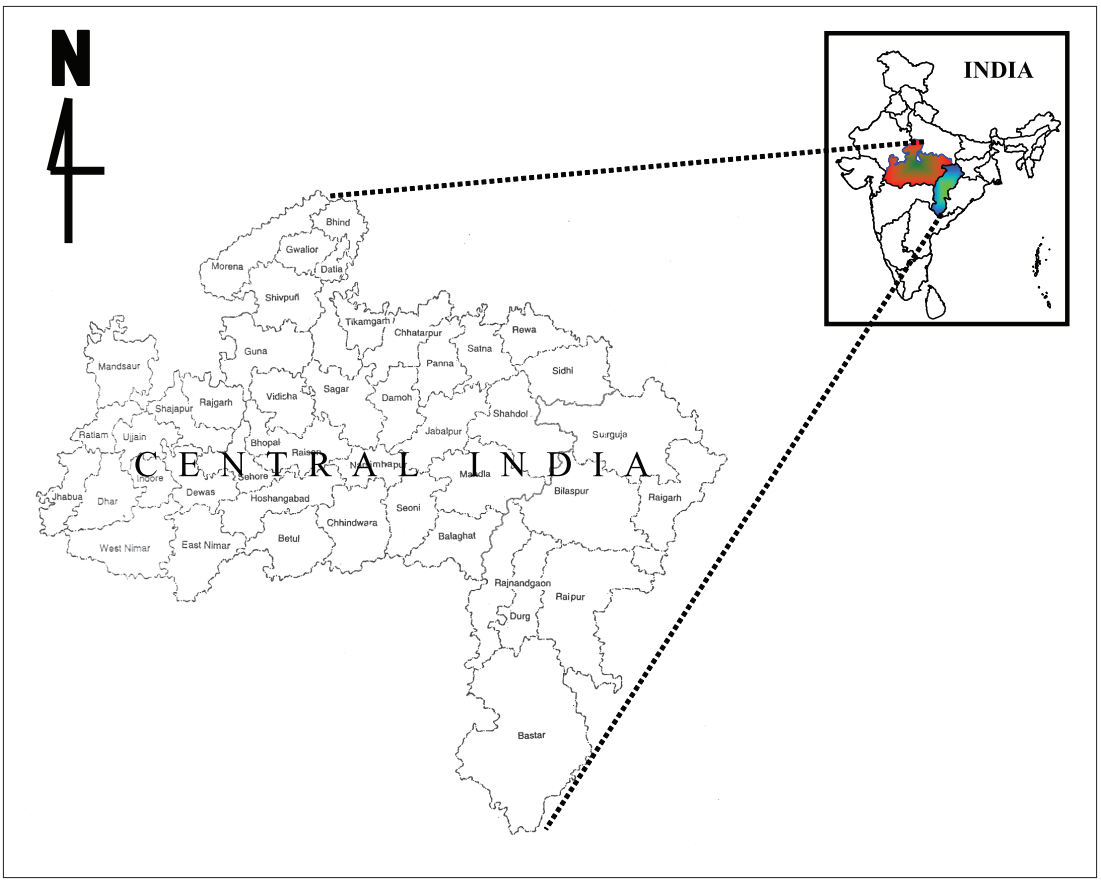
its development process, as under-nutrition is one of the major health problems in developing countries. It is reported that the basic causes of under-nutrition and infections in developing countries are poverty, poor hygienic conditions and little access to preventive health care (Mitra, 1985; WHO, 1990).

Out of 35 states in India, some are identified as demographically lagging behind and called *BIMARU.* Central India also falls in this category and needs a situational analysis related to socio-economic condition, health condition and level of nutrition. Keeping in mind this background, the present paper deals with the socio-economic condition, health scenario and level of nutrition in the region.

## MATERIALS AND METHOD

### Area and People

The present study is based on 45 districts of the erstwhile Madhya Pradesh state (Central India) of India (Map 1). The state has no coastline and no international frontier. Madhya Pradesh lies over a transitional area between the Indo-Gangetic Plain in the north and the Deccan Plateau in the south. Its physiography is characterised by low hills, extensive plateaus, and river valleys. The elevation of the region ranges from 300 to 3,900 feet (100 to 1,200 metres). In the northern part of the region, the land rises generally from south to north, while in the southern part it increases in elevation toward the west.




**Map 1.** Locational Map of Central India

More than 23 percent of the people in this region are officially classified as members of Scheduled Tribes. Hindi, the official state language in the region, is also the language most widely spoken. There are, however, sizable minorities of Muslims, Jains, Christians, and Buddhists. There is also a small Sikh population. Agriculture is the basis of economy in this region. Less than half of the land area is cultivable, however, and its distribution is quite uneven because of variations in topography, rainfall, and soils. Agriculture in this part is characterised by low productivity and the use of traditional methods of cultivation. As only about 15 percent of the sown area is irrigated, the agriculture of the area is largely dependent on rainfall and often suffers from drought and the poor moisture content of its red-to-yellow soils. Much of the irrigation in this region is carried out chiefly by means of canals, wells and tanks (village lakes or ponds), and has been developed through medium-size or small projects executed during the central government's successive five-year plans.

(Note: *The terms 'Madhya Pradesh' and 'Central India' are used alternatively to denote the study area throughout present investigation.).*

The present investigation is based on published data. The information obtained from different sources is used for analysis, correlation, interpretation and presentation of facts. Among statistical tools, besides central tendencies, regression and correlation analysis are used to find out correlation and its extent between different demographic, socio-economic and biological variables. The data for analysis of nutritional status is based on basic anthropometric data collected on adult males, aged 18-62 years, by the Anthropological Survey of India (Basu *et al.,* 1994). Body mass index or BMI (BMI=W/H$^2$) is widely accepted as one of the best indicators of nutritional status in the adults (James, Ferro-Luzzi & Waterlow, 1988; Ferro-Luzzi *et al.,* 1992; Shetty & James, 1994). In the present study, BMI values are calculated to find out the level of nutrition among the populations residing in different districts of Central India. However, to calculate the level of nutrition at district level, data on body height (H) and weight (W) of different populations were clubbed for each district separately. The details of data and methodology in this respect is given elsewhere (Gautam *et al.,* 2006). In the present study, the Human Development Index (HDI) values of 45 districts of Madhya Pradesh were used to find out how far a district has traveled, from a minimum level of achievement, and the path still to be travelled. The index is calculated by the following formula as given in the Madhya Pradesh Human Development Report (Government of Madhya Pradesh, 1998):

$$HDI_{ij}\ (\text{Index}) = \frac{\text{Target}_j - \text{Value}_{ij}}{\text{Target}_j - \text{Min}_j}$$

$HDI_{ij}$ = Index of deprivation for the ith district for the jth criterion.

$Target_j$ = This is the maximum achievable target for the jth criterion (for example, it is 100 per cent for literacy).

$Value_{ij}$ = This is the value of the ith district for the jth criterion.

$Min_j$ = This is the minimum value for the jth criterion (it is 0% for literacy)

It is understood that there are some under-registrations in the data of vital events. Every one knows such defects of vital statistics. However it is true that though this data may not be exact, they reflect close to the reality. Since we do not have any tools to rectify these defects, we restrict ourselves to the available data.

## RESULTS AND DISCUSSION

### Socio-Economic Development

The socio-economic consequences of population growth have always drawn the

attention to the fact that development is viewed as one of the determinants of population growth. However, the relationship between socio-economic development and population growth is not always inverse as is usually believed to be. In Table 1, socio-economic indicators of Central India (Madhya Pradesh) along with three other backward states and Kerala are presented. For a comparative analysis, the relative position of the four backward States in terms of ranks are shown for each indicator, and the average rank for each of the four States has been calculated. It can be seen from the Table that though overall position of Central India (Madhya Pradesh) in terms of socio-economic indicators is far below Kerala State, its position is better than the other three States, followed by Orissa, Uttar Pradesh and Bihar. The reason the Kerala state was selected for this study is due to its unique achievement in demographic transition among Indian states.

**Correlates of Population Growth**

For a clear idea on per capita state domestic product, level of poverty and female literacy in terms of population

**Table 1.** Socio-economic indicators in 4 states and Kerala (after Gupta, 1998)

| *Indicators* | *S T A T E* | | | | |
|---|---|---|---|---|---|
| | *Bihar* | *Orissa* | *Uttar Pradesh* | *M. P. [Central India]* | *Kerala* |
| 1. Per capita income (in Rs) [1994-1995] | 3816 (4) | 5157 (3) | 5331 (2) | 5845 (1) | 6983 |
| 2. Population below poverty line in rural areas (in per cent) [1993-1994] | 58.0 (4) | 49.9 (3) | 42.6 (2) | 40.8 (1) | 25.9 |
| 3. Literacy rate (1991) | | | | | |
| (a) Total | 38.5 (4) | 49.1 (1) | 41.6 (3) | 44.2 (2) | 89.8 |
| (b) Male | 52.5 (4) | 63.1 (1) | 55.7 (3) | 58.4 (2) | 93.6 |
| (c) Female | 22.9 (4) | 34.7 (1) | 25.3 (3) | 28.9 (2) | 86.2 |
| 4. Percentage share of rural population (1991) | 86.8 (4) | 86.7 (3) | 78.9 (2) | 76.9 (1) | 73.4 |
| 5. Percentage share of tribals in the population (1991 rank) | (2) | (3) | (1) | (4) | |
| 6. Average of ranks | 3.7 | 2.14 | 2.3 | 1.85 | |

Note: Figures in parentheses refer to the relative position of the four backward States for each indicator. The average rank for each of the four States is given in the last row.

**Table 2.** Population growth rate (1981-1991) of States in India by per capita SDP (after Kulkarni & Kumar, 1991)

| *Per capita SDP (1981)* | *Population growth rate (1981-1991)* | | |
|---|---|---|---|
| | *High (23.38-28.07)* | *Medium (18.68-23.38)* | *Low (13.98-18.68)* |
| High (1049-1345) | Haryana | Punjab | |
| Medium (745-1049) | Maharashtra<br>West Bengal | Gujarat | |
| Low (441-745) | Bihar<br>Andhra Pradesh<br>Rajasthan<br>Madhya Pradesh<br>Uttar Pradesh | Karnataka<br>Orissa | Kerala<br>Tamil Nadu |

**Table 3.** Population growth rate (1981-1991) of States by the percentage of population below poverty line (after Kulkarni and Kumar, 1991)

| *Percentage of population below poverty line (1981)* | *Population growth rate (1981-1991)* | | |
|---|---|---|---|
| | *High (23.38-28.07)* | *Medium (18.68-23.38)* | *Low (13.98-18.68)* |
| High (40.8-53.9) | Bihar<br>Madhya Pradesh<br>Maharashtra<br>Uttar Pradesh<br>West Bengal | Karnataka<br>Orissa | Tamil Nadu |
| Medium (27.7-40.8) | Andhra Pradesh<br>Rajasthan | Gujarat | |
| Low (14.6-27.7) | Haryana | Punjab | Kerala |

growth, Indian States are plotted in correlation tables and discussed in the following paragraphs.

A. *Per capita State Domestic Product and Population Growth.* It is evident from Table 2 that if the expected inverse relationship is to hold true, Haryana State had a "high" population growth rate in spite of having a high per capita SDP (State Domestic Product). Side by side, States like Kerala and Tamil Nadu did not have a "high" growth rate in spite of exhibiting a low per capita SDP. However, Central India (Madhya Pradesh) occupies the category of low per capita SDP with a "high" population growth rate.

B. *Level of poverty and population growth.* Table 3 reveals that Haryana seems to be fortunate with a "high" per capita SDP and a "low" percentage of population below poverty line. It is interesting to note that in spite of this fact, it falls in the category of "high" population

growth rate. However, it is not surprising that Central India (Madhya Pradesh) is in the category of "high" population growth with "high" percentage of population below poverty line.

C. *Female literacy and population growth.* It can be seen from Table 4 that all the States in the "low" category of female literacy experienced a "high" growth rate of population. But all the States with "high" female literacy did not indicate a "low" population growth rate (for example Maharashtra and west Bengal). However, Central India as usual occupies the category of "low" female literacy with "high" population growth.

**Health Scenario**

***Health infrastructure***

The utilisation of health infrastructure is an important aspect of health facilities. In this context, data on health infrastructure and its utilisation such as occupancy rate of hospital beds, number of outdoor patients per doctor, rural population covered (per '000) by Health Centre, per capita expenditure on health services, percent deliveries attended in institutions or attended by trained persons etc. are presented for Central India (Madhya Pradesh) along with Kerala and three backward States (Table 5).

Table 5 reveals that Central India does not differ much in terms of availability of health infrastructure than the other three backward States. It is interesting to note that if one State is better placed in one parameter of health infrastructure, it is placed last in another parameter. Considering the average rank for all the parameters, we find that Uttar Pradesh tops among all these States, followed by Orissa, Bihar and Central India. However, Kerala States always show better condition than other States with respect to the indicators of health infrastructure.

***Health status***

Health is a multi-dimensional question and its presence or absence is largely a matter of personal judgment (Gupta, 1998). To assess the health status we have

**Table 4.** Population growth rate (1981-1991) of States in India by female literacy (after Kulkarni & Kumar, 1991)

| *Female Literacy* | *Population growth rate (1981-1991)* | | |
|---|---|---|---|
| | *High (23.38-28.07)* | *Medium (18.68-23.38)* | *Low (13.98-18.68)* |
| High (26.68-35.00) | Maharashtra<br>West Bengal | Gujarat<br>Karnataka<br>Punjab | Kerala<br>Tamil Nadu |
| Medium (18.36-26.68) | Andhra Pradesh<br>Haryana | Orissa | |
| Low (10.04-18.36) | Bihar<br>Madhya Pradesh<br>Rajasthan<br>Uttar Pradesh | | |

**Table 5.** Health Facilities in 4 States and Kerala (after Gupta, 1998)

| *Indicators of Health Infrastructure* | *STATES* | | | | |
|---|---|---|---|---|---|
| | *Bihar* | *Orissa* | *Uttar* | *M. P. [Central India]* | *Kerala* |
| 1. Rural population covered per (in 000) | | | | | |
| (a) Sub-Centre | 5.1 (3) | 4.5 (2) | 5.5 (4) | 4.3 (1) | 4.2 |
| (b) Primary Health Centre | 34.04 (3) | 16.4 (1) | 29.6 (2) | 36.9 (4) | 22.3 |
| (c) Community Health Centre | 510 (1) | 140 (2) | 430 (3) | 270 (4) | 400 |
| 2. Average area covered by (in sq km) | | | | | |
| (a) Sub-Centre | 11.5 (1) | 25.8 (3) | 14.3 (2) | 36.5 (4) | 7.0 |
| (b) Primary Health Centre | 77.0 (2) | 145 (3) | 76.8 (1) | 316.5 (4) | 37.0 |
| (c) Community Health Centre | 149.6 (1) | 975.6 (2) | 1102.4 (3) | 2292.3 (4) | 657.4 |
| 3. Average population covered by | | | | | |
| (a) Multipurpose male worker | 46789 | 87970 | NA | 5201 | 5598 |
| (b) Multipurpose female worker | 10926 (4) | 4269 (1) | 5318 (3) | 4523 (2) | 4282 |
| 4. No. of beds per 1 lakh Population | | | | | |
| (a) Rural | 4.2 (4) | 12.8 (1) | 6.9 (3) | 12.2 (2) | 207.7 |
| (b) Urban | 229.5 (2) | 264.9 (1) | 163.5 (3) | 78.2 (4) | 430.7 |
| 5. Per capita expenditure on health services (in Rs.) | 42.62 (4) | 66.72 (1) | 50.18 (3) | 58.14 (2) | 103.77 |
| 6. Percent of health expenditure on health services (in Rs) | 15.75 (4) | 21.85 (3) | 32.33 (1) | 24.34 (2) | |
| 7. Percent deliveries attended in institutions or attended by trained persons (1994) | | | | | |
| (a) Urban | 37.7 (3) | 72.9 (4) | 86.6 (1) | 79.6 (2) | 98.8 |
| (b) Rural | 32.9 (2) | 30.2 (3) | 41.8 (1) | 27.5 (4) | 97.9 |
| 8. Percent cases in institutions or attended by trained persons | | | | | |
| (a) Urban | 89.9 (2) | 66.1 (4) | 93.3 (1) | 86.3 (3) | 91.7 |
| (b) Rural | 41.2 (2) | 35.4 (4) | 75.0 (1) | 38.1 (3) | 97.3 |
| Average Ranks | 2.73 | 2.26 | 2.33 | 2.86 | |

tried to cover as many dimensions of health as possible to assess the effectiveness of health facilities by using the parameters such as life expectancy at birth, crude death rate, infant mortality rate, perinatal death rate expectation of life at 60 years etc. for four States and Kerala (Table 6).

Table 6 reveals that the Kerala State, as per expectation, shows highest life expectancy at birth and at 60 years. Crude death rate, infant mortality rate, perinatal death rate and malaria cases per lakh of population was also found to be lowest in this State than the other four backward States. Average of ranks for the health parameters considered in this study is 1.0 for Bihar, 3.86 for Orissa, 2.2 for Uttar Pradesh and 3.5 for Central India (Madhya Pradesh). If we include the value of health parameters for rural and urban areas, and for males and females separately, and calculate the average of ranks for these states separately, we find that average value of rank of Bihar remains unchanged at 1.0, but it improves in the case of Orissa from 3.86 to 3.1 and in the case of Central India (Madhya Pradesh) from 3.5 to 3.3 and decreases a little in the case of Uttar Pradesh from 2.2 to 2.3.

**Human Development Index and Infant Mortality**

Infant Mortality Rate (IMR) is the most universally accepted indicator of health status not only of infants, but also of the whole population and of the socio-economic conditions under which they live. In addition, IMR is a sensitive indicator of the availability, utilisation and effectiveness of health care, particularly perinatal care (Park, 2002). Side by side, the Human Development Index (HDI) is used as a composite index comprising levels of human development in education, longevity or health, and in access to opportunities measured in per capita incomes (Government of Madhya Pradesh, 1998). In this context an attempt has been made to measure the present status of districts in Central India on the basis of Human Development Index and Infant Mortality Rate. For this purpose, the 45 districts of Central India (Madhya Pradesh) are first grouped into two categories (backward and non-backward) following the methodology as given by MOHFW (NFHS-I, 1992). Data on HDI and IMR for the 45 districts are furnished in Table 7. It reveals that in general the backward districts are categorised with lower levels of HDI and higher levels of IMR than their counterparts. As this Table is quite self-explanatory, it needs no further description. For a visual representation, the data of HDI and IMR are shown in scattered plot diagram (Figures 1 and 2). It appears that there exists an inverse correlation between HDI and IMR among the districts, which is true for both backward and non-backward districts. However, backward districts show a stronger correlation (r=0.43) than non-backward districts (r= 0.26) in this respect.

***Nutritional status***

Knowledge of nutritional status of a community is necessary to have a comprehensive idea about its development process. It is reported that the basic causes of undernutrition and infections in developing countries are poverty, poor hygienic conditions and little access to preventive and health care (Mitra 1985; WHO, 1990). In this respect, data on nutritional status according to BMI is presented for different districts of Central India (Madhya Pradesh) in Table 8.

Percentage distribution of population according to different grades of BMI and CED is shown in Table 8 and Figure 3. Considering 18.5 as the cut-off point for screening the individuals into normal and chronic energy deficiency (CED) groups, it is found that prevalence of CED is lower among the populations of non-backward districts (50.5 %) than that of the popula-

**Table 6.** Some indicators of health status in 4 States and Kerala (after Gupta, 1998)

| *Indicators* | *STATES* | | | | |
|---|---|---|---|---|---|
| | *Bihar* | *Orissa* | *Uttar* | *M. P. [Central India]* | *Kerala* |
| 1. Life Expectancy at Birth (1989-93) | 58.5 | 55.5 | 55.9 | 54.0 | 72.0 |
| | (1) | (3) | (2) | (4) | |
| (a) Rural | | | | | |
| (i) Male | 58.9 | 55.3 | 55.9 | 52.7 | 68.7 |
| | (1) | (3) | (2) | (4) | |
| (ii) Female | 56.3 | 54.6 | 53.9 | 51.8 | 73.9 |
| | (1) | (2) | (3) | (4) | |
| (iii) Combined | 57.7 | 54.9 | 55.0 | 52.3 | 71.8 |
| | (1) | (3) | (2) | (4) | |
| (b) Urban | | | | | |
| (i) Male | 64.1 | 64.4 | 59.8 | 60.2 | 66.8 |
| | (1) | (3) | (4) | (2) | |
| (ii) Female | 66.9 | 65.7 | 61.4 | 62.4 | 74.8 |
| | (1) | (2) | (4) | (3) | |
| (iii) Combined | 65.2 | 63.6 | 60.0 | 61.9 | 72.8 |
| | (1) | (2) | (4) | (3) | |
| 2. Crude Death Rate (1993-94) | | | | | |
| (a) Rural | 11.1 | 12.1 | 11.5 | 12.5 | 6.5 |
| | (1) | (3) | (2) | (4) | |
| (b) Urban | 6.25 | 9.5 | 9.75 | 10.05 | 5.65 |
| | (1) | (2) | (3) | (4) | |
| (c) Combined | 10.5 | 11.7 | 11.3 | 12.1 | 6.05 |
| | (1) | (3) | (2) | (4) | |
| 3. Infant Mortality Rate (1994-96) | | | | | |
| (a) Rural | 73 | 104 | 89 | 104 | 15 |
| | (1) | (3) | (2) | (3) | |
| (b) Urban | 57 | 65 | 58 | 60 | 13 |
| | (1) | (4) | (2) | (3) | |
| (c) Combined | 71 | 101 | 86 | 98 | 15 |
| | (1) | (4) | (2) | (3) | |
| 4. Perinatal Death Rate (1993-94) | | | | | |
| (a) Rural | 36.4 | 66.8 | 50.6 | 54.9 | 17.7 |
| | (1) | (4) | (2) | (3) | |
| (b) Urban | 35.3 | 44.7 | 37.6 | 38.8 | 17.9 |
| | (1) | (4) | (2) | (3) | |
| (c) Combined | 36.2 | 64.6 | 44.8 | 52.0 | 17.7 |
| | (1) | (4) | (2) | (3) | |
| 5. Blindness per 10000 population | 123 | 172 | 158 | 201 | 131 |
| (1986-87) | (1) | (3) | (2) | (4) | |
| 6. Malaria cases per lakh of population | | | | | |
| (1992-94) | 63.6 | 971.0 | 80.7 | 661.3 | 28.7 |
| | (1) | (4) | (2) | (3) | |
| 7. Expectation of life at 60 years (1989-93) | 16.2 | 15.3 | 15.2 | 15.2 | 19.0 |
| | (1) | (2) | (3) | (3) | |
| Average Ranks | | | | | |
| (a) | 1 | 3.86 | 2.2 | 3.5 | |
| (b) | 1 | 3.1 | 2.3 | 3.3 | |

Note: average rank (a) is calculated without considering rural, urban and gender data; (b) is calculated considering rural, urban and gender data

**Table 7.** Human Development Index and Infant Mortality Rate in the districts of Central India

| *S.No.* | *Districts Index (IMR)* | *Human Development (HDI)* | *Infant Mortality Rate* |
|---|---|---|---|
| Non-Backward | | | |
| 1 | Balaghat | 0.516 | 110 |
| 2 | Bastar | 0.514 | 83 |
| 3 | Bilaspur | 0.555 | 87 |
| 4 | Chhindwara | 0.529 | 103 |
| 5 | Dewas | 0.569 | 90 |
| 6 | Durg | 0.622 | 75 |
| 7 | Indore | 0.637 | 75 |
| 8 | Jabalpur | 0.515 | 101 |
| 9 | Mandla | 0.449 | 88 |
| 10 | Mandsaur | 0.453 | 104 |
| 11 | Narsimhapur | 0.601 | 110 |
| 12 | Raigarh | 0.509 | 88 |
| 13 | Raipur | 0.561 | 91 |
| 14 | Rajgarh | 0.458 | 122 |
| 15 | Rajnadgaon | 0.512 | 97 |
| 16 | Ratlam | 0.601 | 100 |
| 17 | Rewa | 0.451 | 128 |
| 18 | Sarguja | 0.495 | 76 |
| 19 | Satna | 0.448 | 143 |
| 20 | Sehore | 0.553 | 122 |
| 21 | Seoni | 0.505 | 98 |
| 22 | Shahdol | 0.431 | 110 |
| 23 | Shajapur | 0.519 | 105 |
| 24 | Sidhi | 0.499 | 105 |
| 25 | Ujjain | 0.565 | 99 |
| 26 | Vidisha | 0.481 | 124 |
| *Average* | | *0.521* | *101* |
| Backward | | | |
| 1 | Betul | 0.434 | 128 |
| 2 | Bhind | 0.571 | 102 |
| 3 | Bhopal | 0.611 | 70 |
| 4 | Chhatarpur | 0.435 | 150 |
| 5 | Damoh | 0.456 | 123 |
| 6 | Datia | 0.496 | 115 |
| 7 | Dhar | 0.537 | 84 |
| 8 | East Nimar | 0.478 | 100 |
| 9 | Guna | 0.467 | 130 |
| 10 | Gwalior | 0.592 | 70 |
| 11 | Hosangabad | 0.55 | 109 |
| 12 | Jhabua | 0.356 | 130 |
| 13 | Morena | 0.508 | 100 |
| 14 | Panna | 0.426 | 133 |
| 15 | Raisen | 0.542 | 124 |
| 16 | Sagar | 0.494 | 116 |
| 17 | Shivpuri | 0.449 | 164 |
| 18 | Tikamgarh | 0.457 | 132 |
| 19 | West Nimar | 0.401 | 104 |
| *Average* | | *0.487* | *114* |
| For Central India (Grand Total) | | | |
| *Minimum* | | 0.356 | 70 |
| *Maximum* | | 0.637 | 164 |
| *Average* | | 0.507 | 107 |

**Table 8.** Percentage distribution of BMI in backward and non-backward districts (after Gautam *et al.,* 2006)

| *Districts* | BMI (Grouped) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *GED Grade III (Severe)* | *GED Grade II (Moderate)* | *GED Grade I (Mild)* | *Low Weight Weight* | *Normal (20.0-24.9)* | *Obese Grade I (25.0-29.99)* | *Obese Grade II (> 30)* | *Total* |
| Backward | | | | | | | | |
| Betul | 9.3 | 15.0 | 33.7 | 22.7 | 18.7 | 0.7 | 0.0 | 100.0 |
| Chhatarpur | 6.2 | 12.8 | 32.1 | 31.5 | 16.7 | 0.7 | 0.0 | 100.0 |
| Damoh | 5.7 | 11.0 | 28.8 | 29.8 | 23.4 | 1.3 | 0.0 | 100.0 |
| Dhar | 3.7 | 10.0 | 26.3 | 33.3 | 25.3 | 1.3 | 0.0 | 100.0 |
| Guna | 9.6 | 15.3 | 37.4 | 24.9 | 11.8 | 0.6 | 0.3 | 100.0 |
| Gwalior | 5.7 | 11.0 | 25.0 | 29.3 | 28.0 | 1.0 | 0.0 | 100.0 |
| Hoshangabad | 14.8 | 18.1 | 31.2 | 21.1 | 13.1 | 1.7 | 0.0 | 100.0 |
| Jhabua | 15.7 | 12.7 | 30.7 | 17.7 | 20.0 | 3.3 | 0.0 | 100.0 |
| Panna | 3.6 | 11.8 | 31.4 | 29.4 | 23.5 | 0.3 | 0.0 | 100.0 |
| Raisen | 6.7 | 15.7 | 35.0 | 26.0 | 16.3 | 0.3 | 0.0 | 100.0 |
| Saugar | 5.7 | 9.4 | 29.7 | 27.1 | 23.7 | 4.0 | 0.3 | 100.0 |
| Shibpuri | 7.9 | 15.5 | 37.0 | 22.8 | 15.2 | 1.7 | 0.0 | 100.0 |
| Tikamgar | 13.2 | 17.4 | 35.0 | 23.8 | 10.0 | 0.6 | 0.0 | 100.0 |
| Total | 8.3 | 13.5 | 31.8 | 26.1 | 18.9 | 1.4 | 0.1 | 100.0 |
| Non backward | 4.7 | 12.3 | 26.3 | 28.7 | 26.7 | 1.3 | 0.0 | 100.0 |
| Bilaspur | 11.3 | 13.7 | 31.0 | 21.7 | 22.0 | 0.3 | 0.0 | 100.0 |
| Chhindwa | 7.0 | 11.3 | 33.7 | 29.7 | 17.7 | 0.7 | 0.0 | 100.0 |
| Dewas | 6.0 | 12.0 | 36.5 | 27.4 | 18.1 | 0.0 | 0.0 | 100.0 |
| Durg | 3.3 | 10.0 | 23.0 | 30.3 | 31.7 | 1.3 | 0.3 | 100.0 |
| Indore | 5.0 | 13.3 | 32.3 | 25.0 | 22.3 | 1.7 | 0.3 | 100.0 |
| Jabalpur | 8.6 | 10.9 | 24.4 | 24.4 | 30.4 | 1.3 | 0.0 | 100.0 |
| Khandwa | 13.1 | 18.8 | 34.2 | 16.8 | 16.4 | 0.7 | 0.0 | 100.0 |
| Khargone | 10.3 | 15.7 | 31.0 | 21.3 | 18.3 | 3.3 | 0.0 | 100.0 |
| Mandla | 7.3 | 12.6 | 35.4 | 23.8 | 18.2 | 2.6 | 0.0 | 100.0 |
| Mandsaur | 9.4 | 9.0 | 26.4 | 25.4 | 27.1 | 2.7 | 0.0 | 100.0 |
| Narsingh | 9.7 | 14.3 | 27.3 | 21.0 | 26.0 | 1.7 | 0.0 | 100.0 |
| Raigarh | 4.1 | 13.7 | 33.3 | 27.6 | 20.0 | 1.3 | 0.0 | 100.0 |
| Raipur | 12.0 | 9.7 | 29.0 | 25.0 | 22.7 | 1.7 | 0.0 | 100.0 |
| Rajgarh | 10.7 | 12.9 | 38.2 | 20.4 | 16.6 | 1.3 | 0.0 | 100.0 |
| Ratlam | 9.4 | 8.7 | 29.8 | 29.8 | 20.7 | 0.7 | 1.0 | 100.0 |
| Rewa | 3.3 | 5.4 | 29.1 | 33.8 | 26.4 | 2.0 | 0.0 | 100.0 |
| Sahdol | 12.4 | 16.1 | 33.4 | 20.4 | 17.1 | 0.7 | 0.0 | 100.0 |
| Satna | 4.6 | 9.6 | 33.4 | 27.5 | 24.5 | 0.3 | 0.0 | 100.0 |
| Seoni | 7.3 | 11.7 | 30.0 | 23.7 | 26.0 | 1.3 | 0.0 | 100.0 |
| Shajapur | 8.0 | 9.0 | 26.9 | 30.2 | 25.6 | 0.3 | 0.0 | 100.0 |
| Sidhi | 2.4 | 5.1 | 31.1 | 38.6 | 22.8 | 0.0 | 0.0 | 100.0 |
| Surguja | 3.0 | 7.6 | 27.4 | 31.0 | 30.4 | 0.7 | 0.0 | 100.0 |
| Ujjain | 9.7 | 19.4 | 32.8 | 24.4 | 12.4 | 1.0 | 0.3 | 100.0 |
| Vidisha | 9.4 | 15.0 | 34.4 | 26.6 | 13.1 | 1.6 | 0.0 | 100.0 |
| Total | 7.7 | 12.0 | 30.8 | 26.1 | 22.1 | 1.2 | 0.1 | 100.0 |

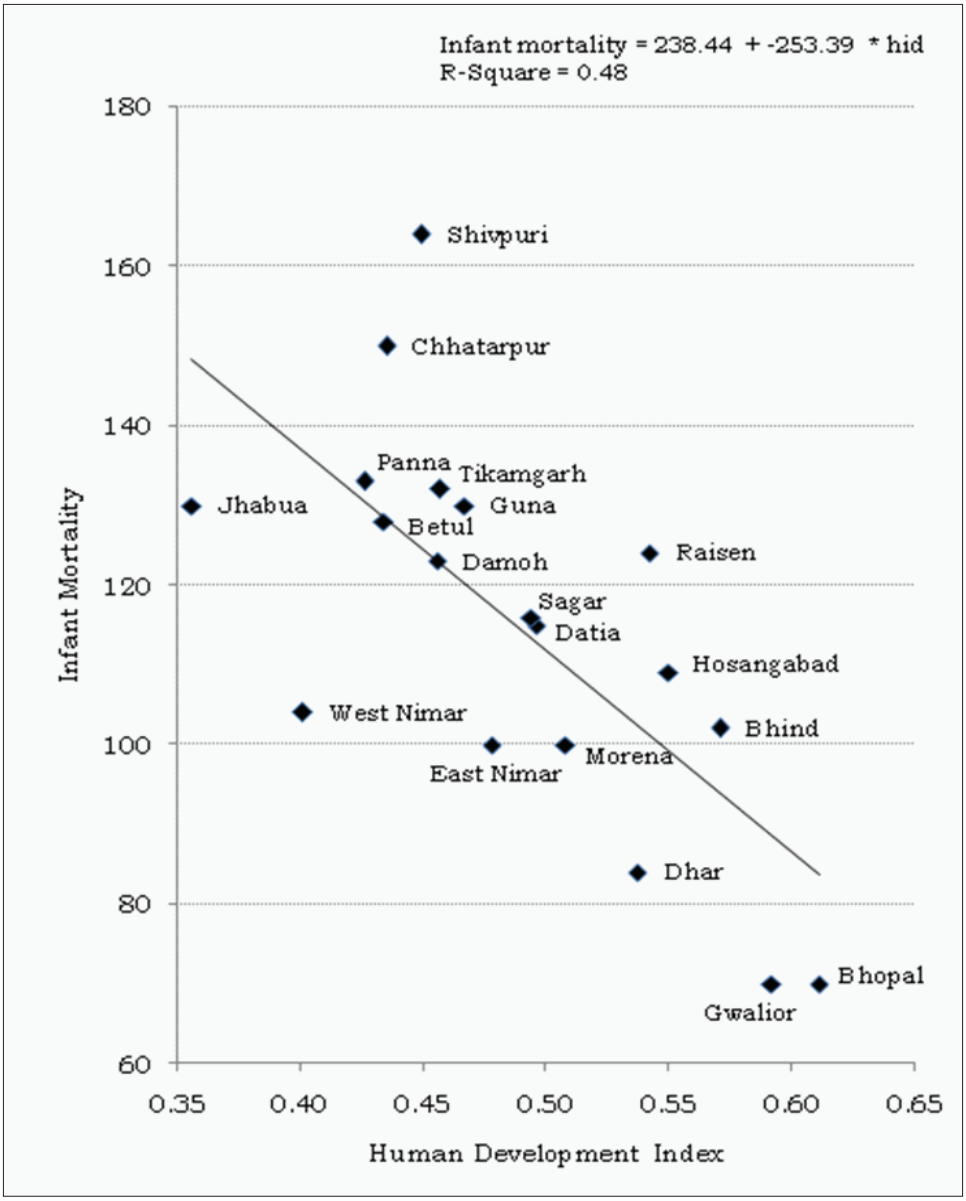



**Figure 1.** Bivariate scattered diagram of HDI and IMR: Backward districts


**Figure 2.** Bivariate scattered diagram of HDI and IMR: Non-Backward Districts

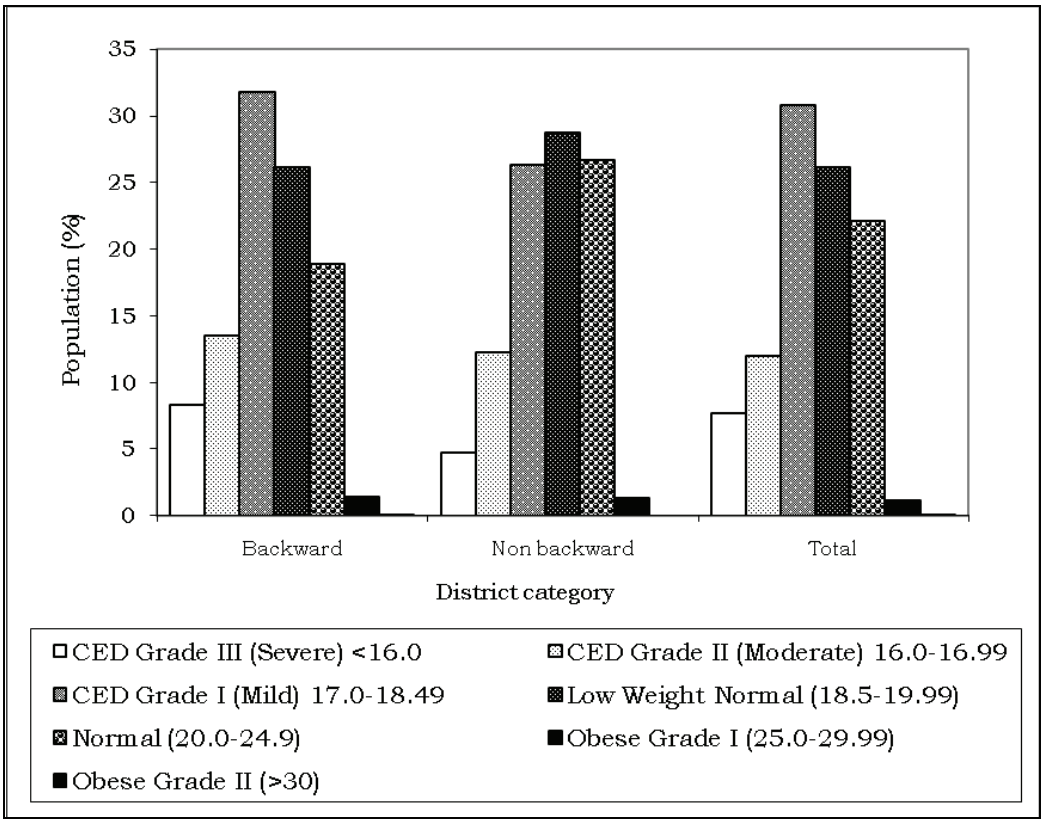



**Figure 3.** Distribution of population according to different grade of BMI and CED among Backward and Non-backward Districts

tions of backward districts (53.6 %). Like Table 7, this Table is also quite self-explanatory.

## CONCLUSION

Today, different parts of the world are passing through different stages of demographic, health and socio-economic developmental transition. Whereas some of the countries are witnessing a population decline, countries like India are facing the problem of exponential population growth, and all its developmental efforts are being dipped into uncontrolled population growth. The country is well-established in its diversity. The demographic diversity is also equally striking. The Central part of this country is comparatively lagging behind in demographic, socio-economic and health scenarios. In this aspect, the level of socio-economic development is relatively low when compared to most of the States of the India. The present study reveals that there exists an inverse relationship between socio-economic development and population growth in this region. Though the overall position of Central India (Madhya Pradesh) in terms of socio-economic indicators is far below Kerala State, its position is found to be better than the other three States, followed by Orissa, Uttar Pradesh and Bihar. It is generally argued that in spite of per capita income, it is the income distribution aspect that is more relevant in

the context of population growth. Side by side, female literacy is one of the indicators, which reveals to a large extent the status of women, which constitutes a crucial aspect of the process of social development. This also emerges as the important variable with a negative effect on both fertility and mortality (Kulkarni and Kumar, 1991). It appears from the present study that Central India (Madhya Pradesh) falls in the category of "high" population growth with "high" percentage of population below poverty line. Side by side, it occupies the category of "low" female literacy with "high" population growth.

Apart from its use as a demographic measure, the level of infant mortality is important as an indicator of health and general standard of living of a community or a particular geographic area. It is generally believed that the lower the level of social and economic development of a country, the greater is the proportion of infant deaths. The high level of IMR and low level of socio-economic development in Central India corroborates this view. The negative correlation between IMR and HDI indicates that if the level of development increases in the region, the IMR will fall automatically by betterment of health and living conditions.

Non-backward districts of Central India have better levels of nutritional status compared to the backward districts, which corroborates the findings of the Ministry of Health and Family Welfare (NFHS-I, 1992). It should be noted that most of the districts in the non-backward category are tribal dominated. A preponderance of tribal populations in these districts varies between 2.60 % in Ujjain district and 64.87 % in Mandla district. Whereas the rest of the districts in the backward category, except the Jhabua, Betul and Dhar districts, have less than 22 % tribal population. The lifestyle and dietary pattern of the populations of non-backward districts might have an impact on their physique as well as BMI. Ranking of backward and non-backward districts in terms of Human Development Index also corroborate the findings of Ministry of Health and Family Welfare.

When Central India is compared with Kerala State, it is found that this part of India is lagging far behind in terms of socio-economic indicators, population growth, health facilities and health status. It can be mentioned that Kerala of India has experienced one of the sharpest fertility declines among the Indian states. The success in Kerala was not due to greater family planning inputs. It was likely due to more efficient delivery of services and a higher spin-off effect. In Kerala the steps came in the right order – a reduction in infant mortality and child mortality accompanied or followed by an increase in female education, followed by redistribution policies and finally family planning programmes. Within the course of a generation, Kerala's fertility has declined from one of the highest in the country to one of the lowest. Kerala's achievement in demographic transition remains unique in the country in the sense that it reached replaced level fertility when its IMR was 13, a rate which is comparable to some of the best in the world.

On the basis of the present findings, it can be suggested that to curve the population growth in this kind of region, the infant mortality should be controlled, and health and nutritional status should be essentially improved through overall socio-economic development. This requires area-specific and population-specific micro-level programming and effective implementation of health and developmental programmes at grassroot levels. For further and in-depth analysis of the problem, population- and region-specific micro level demographic anthropological studies may bring more meaningful pictures, so such studies should be launched or encouraged. In this connection the view of Zachariah (1998) seems to be worth mentioning. According to him,

Kerala's fertility and mortality were due as much to historical factors as recent policy interventions, therefore the other states in India cannot follow Kerala's path in total. While they can learn many things in the area of effective programmes and their implementation methods, they have to devise other methods to diffuse the policies and programmes taking into consideration the special situation in their respective states. For an effective health planning for Central India the above view must be kept in mind.

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