



Ministry of Health and Family Welfare
Government of India

Comprehensive National Nutrition Survey

Madhya Pradesh
Preliminary Factsheet
2016-17



About the CNNS

The Comprehensive National Nutrition Survey (CNNS) is the first ever national nutrition survey covering 112,316 pre-schoolers, school-age children, and adolescents in rural and urban areas across 30 states of India. The CNNS provides national and state level representative data for nutritional status and micronutrient deficiencies among children and adolescents from birth to 19 years and estimates of biomarkers for non-communicable diseases (NCDs) among those aged 5-19 years.

CNNS captures data across three age groups – children under 5, children aged 5–9 years and adolescents aged 10–19 years.

CNNS provides for the first time biomarkers of micronutrient deficiencies and non-communicable diseases across 30 states of India.

Methodology: The CNNS adopted a multi-stage, stratified, probability proportion to size cluster sampling design. Survey questions were administered at both the household and respondent levels. The household questionnaire captured information on the usual residents and visitors who stayed in the house the previous night, socio-economic characteristics and water and sanitation facilities in the households. Through the individual questionnaire data were collected on the respondent's background characteristics, hygiene practices, infant and young child feeding practices (IYCF), dietary diversity, morbidity status, and cognitive development of children. Computer Assisted Personal Interview (CAPI) tools were used to collect survey data.

Indicators: Several anthropometric measurements were collected from survey participants including measurements of height, weight, Mid-Upper Arm Circumference (MUAC) and Triceps Skinfold Thickness (from participants aged 0-19 years), Subscapular Skinfold Thickness (from participants aged 1-19 years) and waist circumference and handgrip strength (from participants aged 5-19 years). In order to estimate prevalence of micronutrient deficiencies, and NCDs among survey participants, biological samples were collected from about half of the survey participants aged 1-19 years. A robust quality assurance and monitoring mechanism was established to ensure data quality during fieldwork.

CNNS collected detailed anthropometric measurements from over 110,000 children and adolescents and biological samples (blood, urine and stool) from over 50,000 children and adolescents.

CNNS measured new anthropometric indicators such as MUAC, triceps & subscapular skinfold thickness to provide an additional insight into the nutritional status of children in India.

Stakeholders: Under the overall leadership and guidance of the Ministry of Health and Family Welfare (MoHFW) and Technical Advisory Committee (TAC) designated by the MoHFW and in collaboration with the United Nations Children’s Fund (UNICEF), the CNNS was implemented by multiple partners. Aditya and Megha Mittal provided financial support for the survey.

Several national and international organizations provided technical and quality assurance support. The Population Council has served as the lead agency to implement the survey. The Centre for Disease Control (CDC) in Atlanta, USA, the All India Institute of Medical Sciences (AIIMS), New Delhi, the National Institute of Nutrition (NIN), Hyderabad, and Clinical Development Services Agency (CDSA), New Delhi provided quality assurance support for the biomarker component. The Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh and Kalawati Saran Children’s Hospital, New Delhi, provided concurrent monitoring support for the household survey and anthropometric measurements.

Data: This fact sheet provides information on key indicators for the state of Madhya Pradesh where the CNNS was conducted from October 5, 2016 through February 5, 2017 and gathered household and anthropometry data from 1,152, 1,199 and 1,137 and biological samples from 455, 622 and 593 children aged 0-4 years (1-4 years for biological sample), 5-9 years, and adolescents aged 10-19 years, respectively. In Madhya Pradesh, survey and anthropometry data were collected by KANTAR Public and Super Religare Laboratories (SRL) Ltd collected biological samples.

Madhya Pradesh – Key Anthropometric Indicators

| Anthropometric profile | Sex | | Residence | | | |
|--|--|--------|-----------|-------|-------|------|
| | Male | Female | Urban | Rural | Total | |
| CHILDREN UNDER AGE 5 YEARS  | Children under age 5 years who are stunted (height-for-age) ¹ (%) | 40.5 | 38.5 | 33.6 | 40.6 | 39.5 |
| | Children under age 5 years who are severely stunted (height-for-age) ² (%) | 16.8 | 11.5 | 14.8 | 13.9 | 14.1 |
| | Children under age 5 years who are wasted (weight-for-height) ¹ (%) | 22.1 | 17.2 | 13.2 | 20.8 | 19.6 |
| | Children under age 5 years who are severely wasted (weight-for-height) ² (%) | 8.3 | 4.9 | 3.2 | 7.3 | 6.6 |
| | Children under age 5 years who are underweight (weight-for-age) ¹ (%) | 40.1 | 37.4 | 32.7 | 39.9 | 38.7 |
| | Children under age 5 years who are severely underweight (weight-for-age) ² (%) | 10.6 | 14.3 | 8.9 | 13.2 | 12.5 |
| | Children aged 6-59 months with MUAC <12.5cm (%) | 4.1 | 7.7 | 3.6 | 6.4 | 5.9 |
| | Children aged 6-59 months with MUAC <11.5cm (%) | 0.0 | 2.5 | 0.7 | 1.4 | 1.3 |
| | Children aged 6-59 months with MUAC-for-age <-2 SD ³ (%) | 13.7 | 12.9 | 6.9 | 14.6 | 13.3 |
| | Children aged 6-59 months with MUAC-for-age <-3 SD ³ (%) | 1.1 | 5.6 | 1.3 | 3.8 | 3.4 |
| | Children under age 5 years with triceps skinfold thickness-for-age <-2 SD ³ (%) | 9.0 | 10.0 | 7.8 | 9.8 | 9.5 |
| | Children under age 5 years with triceps skinfold thickness-for-age <-3 SD ³ (%) | 2.1 | 4.1 | 1.1 | 3.5 | 3.1 |
| | Children under age 5 years with triceps skinfold thickness-for-age >+2 SD ³ (%) | 0.4 | 0.0 | 0.7 | 0.1 | 0.2 |

¹Below -2 standard deviations (SD), based on the WHO standards

²Below -3 standard deviations, based on the WHO standards

³Based on WHO standards

Madhya Pradesh – Key Anthropometric Indicators

| Anthropometric profile | | Sex | | Residence | | |
|---|---|------|--------|-----------|-------|-------|
| | | Male | Female | Urban | Rural | Total |
| CHILDREN UNDER AGE 5 YEARS  | Children under age 5 years with triceps skinfold thickness-for-age $>+3$ SD ³ (%) | 0.1 | 0.0 | 0.5 | 0.0 | 0.1 |
| | Children aged 1-4 years with subscapular skinfold thickness-for-age <-2 SD ³ (%) | 12.0 | 14.9 | 4.2 | 15.3 | 13.5 |
| | Children aged 1-4 years with subscapular skinfold thickness-for-age <-3 SD ³ (%) | 2.3 | 5.3 | 0.2 | 4.5 | 3.8 |
| | Children aged 1-4 years with subscapular skinfold thickness-for-age $>+2$ SD ³ (%) | 1.5 | 0.3 | 1.8 | 0.7 | 0.9 |
| | Children aged 1-4 years with subscapular skinfold thickness-for-age $>+3$ SD ³ (%) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| Anthropometric profile | | Sex | | Residence | | |
|--|--|------|--------|-----------|-------|-------|
| | | Male | Female | Urban | Rural | Total |
| CHILDREN AGED 5-9 YEARS  | Children aged 5-9 years who are stunted (height-for-age) ¹ (%) | 24.1 | 18.3 | 20.6 | 21.3 | 21.1 |
| | Children aged 5-9 years who are severely stunted (height-for-age) ² (%) | 6.9 | 3.7 | 4.0 | 5.5 | 5.3 |
| | Children aged 5-9 years who are moderate or severely thin (BMI for age) z-score <-2 SD ³ (%) | 28.7 | 15.1 | 21.7 | 21.8 | 21.8 |
| | Children aged 5-9 years who are severely thin (BMI for age) z-score <-3 SD ³ (%) | 6.9 | 3.8 | 4.9 | 5.4 | 5.3 |
| | Children aged 5-9 years who are overweight or obese (BMI for age) z-score $>+1$ standard deviations ³ (%) | 1.8 | 1.1 | 2.6 | 1.2 | 1.4 |
| | Children aged 5-9 years who are obese (BMI for age) z-score $>+2$ SD ³ (%) | 1.1 | 0.3 | 1.4 | 0.6 | 0.7 |

¹Below -2 standard deviations (SD), based on the WHO standards

²Below -3 standard deviations, based on the WHO standards

³Based on WHO standards

Madhya Pradesh – Key Anthropometric Indicators

| Anthropometric profile | | Sex | | Residence | | |
|---|--|------|--------|-----------|-------|-------|
| | | Male | Female | Urban | Rural | Total |
| ADOLESCENTS AGED 10-19 YEARS  | Adolescents aged 10-14 years who are moderate or severely thin (BMI for age) z-score <-2 SD ³ (%) | 41.1 | 29.7 | 27.6 | 37.6 | 35.9 |
| | Adolescents aged 15-19 years who are moderate or severely thin (BMI for age) z-score <-2 SD ³ (%) | 34.5 | 21.1 | 22.0 | 28.2 | 27.0 |
| | Adolescents aged 10-19 years who are moderate or severely thin (BMI for age) z-score <-2 SD ³ (%) | 38.5 | 25.5 | 25.0 | 33.5 | 32.0 |
| | Adolescents aged 10-14 years who are severely thin (BMI for age) z-score <-3 SD ³ (%) | 12.3 | 9.1 | 11.5 | 10.7 | 10.8 |
| | Adolescents aged 15-19 years who are severely thin (BMI for age) z-score <-3 SD ³ (%) | 9.5 | 1.7 | 2.8 | 5.7 | 5.1 |
| | Adolescents aged 10-19 years who are severely thin (BMI for age) z-score <-3 SD ³ (%) | 11.2 | 5.5 | 7.5 | 8.5 | 8.3 |
| | Adolescents aged 10-14 years who are overweight or obese (BMI for age) z-score > +1 SD ³ (%) | 1.4 | 1.6 | 4.8 | 0.8 | 1.5 |
| | Adolescents aged 15-19 years who are overweight or obese (BMI for age) z-score > +1 SD ³ (%) | 1.9 | 1.8 | 5.1 | 1.1 | 1.8 |
| | Adolescents aged 10-19 years who are overweight or obese (BMI for age) z-score > +1 SD ³ (%) | 1.6 | 1.7 | 4.9 | 0.9 | 1.7 |
| | Adolescents aged 10-14 years who are obese (BMI for age) z-score > +2 SD ³ (%) | 0.4 | 0.2 | 1.0 | 0.1 | 0.3 |
| | Adolescents aged 15-19 years who are obese (BMI for age) z-score > +2 SD ³ (%) | 0.3 | 0.2 | 1.4 | 0.0 | 0.3 |
| | Adolescents aged 10-19 years who are obese (BMI for age) z-score > +2 SD ³ (%) | 0.4 | 0.2 | 1.2 | 0.1 | 0.3 |

³Based on WHO standards

Madhya Pradesh – Key Indicators of Micronutrient Deficiencies

| INDICATORS | CHILDREN AGED 1-4 YEARS  Total (95% Confidence Interval) | CHILDREN AGED 5-9 YEARS  Total (95% Confidence Interval) | ADOLESCENTS AGED 10-19 YEARS  Total (95% Confidence Interval) |
|---|---|---|--|
| | Prevalence of anaemia ^{4,5} (%) | 53.5 (41.8-64.8) | 22.0 (18.1-26.5) |
| Prevalence of anaemia- males ^{4,5} (%) | 60.4 (48.1-71.5) | 22.7 (16.6-30.3) | 15.4 (11.8-19.8) |
| Prevalence of anaemia- females ^{4,5} (%) | 47.4 (33.6-61.6) | 21.2 (16.2-27.1) | 28.7 (19.5-40.1) |
| Prevalence of low serum ferritin ^{5,6} (%) | 45.9 (28.8- 64.1) | 25.2 (18.0-34.0) | 22.1 (17.4-27.7) |
| Prevalence of folate deficiency ^{5,7} (%) | 57.6 (36.8-76.1) | 62.4 (50.3-73.0) | 74.5 (61.6-84.2) |
| Prevalence of vitamin B12 deficiency ^{5,8} (%) | 11.6 (6.8-19.1) | 22.4 (16.7-29.3) | 42.0 (33.9-50.6) |
| Prevalence of serum 25-hydroxy vitamin D <12ng/ml ⁹ (%) | 7.7 (4.2-13.5) | 19.7 (14.3-26.4) | 23.0 (15.8-32.4) |
| Prevalence of vitamin A deficiency ^{5,10} (%) | * | 13.4 (3.5-40.2) | 13.2 (4.2-34.6) |
| Prevalence of zinc deficiency ¹¹ (%) | 22.3 (11.5-38.7) | 12.3 (6.9-21.0) | 19.9 (13.4-28.6) |
| Median urinary iodine concentration($\mu\text{g/l}$) ⁵ | 132 | 135 | 189 |

⁴CNNS estimated anaemia using the gold standard method, i.e., haemoglobin concentration in venous whole blood sample analysed by cyanmethaemoglobin method in the laboratory using automated haematology counter. These estimates cannot be directly compared with other large scale surveys in India that estimate anaemia from capillary blood using Hemo Cue analyser.

⁵WHO standard cut-off

⁶For children aged 12-59 months: serum ferritin <12 $\mu\text{g/l}$; for children/adolescents aged ≥ 5 years: serum ferritin <15 $\mu\text{g/l}$; all cases with C-reactive protein > 5 mg/L were excluded

⁷Erythrocyte folate < 151 ng/ml

⁸Serum vitamin B12 < 203 pg/ml

⁹Vitamin D deficiency; Institute of Medicine (IOM) standard cut-off

¹⁰Serum retinol < 20 $\mu\text{g/dl}$; all cases with C-reactive protein > 5 mg/L were excluded

¹¹For children aged 1-9 years: serum zinc < 65 $\mu\text{g/dl}$; for adolescent girls: serum zinc <70 $\mu\text{g/dl}$ if fasting, < 66 $\mu\text{g/dl}$ if non-fasting; for adolescent boys: serum zinc <74 $\mu\text{g/dl}$ if fasting, <70 $\mu\text{g/dl}$ if non-fasting; International Zinc Nutrition Consultative Group cut-off

Madhya Pradesh – Key Indicators of Non-Communicable Disease Risks

| | | CHILDREN AGED 5-9 YEARS  | ADOLESCENTS AGED 10-19 YEARS  |
|------------|---|---|--|
| | | Total (95% Confidence Interval) | Total (95% Confidence Interval) |
| INDICATORS | Prevalence of high total cholesterol ¹² (%) | 0.3 (0.1-1.6) | 0.6 (0.1-2.7) |
| | Prevalence of high LDL cholesterol ¹³ (%) | 0.4 (0.1-1.3) | 1.7 (0.7-3.7) |
| | Prevalence of low HDL cholesterol ¹⁴ (%) | 26.1 (18.8-34.9) | 27.0 (17.5-39.2) |
| | Prevalence of high triglycerides ¹⁵ | 35.8 (26.3-46.6) | 10.0 (6.1-16.0) |
| | Prevalence of high fasting plasma glucose ^{16,17} (indicative of prediabetes) (%) | 16.9 (11.8-23.6) | 10.8 (6.0-18.9) |
| | Prevalence of very high fasting plasma glucose, ^{17,18} (indicative of diabetes) (%) | 0.0 (0.0-0.0) | 0.8 (0.2-3.5) |
| | Prevalence of glycosylated haemoglobin concentration 5.7-6.4% ¹⁷ (indicative of prediabetes) | 12.6 (5.7-25.6) | 13.5 (9.0-19.8) |
| | Prevalence of glycosylated haemoglobin concentration ≥ 6.5% ¹⁷ (indicative of diabetes) | 0.5 (0.1-3.3) | 0.1 (0.0-0.6) |
| | Prevalence of high serum creatinine ^{19,20} (%) | 3.0 (1.0-8.6) | 1.6 (0.6-4.3) |

¹²Total cholesterol ≥ 200 mg/dl; Cut-offs taken from National Cholesterol Education Program

¹³LDL ≥ 130 mg/dl; Cut-offs taken from National Cholesterol Education Program

¹⁴HDL < 40 mg/dl; Cut-offs taken from National Cholesterol Education Program

¹⁵For children aged 5-9 years: serum triglycerides > 100 mg/dl; and for adolescents aged 10-19 years: serum triglycerides > 130 mg/dl; cut-offs taken from National Cholesterol Education Program.

¹⁶Plasma glucose > 100 mg/dl & < 126 mg/dl, indicative of prediabetes

¹⁷Cut-off taken from Global International Diabetes Federation

¹⁸Plasma glucose ≥ 126 mg/dl, indicative of diabetes

¹⁹For children aged 5-12 years: serum creatinine > 0.7 mg/dl; for adolescents aged > 12 years: serum creatinine > 1.0 mg/dl

²⁰High serum creatinine was found clustered in few districts. Such clustering has also been reported in public health literature.

The Comprehensive National Nutrition Survey (CNNS) is the first ever national nutrition survey covering over 110,000 pre-schoolers, school-age children, and adolescents in rural and urban areas across 30 states of India.



The CNNS provides national and state level representative estimates from biological samples (blood, urine and stool) for micronutrient deficiencies and non-communicable diseases (NCDs) using best practices in training and field and gold standard laboratory methods.

See CNNS results online: www.NutritionINDIA.info

The survey was conducted with generous financial support from Aditya and Megha Mittal.



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