



सत्यमेव जयते

Ministry of Health and Family Welfare
Government of India



Comprehensive National Nutrition Survey

2016 – 2018

Uttarakhand
State Presentation



Largest Micronutrient Survey ever conducted: CNNS 2016-

112,316

Children and adolescents interviewed



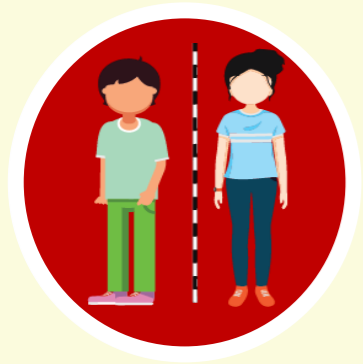
51,029

Blood, stool and urine samples collected



360

Anthropometric measurers



2500

Survey personnel in 30 states



30

Microscopists



100

Data Quality assurance monitors



200

Trainers and coordinators



200

Lab technicians



360

Phlebotomists



900

Interviewers



Justification and Objectives



- To assess the prevalence of malnutrition in both children and adolescents with special focus on assessment of micronutrient deficiencies through biochemical measures.
- To identify determinants and associations of various risk factors for anaemia in both children and adolescents.
- To assess biomarkers for hypertension, diabetes, cholesterol and kidney function and their associations with various risk factors for Non-Communicable Diseases (NCDs).

Malnutrition is responsible for 68% of total under five mortality in India*

*Soumya Swaminathan, et al. (2019), The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. [https://doi.org/10.1016/S2352-4642\(19\)30273-1](https://doi.org/10.1016/S2352-4642(19)30273-1)

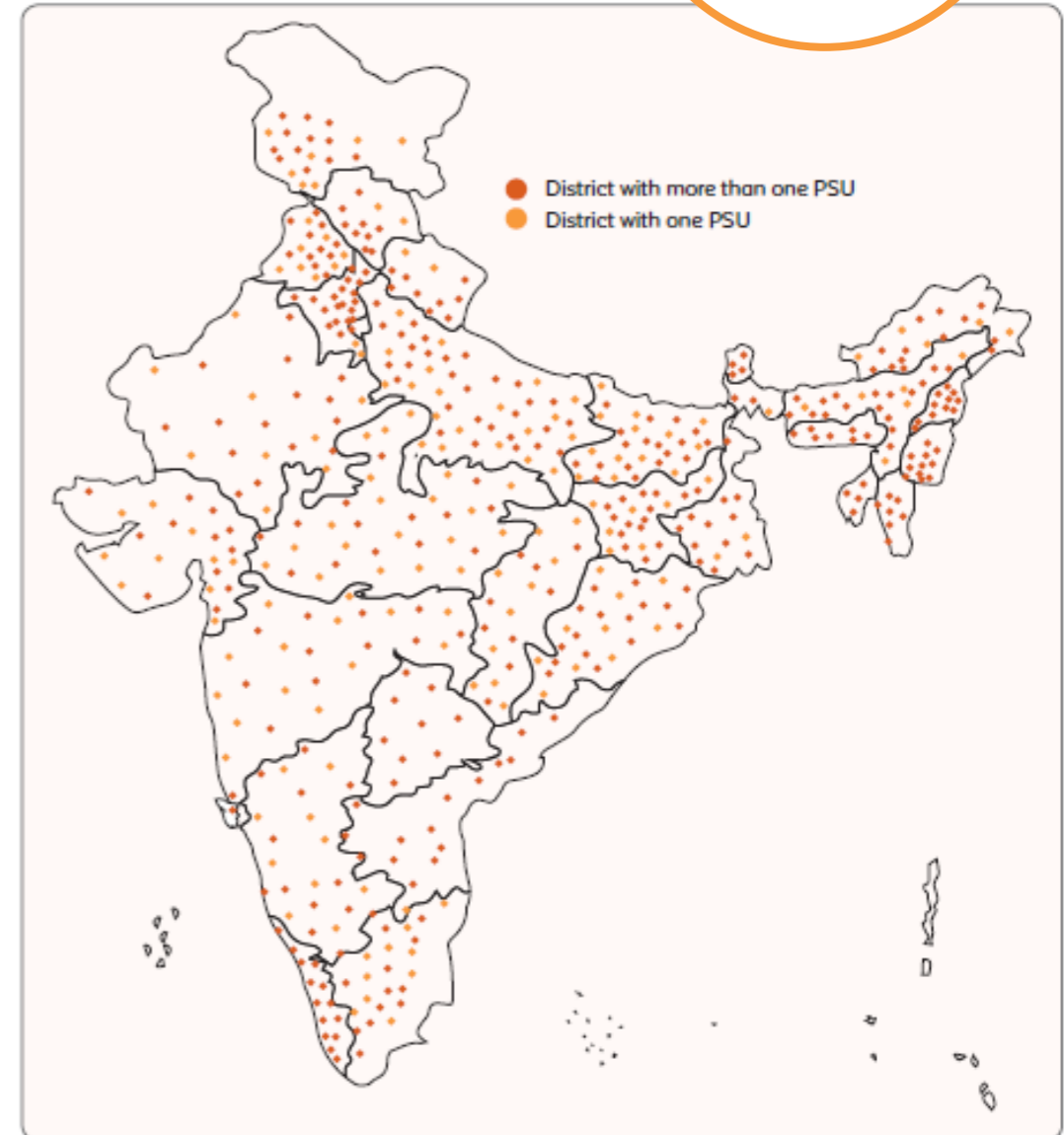
Survey Design



CNNS is a cross-sectional, household survey using a multi-stage sampling design.

CNNS covered **2035 Primary Sampling Units (PSUs)** from more than **82%** of all districts from the Census 2011 (516 out of 628 districts) across 30 states:

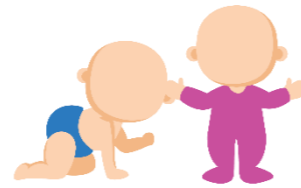
- 160 Districts- one PSU
- 356 Districts- two or more PSUs



Anthropometry data



Pre-school children (0-4 years)



School-age children (5-9 years)



Adolescents (10-19 years)






Anthropometric measurements

- Height
- Weight
- Mid-upper arm circumference (MUAC)
- Triceps skinfold
- Subscapular skinfold (1-4 years)

- Waist circumference

Biochemical indicators – micronutrient deficiencies and NCDs



Indicator Group			
Anaemia and haemoglobinopathies	<ul style="list-style-type: none"> • Haemoglobin • Variant haemoglobins 		
Inflammatory biomarkers	<ul style="list-style-type: none"> • C-reactive protein 		
Protein	<ul style="list-style-type: none"> • Serum protein and albumin 		
Micronutrients	<ul style="list-style-type: none"> • Iron: Serum ferritin, serum transferrin receptor • Vitamin A: Serum retinol • Zinc: Serum zinc • B-vitamins: Erythrocyte folate, serum B12 • Vitamin D: Serum 25 (OH) D • Urinary Iodine 		
Non-communicable diseases	<ul style="list-style-type: none"> • Blood Pressure • Blood glucose, HbA1c • Lipid profile: Serum cholesterol, LDL, HDL, and triglycerides • Renal function: Serum creatinine, urinary protein creatinine ratio 		

Monitoring and Supervision



Three-tiers of Data Quality Assurance

- Field work/protocol/training monitoring: by quality control team
- Biological sample quality control : by AIIMS, NIN and US CDC

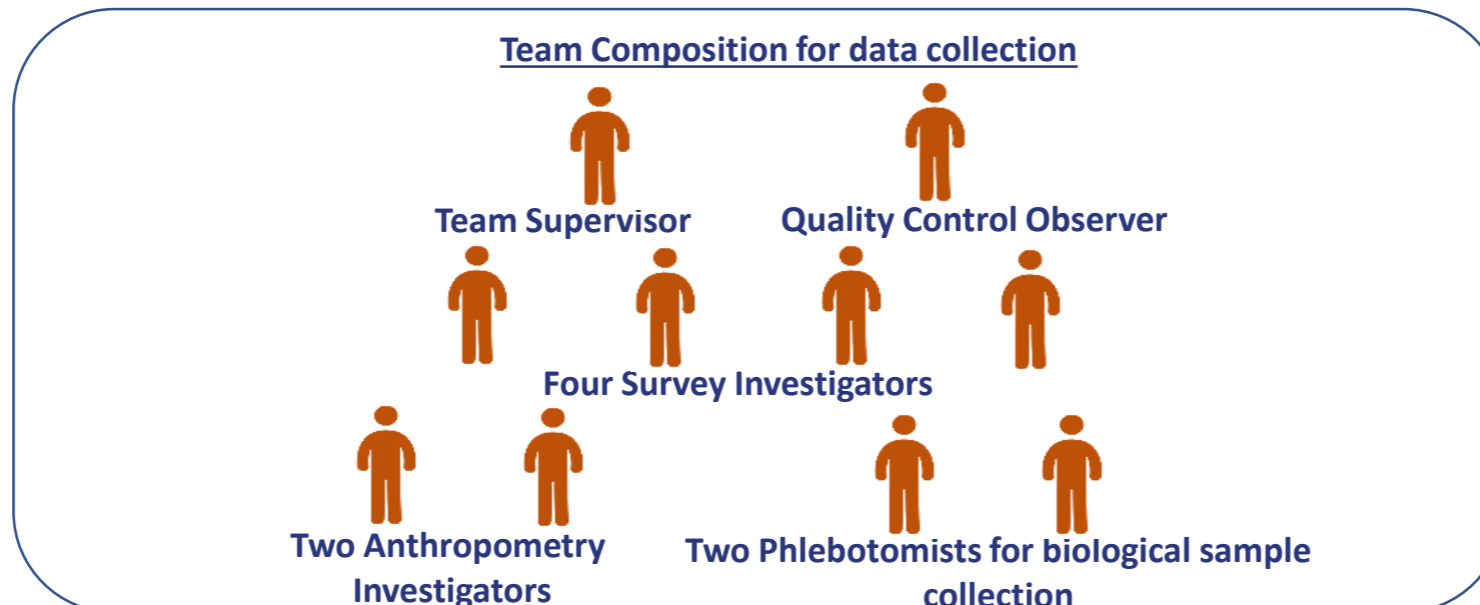
Third Level

- 3-member Data Quality Assurance (DQA) team for re-interviews & observations
- Concurrent monitoring of biological sample collection, storage and transportation by CDSA

Second Level

- Internal monitoring by the Quality Control Observer
- Daily supervision of the field work by Team Supervisor

First Level



Quality Assurance Measures for Data Quality

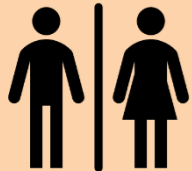


Evaluation of Interviewers prior to employment



Survey team

- Written and oral test
- Mock interview
- Ethics test



Anthropometry team

- Standardisation
- Selection based of demonstrated capacity measured by technical error of measurements (TEM)

Quality Assurance Measures



DQA team conducted consistency checks, and provided feedback on real time basis



No more than 4 interviews allowed in a day by an interviewer



Daily SMS based monitoring/ alerts system for biological sample (from PSUs, collection points and reference labs).



Sample transportation in thermal insulation bags maintaining temperature at 2-8° Celsius for up to 16 hours



Time and temperature monitoring of samples by digital data loggers

Agencies engaged in the implementation of CNNS



Survey Implementation by MoHFW, Government of India and supported by UNICEF

Technical support:
US Centre for Disease Control
and UNICEF

Regular review and technical
guidance: Technical advisory group
constituted by MoHFW

Quality assurance and external
monitoring: AIIMS, PGIMER, NIN,
KSCH and CDSA

Overall field coordination, training, quality monitoring,
data management and analysis:
Population Council

Biological sample collection,
transportation & analysis:
SRL Limited

Survey and anthropometric data
collection: IIMR, Kantar Public,
Gfk Mode and Sigma Consulting

Sample size in Uttarakhand



CNNS covered 60 PSUs for data collection in Uttarakhand

Achieved following sample size by age groups:

	0-4 years	5-9 years	10-19 years	Total
Household and anthropometry data	1,134	1,154	1,077	3,365
Biological sample	579	587	519	1,685

Period of data collection in Uttarakhand



CNNS data collection period: September 21, 2017 to February 28, 2018

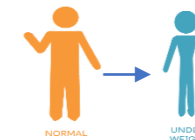
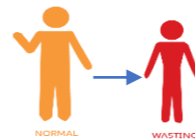
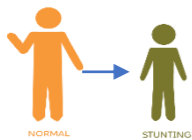
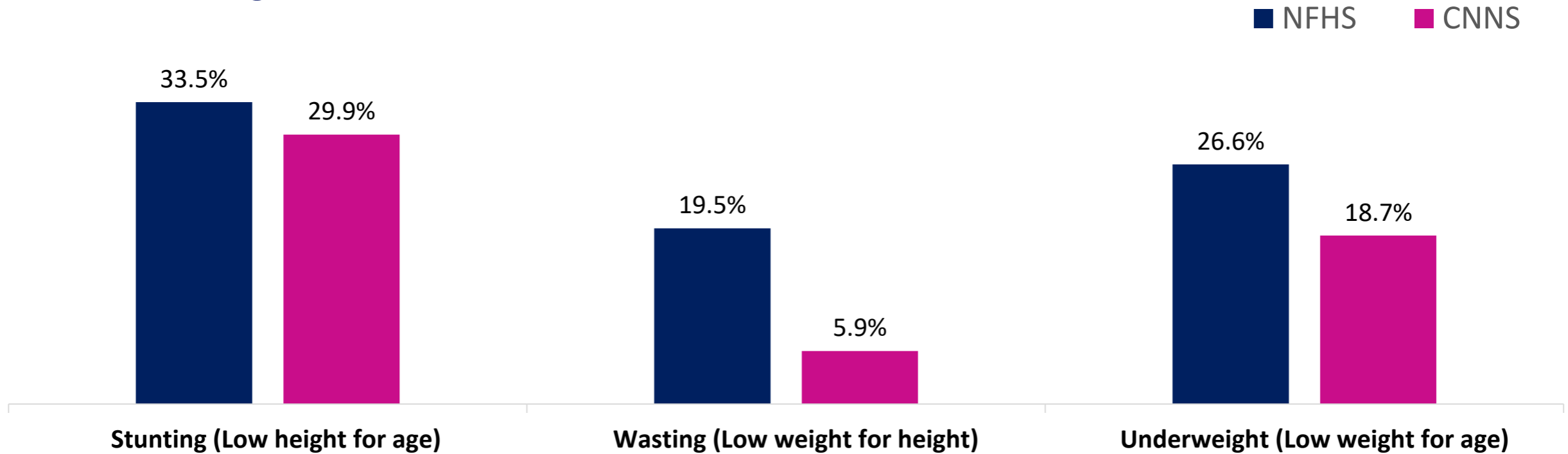
- CNNS collected data during the winter season of 2017-18, while
- NFHS collected data during the winter season through monsoon season of 2015

Survey	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CNNS 2017-18	February, 2018								September, 2017 to			
NFHS 4 2015	January to July, 2015											

Uttarakhand key findings: Anthropometry (1/2)



Significant declines in wasting and underweight were observed in children under 5 years; no significant decline in stunting



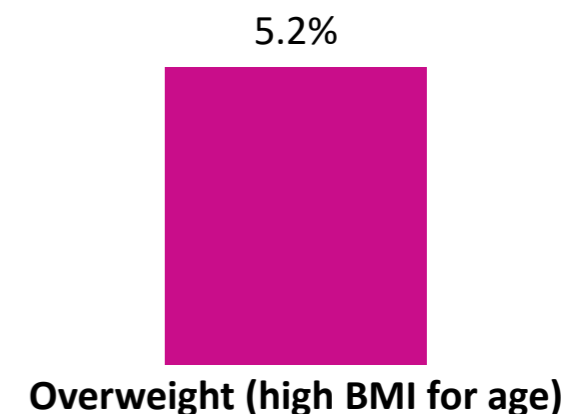
Uttarakhand key findings: Anthropometry (2/2)



1/7 adolescents aged 10-19 years was thin for their age (BMI-Age < -2SD)

1/5 children aged 5-9 years was stunted. The school age period does not provide an opportunity for catch up growth in height.

5% of adolescents aged 10-19 years were overweight or obese.

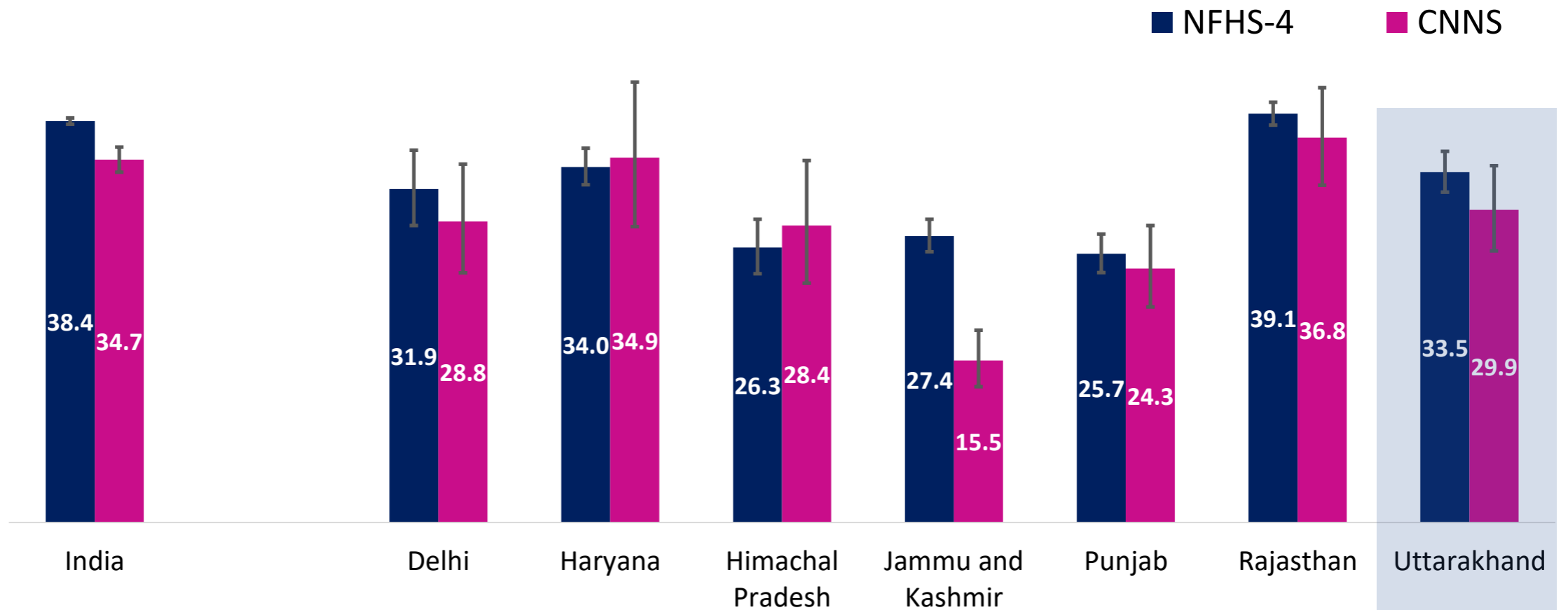


Stunting unchanged among children under five



No significant decline in stunting in Uttarakhand was observed in CNNS compared to NFHS-4 – **30% vs 34%**

Among northern states, stunting declined significantly only in Jammu and Kashmir

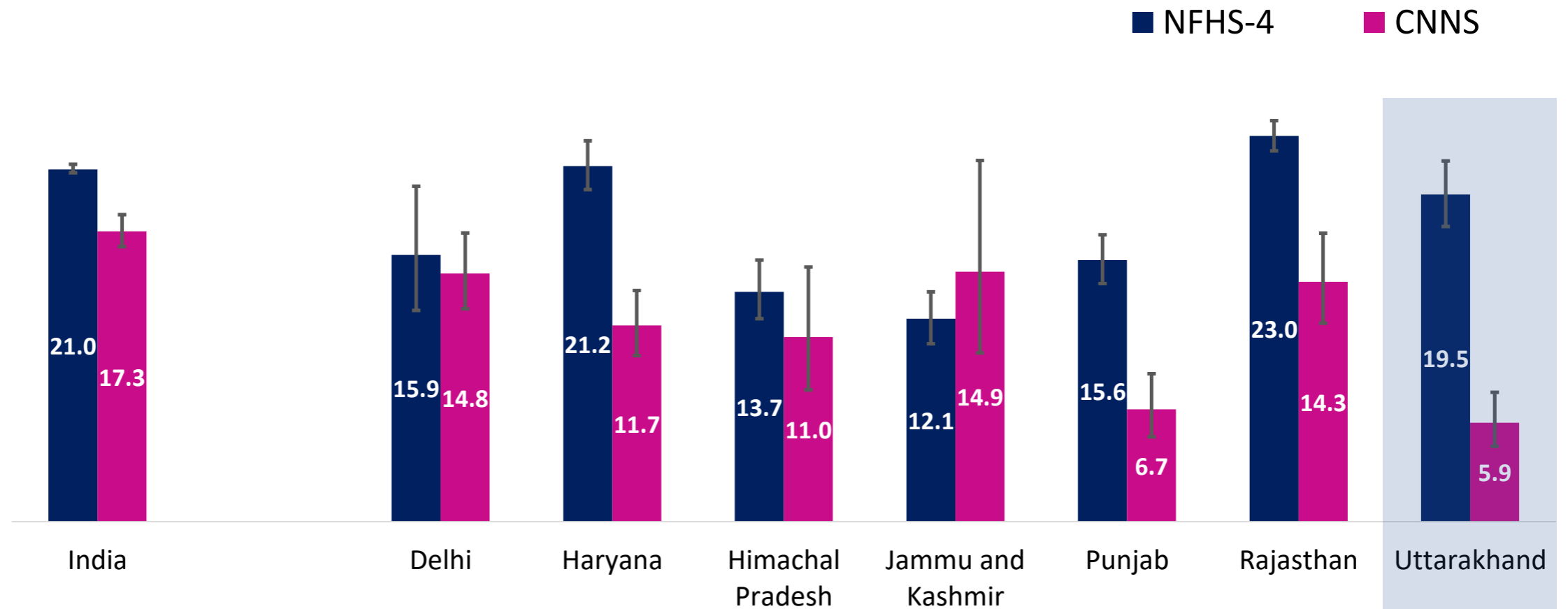


Wasting among children under five declined



Prevalence of wasting declined significantly in Uttarakhand between NFHS-4 and CNNS – **20% Vs 6%**

In 4/7 northern states, wasting declined; except in Jammu and Kashmir, Himachal Pradesh and Delhi



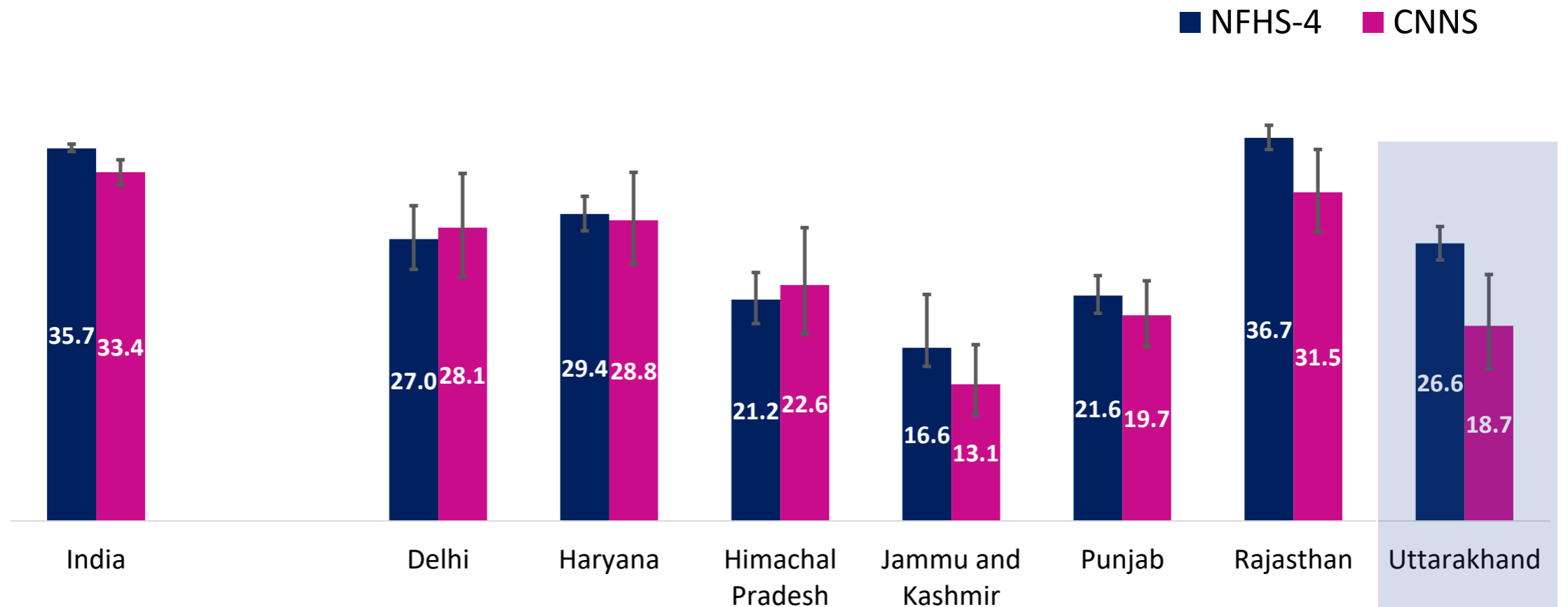
Prevalence of underweight among children under five declined



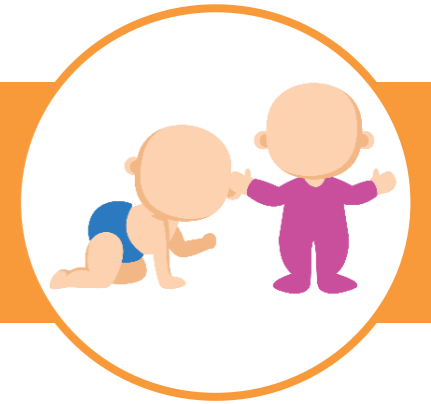
Underweight is a composite measure of chronic and acute malnutrition

The prevalence of underweight declined significantly between NFHS-4 and CNNS – **27% Vs 19%**

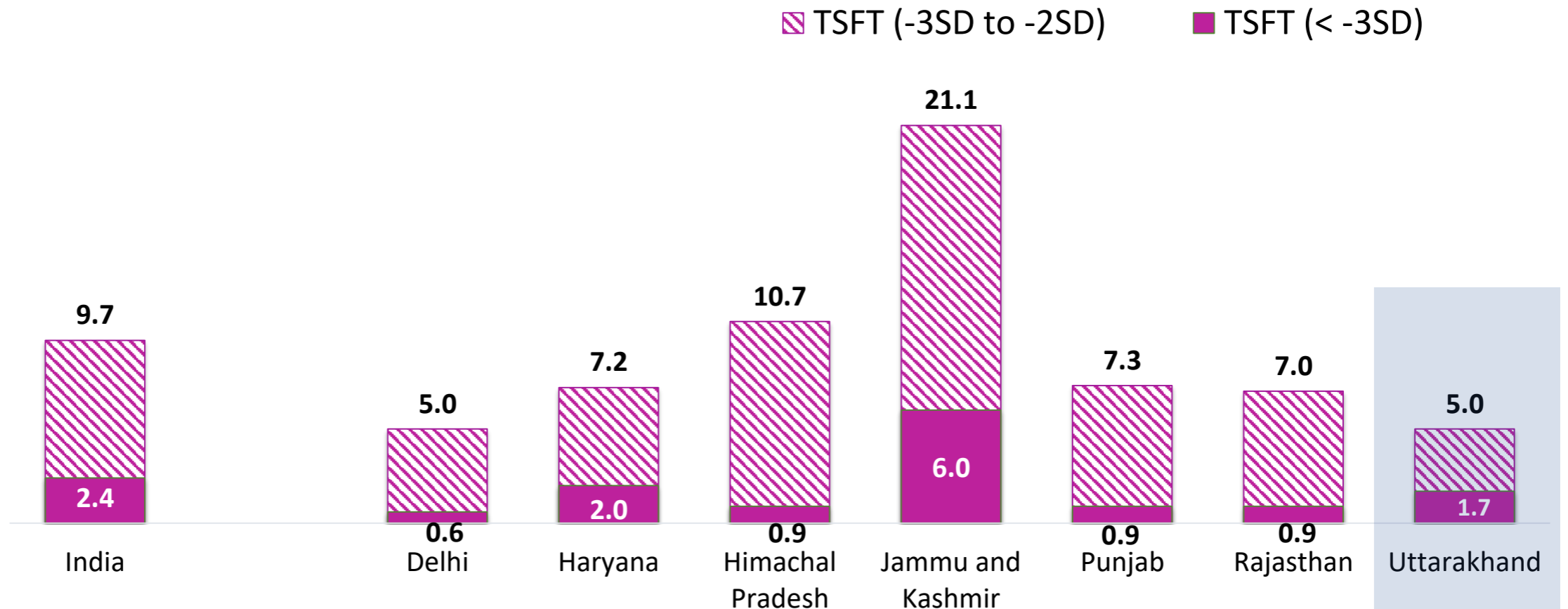
Prevalence of underweight remained unchanged in all other northern states



Triceps Skinfold Thickness (TSFT) for children under five



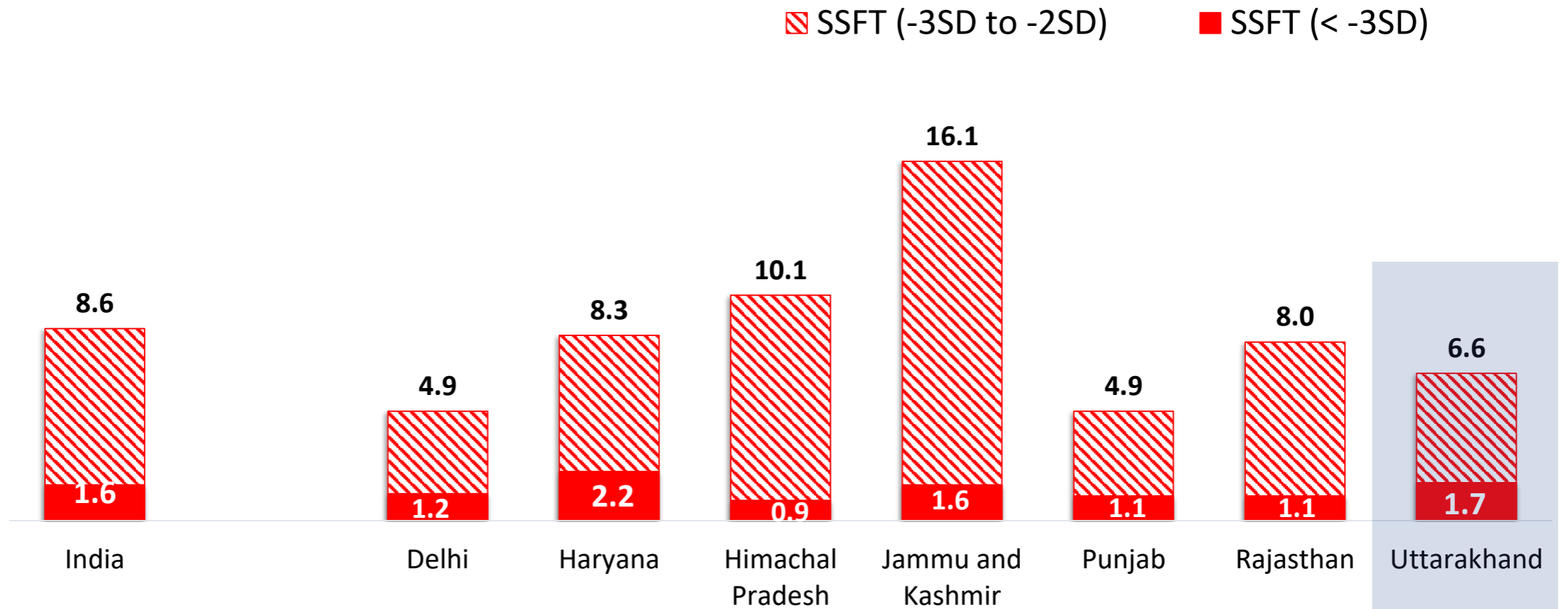
Low fat mass as reported by TSFT in Uttarakhand (**5%**) was half of the national average (**10%**) and lowest among other northern states



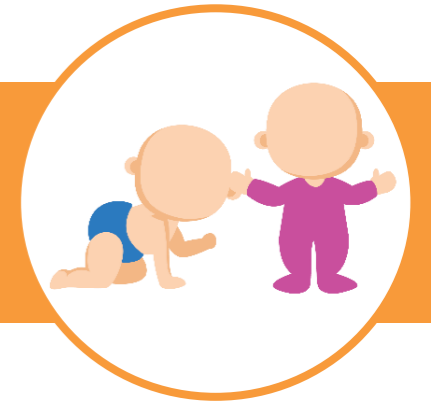
Subscapular Skinfold Thickness (SSFT) for children aged 1-4 years



Thinness as reported by SSFT in Uttarakhand (7%) was moderately high among northern states and slightly lower than national level (9%)

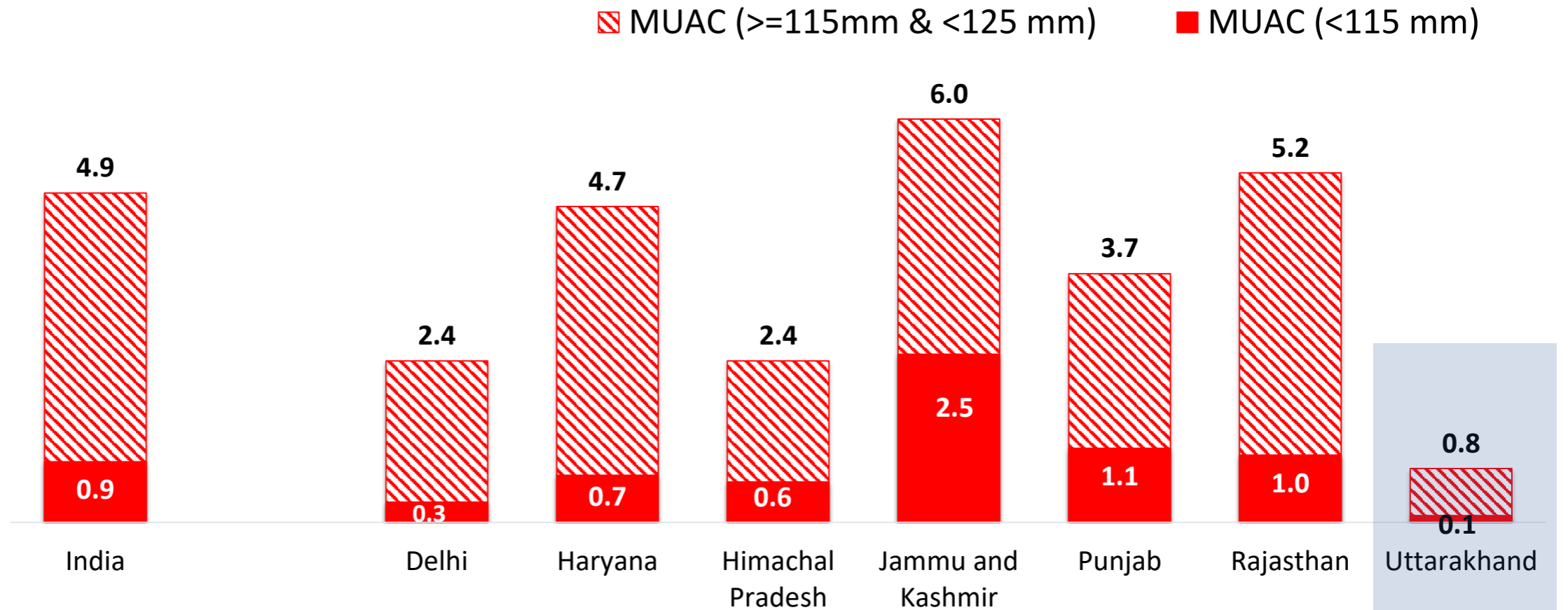


Mid Upper Arm Circumference (MUAC) for children aged 6–59 months



About **1%** children in Uttarakhand had low MUAC, lowest among northern states

Prevalence of low MUAC ranged between **1%** and **6%** across the northern states



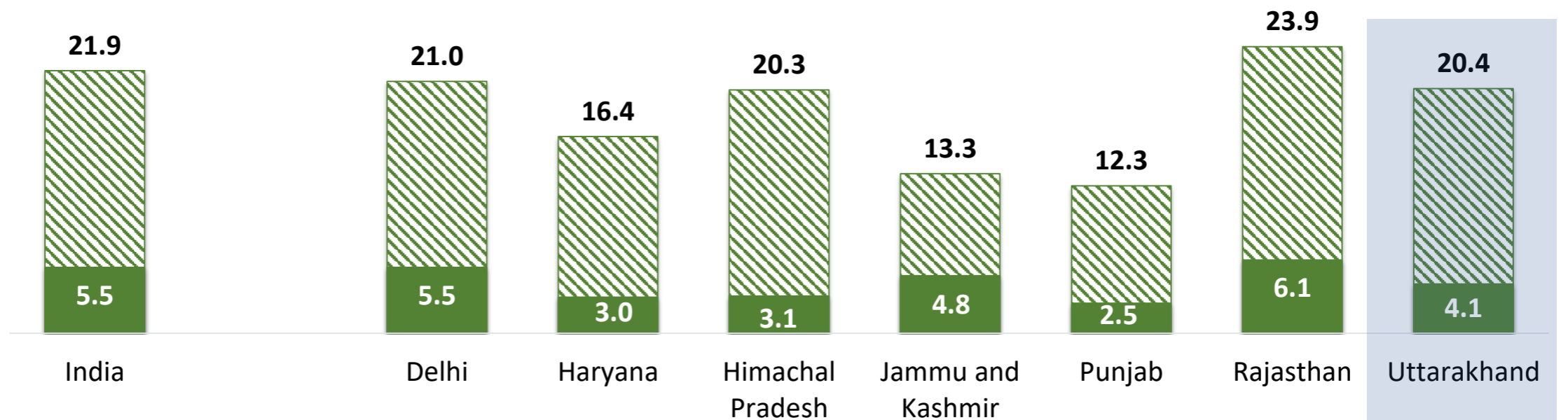
Stunting among school-age children (5-9 years)



1/5 children aged 5-9 years was stunted; significant proportion of children who were stunted in childhood remained stunted into their schooling age reducing their potential capacity for education

Uttarakhand (**20%**) had high prevalence of stunting as in three other northern region states and at about same level of India as a whole (**22%**)

▨ Moderately stunted (-3SD to -2SD) ■ Severely stunted (< -3SD)



Thinness among school-age children (5-9 years)

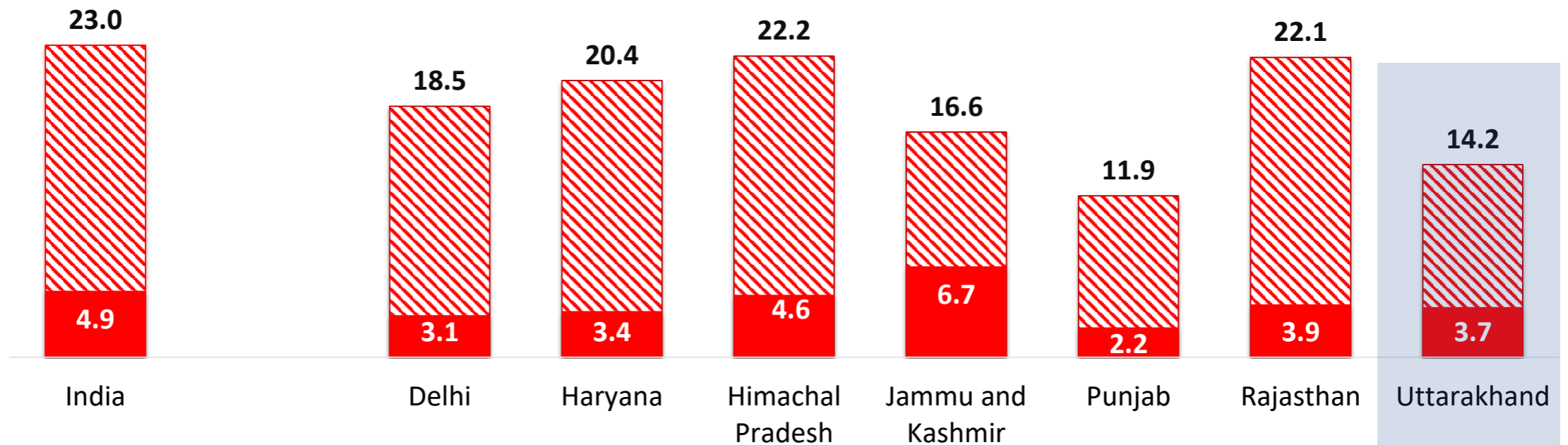


1/7 children aged 5-9 years was thin in Uttarakhand

Prevalence of thinness in Uttarakhand (**14%**) was moderately high in the northern region but significantly lower than national average (**23%**)

▨ Moderate thinness (-3SD to -2SD)

■ Severe thinness (< -3SD)



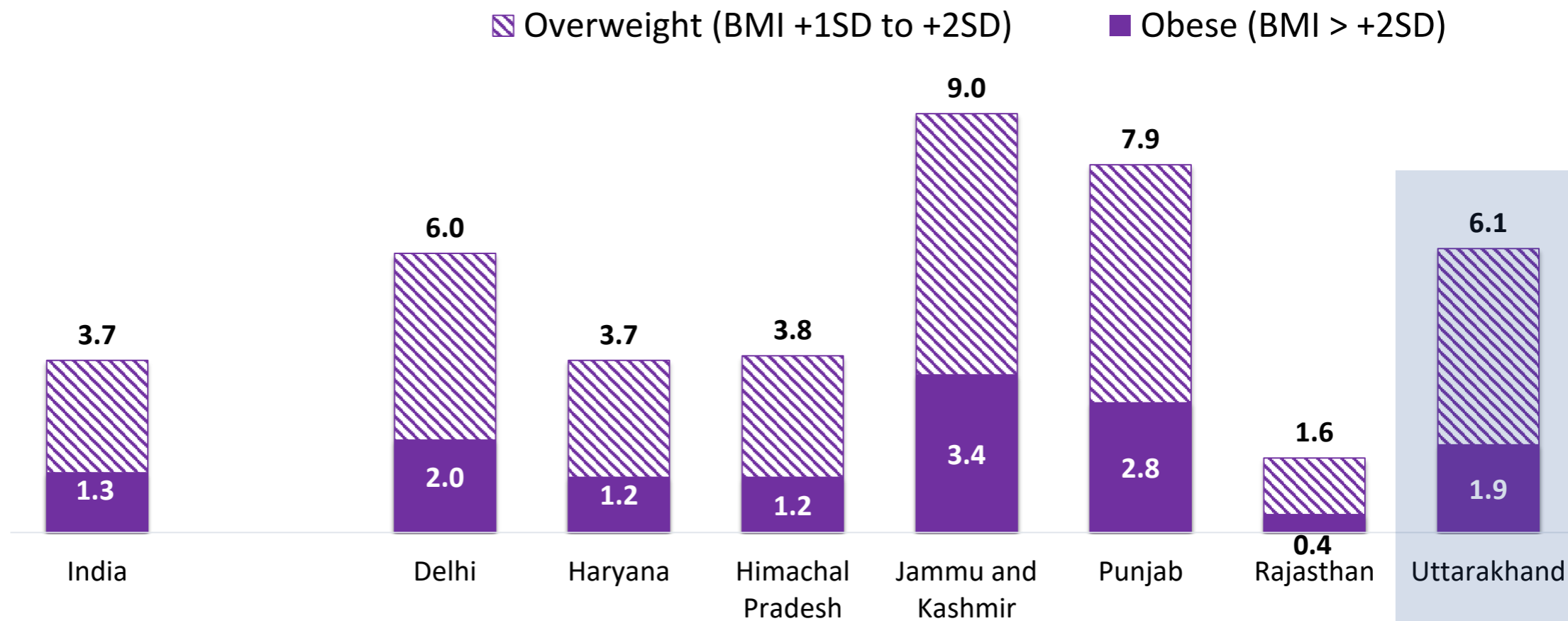
Overweight and obesity among school-age children (5-9 years)



Overweight and obesity are on rise even among children aged 5-9 years

Prevalence of overweight in Uttarakhand (6%) was slightly higher than national average (4%)

Among northern states, Rajasthan was one with lowest prevalence of overweight in this age group

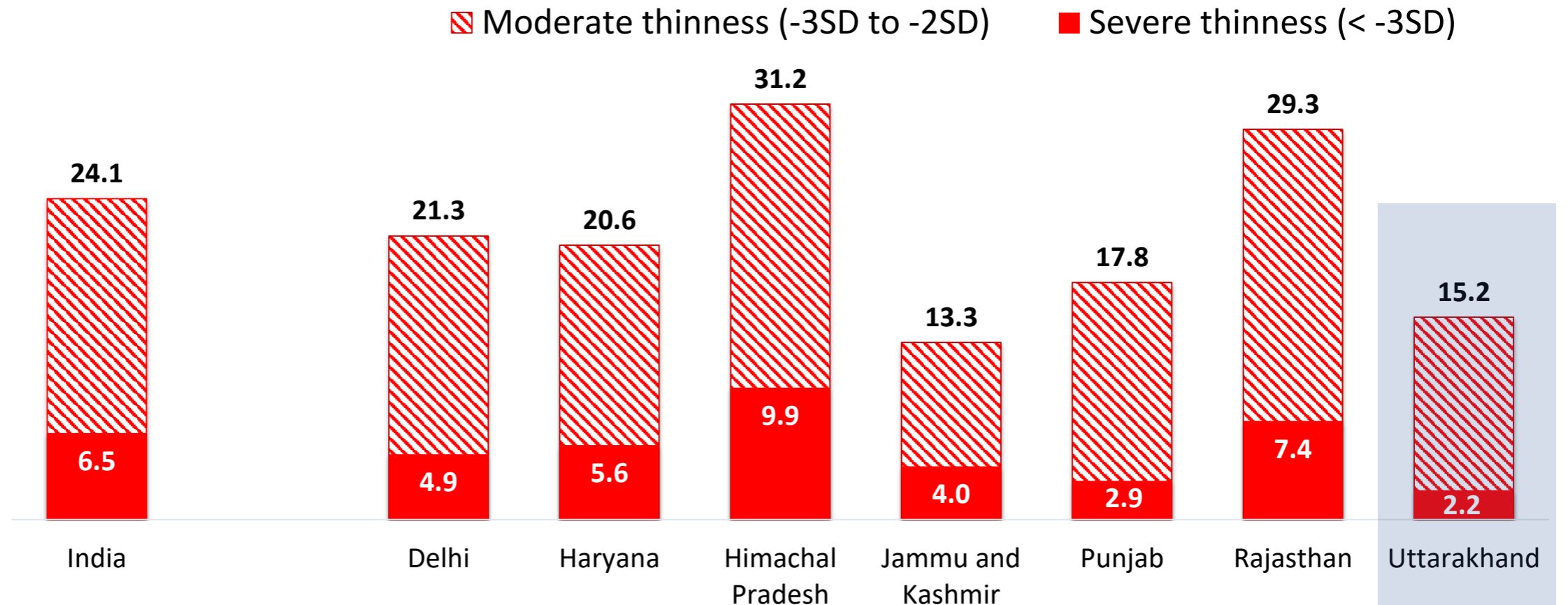


Thinness among adolescents aged 10–19 years substantially high



1/7 adolescents aged 10-19 years was thin in Uttarakhand (15%), significantly lower than national average (24%)

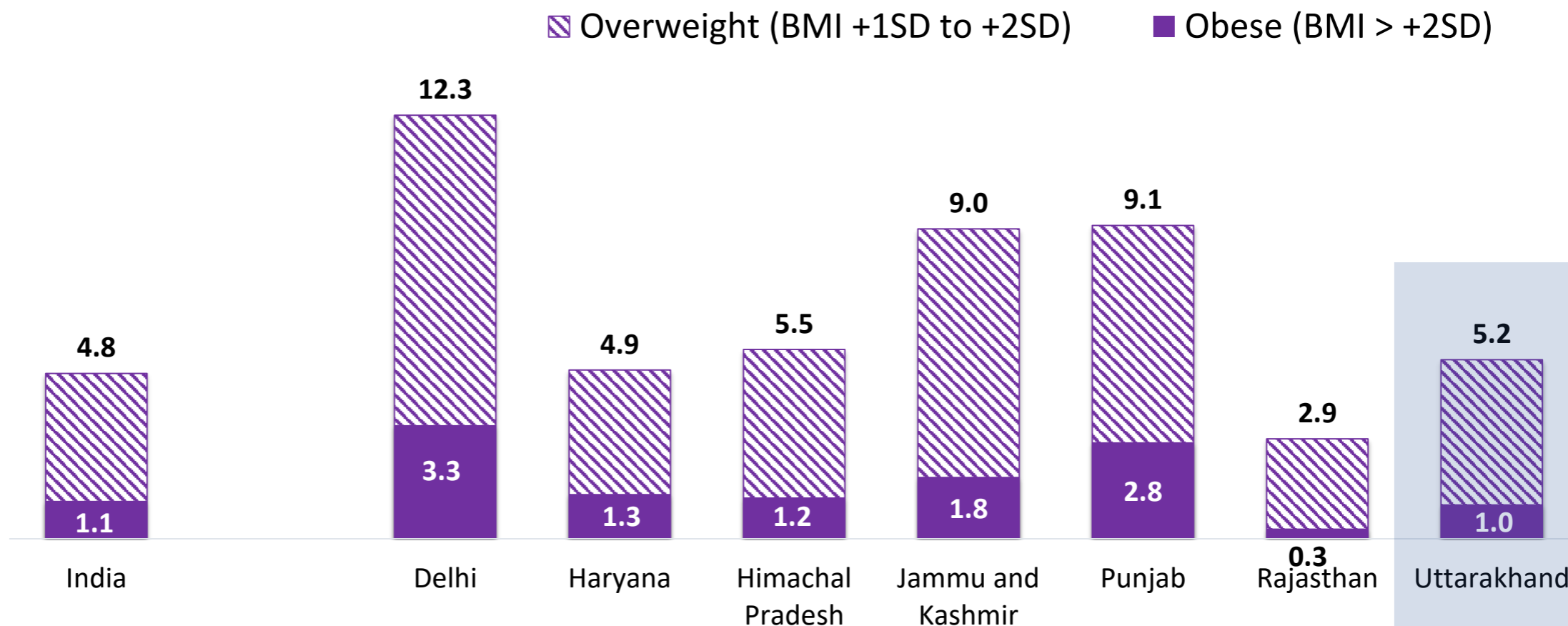
In northern region, Himachal Pradesh (31%) and Rajasthan (29%) had high prevalence of thinness



Prevalence of overweight among adolescents aged 10–19 years high



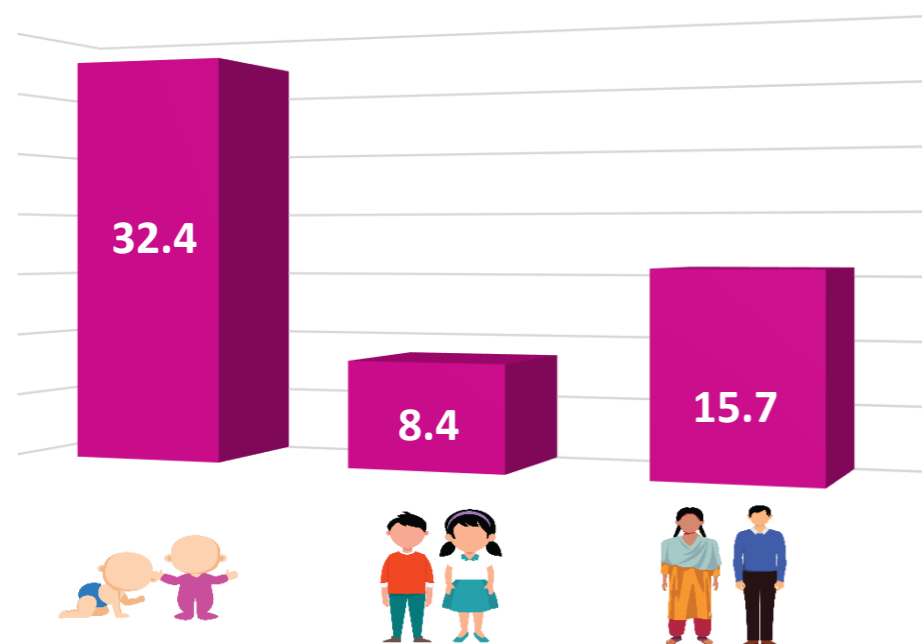
1/20 adolescents was overweight in Uttarakhand (5%), was at similar level to the national average
Rajasthan (3%) had lowest prevalence among all northern states



Uttarakhand key findings: Anaemia and iron deficiency

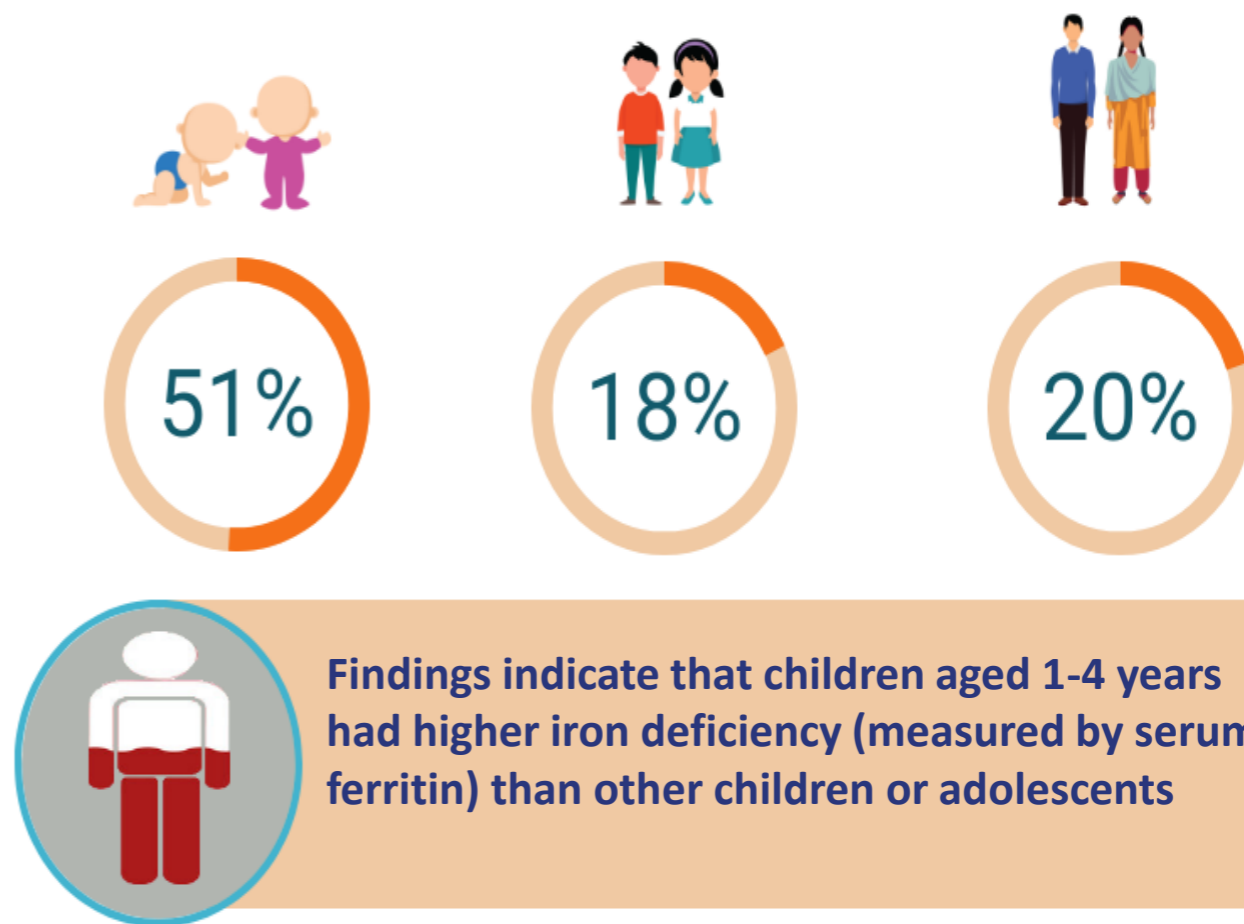


Anaemia



In Uttarakhand, like in most states, anaemia was significantly higher among children aged 1-4 years compared to children aged 5-9 years and adolescents aged 10-19 years

Iron deficiency



Findings indicate that children aged 1-4 years had higher iron deficiency (measured by serum ferritin) than other children or adolescents

Prevalence of Anaemia among children and adolescents

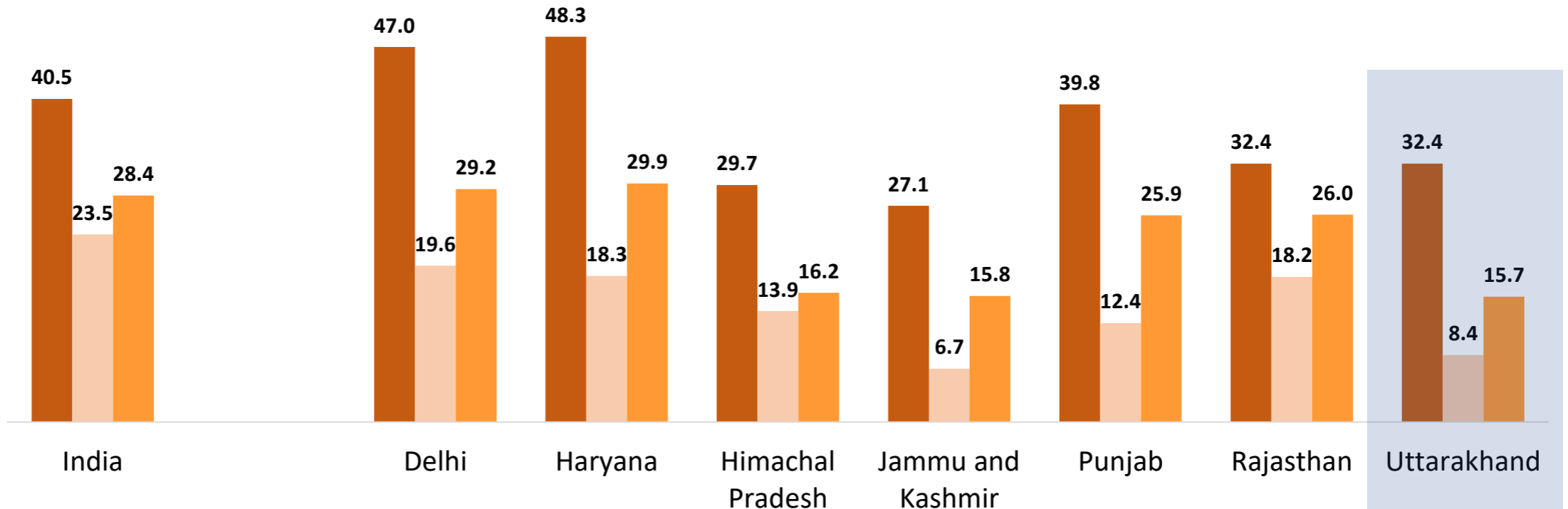


About **1/3** children aged 1-4 years was anaemic in Uttarakhand (**32%**), significantly lower than national average (**41%**)

Prevalence of anaemia was highest among children aged 1-4 years, increased again in adolescence

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years

Anaemia Cut Offs (WHO)
 1-4 years: Hb<11.0 g/dl
 5-11 years: Hb<11.5 g/dl
 12-14 years: Hb< 12 g/dl
 Girls ≥15years: Hb< 12g/dl
 Boys ≥15 years: Hb< 13 g/dl
 (Adjusted for altitude)

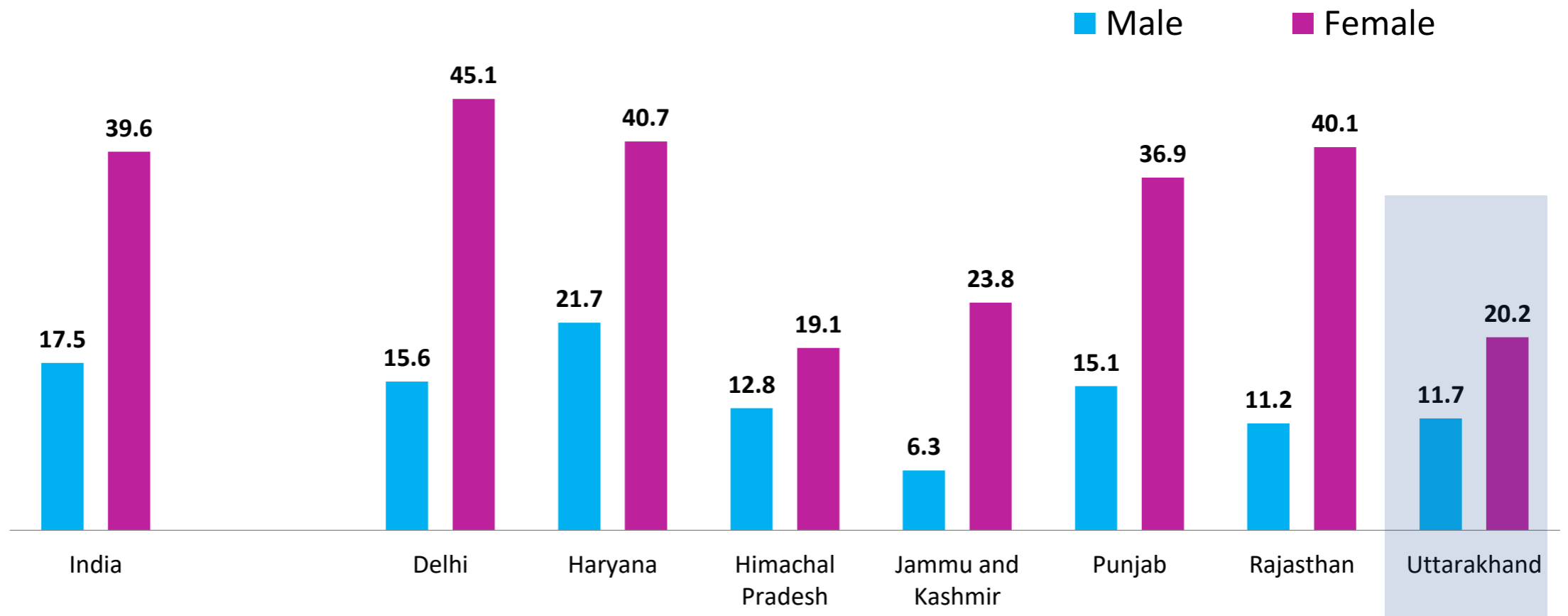


Prevalence of Anaemia among adolescents (10–19 years)



Overall, in the country, anaemia prevalence among adolescent girls (10-19 years) was twice that of adolescent boys

In Uttarakhand, adolescent girls were significantly more likely than adolescent boys to be anaemic



Iron deficiency measured by serum ferritin among children and adolescents

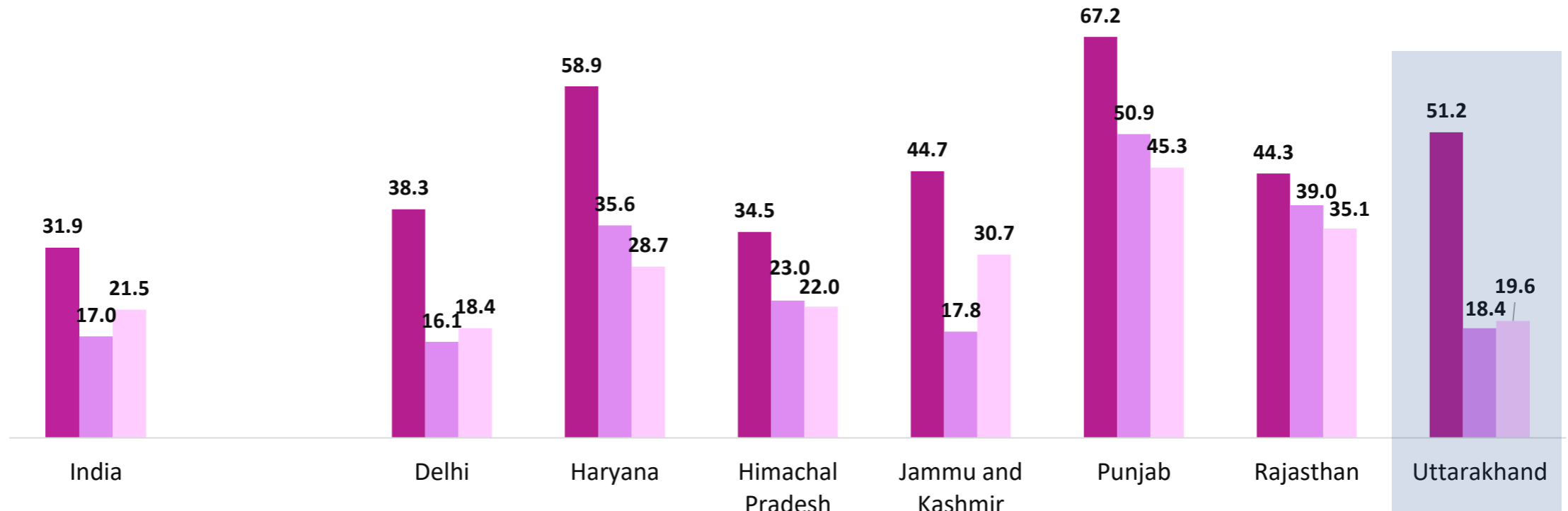


1/2 children aged 1-4 years had iron deficiency in Uttarakhand (**51%**), significantly higher than the national average (**32%**); prevalence was highest among children aged 1-4 years

Among northern states, children from Punjab and Haryana had highest prevalence of iron deficiency

Cut Offs (WHO)
 1-4 years: SF <12 µg/l;
 ≥5 years: SF <15 µg/l
 (high CRP excluded)

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years



Uttarakhand key findings: Vitamin A and Vitamin D deficiency



Vitamin A deficiency was high (23%) in school-aged children indicating the need for policy review.

Children under five and adolescents had significantly lower prevalence (14% and 16%) as compared to school-aged children.



Vitamin D deficiency ranged from 46% to 63% in 1-19 years age group as per cut off by expert panel of IOM.

Children and adolescents were found to have very high level of Vitamin D deficiency

Vitamin A deficiency among children and adolescents



14-23% children and adolescents had Vitamin A deficiency in Uttarakhand, at similar level to the national average (**16-22%**)

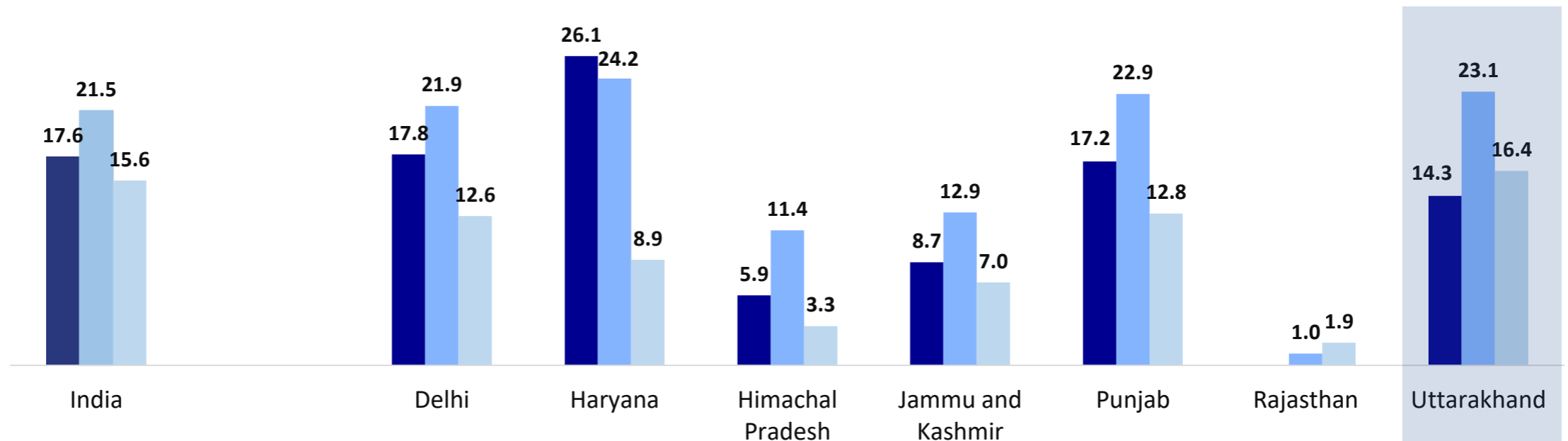
Among northern states, Rajasthan (**1-2%**) had lowest prevalence of Vitamin A deficiency

■ 1-4 Years ■ 5-9 Years ■ 10-19 Years

Cut Offs (WHO)

1-19 Years: Serum retinol < 20 µg/dl.

(High CRP excluded)



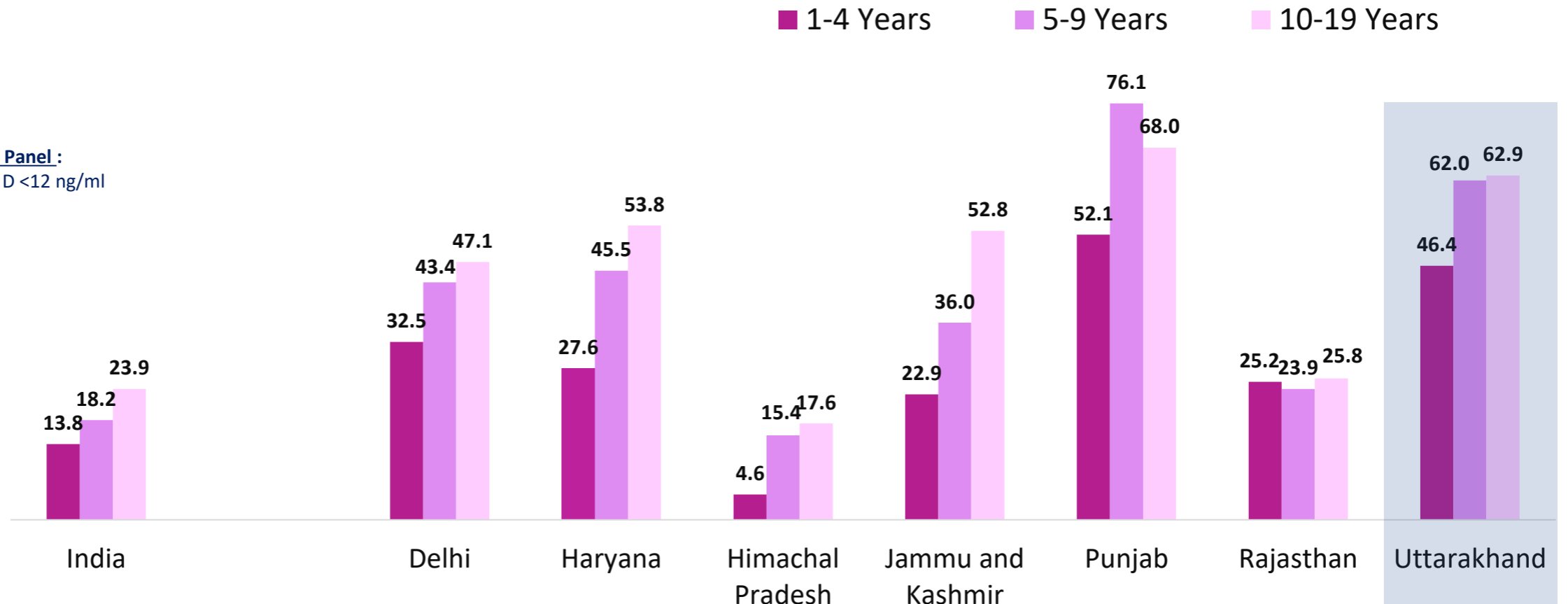
Vitamin D deficiency increases with age



46-63% children and adolescents had Vitamin D deficiency in Uttarakhand, thrice times than the national average (**14-24%**)

In most northern states, Vitamin D deficiency increased sharply with age

Cut Off (IOM) Vit D Expert Panel :
Serum 25-hydroxy vitamin D <12 ng/ml



Uttarakhand key findings: Non-communicable diseases



More than 5% school-age children and adolescents were found with high level of glycosylated haemoglobin (HbA1c).

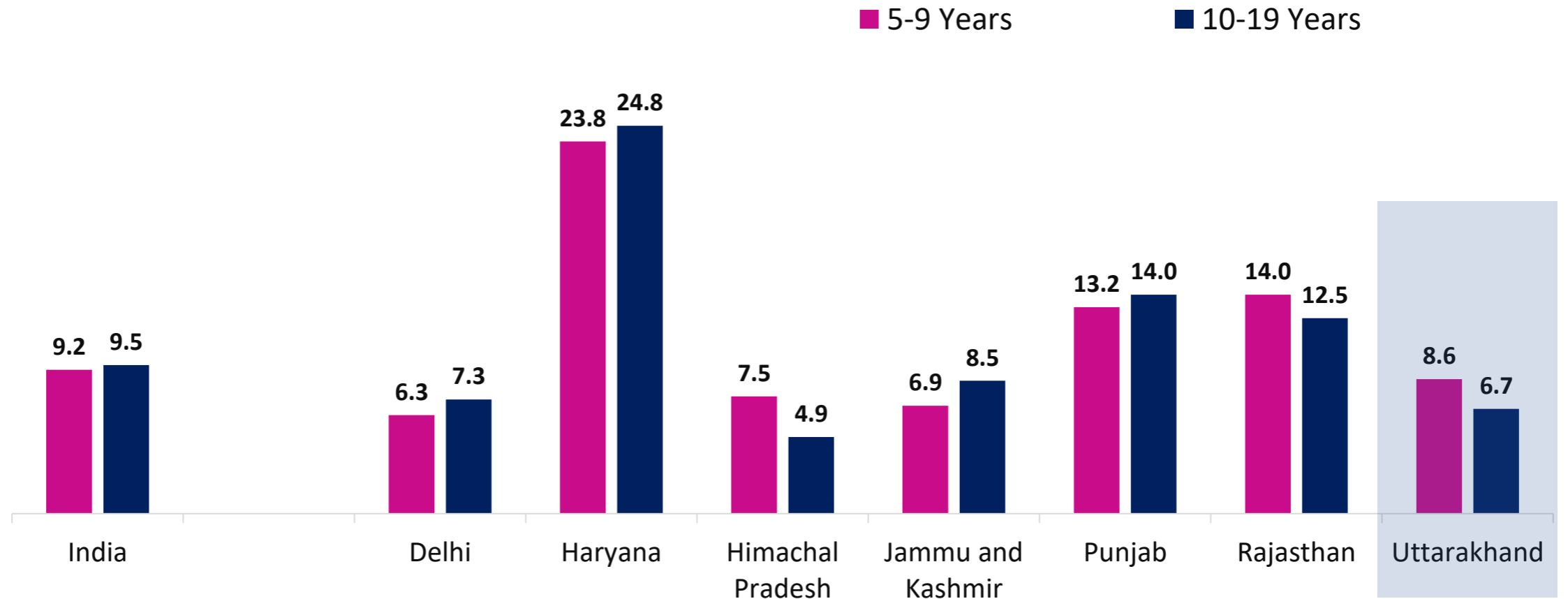
Other indicators of risks of NCDs, such as level of cholesterol, triglycerides, LDL and HDL point to increased risks of NCDs among adolescents.

Risk of diabetes among school-age children and adolescents



Based on Glycosylated hemoglobin (HbA1c), **9%** of children and **7%** of adolescents had increased risk of diabetes in Uttarakhand, at similar level to the national average

Among all northern states, risk of diabetes was highest in Haryana

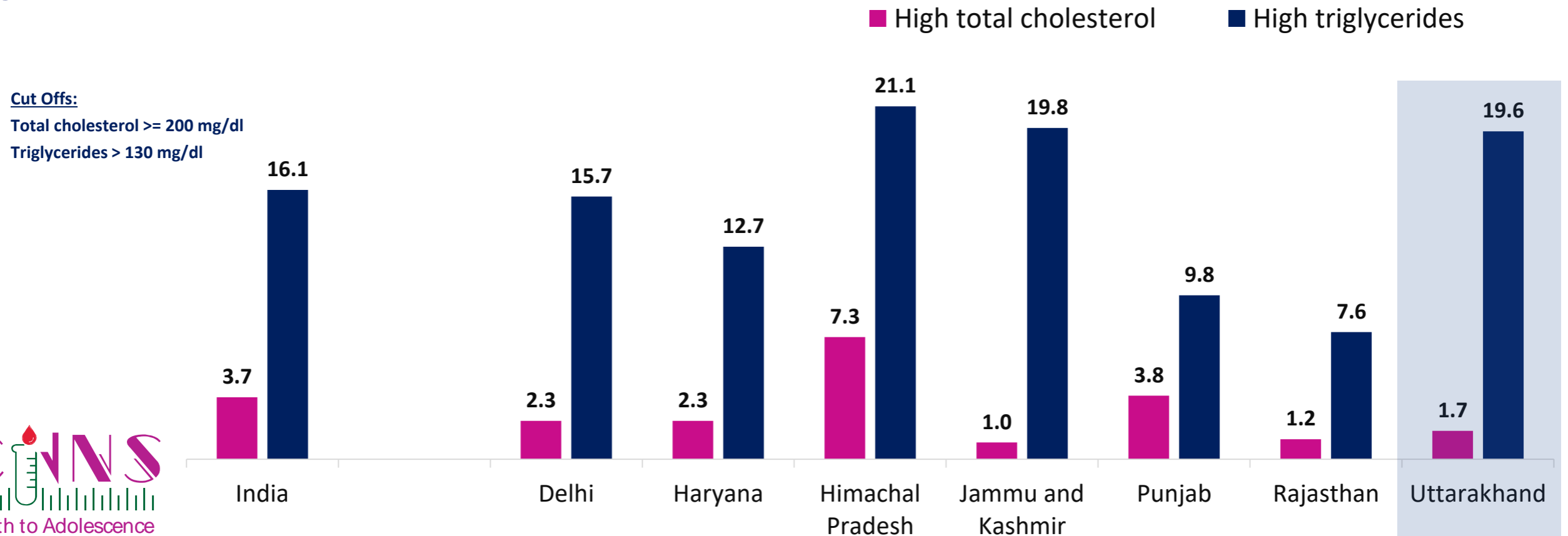


High total cholesterol and high triglycerides among adolescents



Elevated risk of NCDs in Uttarakhand among adolescents – **2%** had high level of total cholesterol and **20%** with high level of triglycerides

Prevalence of high total cholesterol and high triglycerides were highest in Himachal Pradesh in the northern region



High LDL and low HDL among adolescents

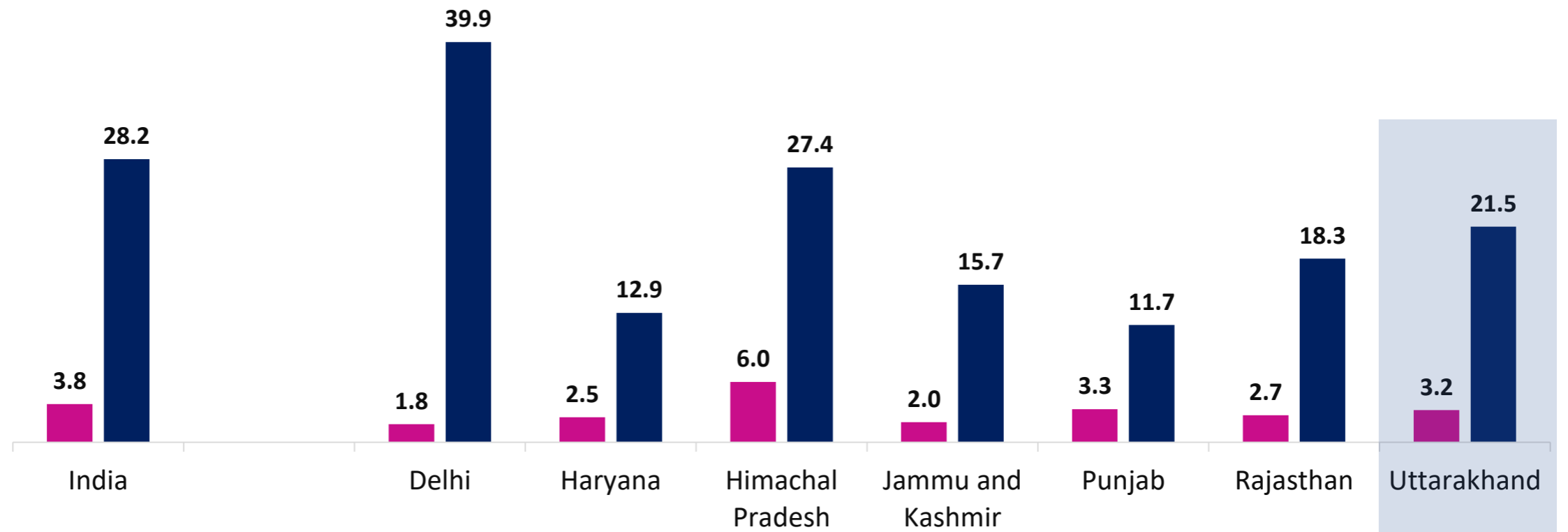


Risk of NCDs among adolescents in Uttarakhand was high – **3%** had high level of LDL and **22%** had low level of HDL

Among the northern states, prevalence of low HDL was very high in Delhi (**40%**)

Cut Offs:
LDL \geq 130 mg/dl
HDL $<$ 40 mg/dl

■ High LDL ■ Low HDL



Preliminary Policy Discussions from CNNS



- Only about half of anaemia is caused by iron deficiency. Programmes must address all causes of anaemia but continue to address iron deficiency in children under five and adolescent girls (population with largest burden).
- Vitamin A deficiency is less prevalent than expected. Policy review is warranted. Interventions such as dietary diversification and fortification can be taken to scale to address the remaining burden.
- Vitamin D deficiency is an emerging public health issue among urban children and adolescents. Scaling up of fortification efforts can be considered. Further research is required to uncover the effects of pollution and other factors to design better programmes.
- Urinary Iodine data need to be examined in conjunction with salt consumption data for the population and level of iodine in salt at the household level.
- Control of NCDs such as diabetes and cardiovascular disease must start in the early ages to instil lifelong healthy habits as adult diseases start in childhood.

The survey was conducted with generous financial support from

Aditya and Megha Mittal

and technical support from

unicef  for every child

