PREVALENCE OF OVER-NUTRITION IN 0-18 YEAR CHILDREN - IMPLICATIONS OF USE OF WHO BMI STANDARDS

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India has the highest prevalence of under-nutrition in children and the highest number of under-nourished children in the world.

During the last five decades the country had invested heavily in intervention programmes to combat under-nutrition in pre-school and school age children

Over the last three decades there has been improvement in GDP, reduction in poverty and improvement in household food security.

There has been substantial improvement in access to health care. Early detection and treatment of infection has resulted in reduction in nutrition toll of infection

All these have resulted in reduction in under-nutrition and improvement in health status of the population especially the children

India is undergoing nutrition transition and now faces dual nutrition burden

Under-nutrition persists but over-nutrition has emerged as a major public health problem in children

India depends mainly on national nutrition surveys to monitor changes in nutritional status of children over time.

Between 1970s to 2015, NNMB surveys and NFHS 1-4 surveys provide ample data on nutritional status of pre-school children.

They documented progressive reduction in under-nutrition and increase in over-nutrition rates

There is a paucity of data to assess changes in nutritional status in school age children.

Only NNMB surveys which covered 8-10 states and had relatively lower sample size provided data on nutritional status of school age children between 1970s and 2012

Between 2012 to 2014, Annual Health Survey and District Level Household Survey 4 (AHS CAB and DLHS 4) surveyed representative sample of the households and collected data on nutritional status of pre-school and school age children from these households

These two surveys are among the largest in the world and provide data on nutritional status of pre-school and school age children at district, state, region and national level.

Data from surveys were analysed to document:

- **growth of Indian children as assessed by height-, weight- and BMI-for-age compared with the WHO growth standards for 0-18 year children**

- **prevalence of under- and over-nutrition in pre-school and school age children**

CHILDREN WITH HEIGHT & WEIGHT MEASUREMENTS IN AHS CAB & DLHS4

Age	Measured	Not present	Refused	Other reasons	Total
DLHS 4					
0-4 yrs	74398	98	91	130	74717
5-9 yrs	80909	110	49	102	81170
10-14 yrs	65225	84	27	90	65426
15-18 yrs	75131	144	44	117	75436
Total	295663	436	211	439	296749
AHS CAB					
0-4 yrs	130606	7535	858	158	139157
5-9 yrs	144084	12536	730	247	157597
10-14 yrs	163230	15793	820	300	180143
15-18 yrs	119096	13964	729	243	134032
Total	557016	49828	3137	948	610929

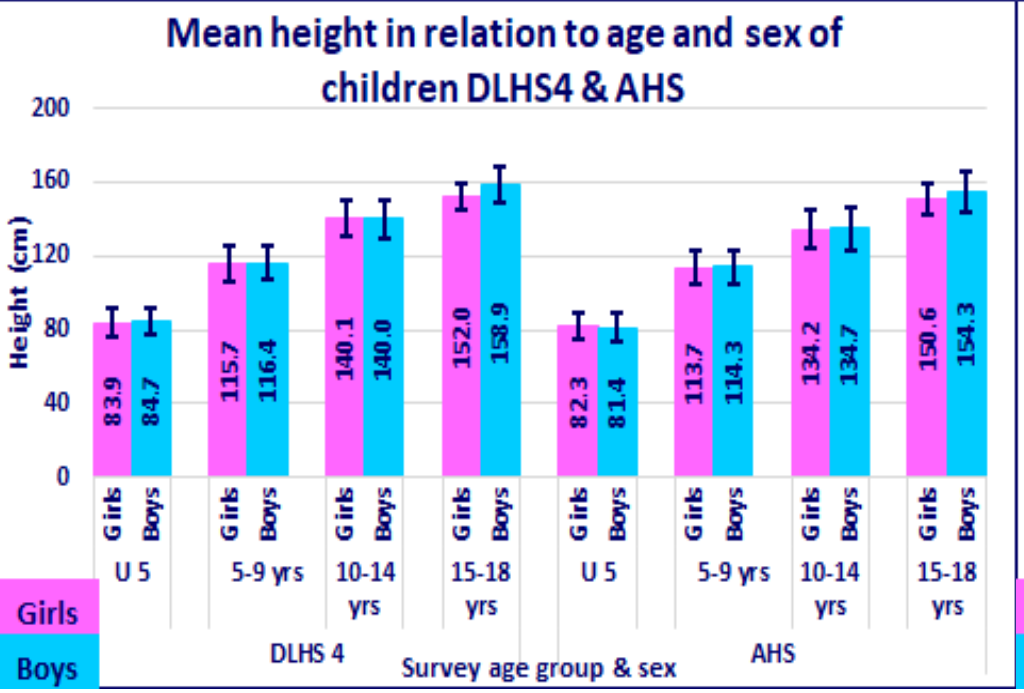
The sampling frame for the surveys had been prepared by IIPS and RGI

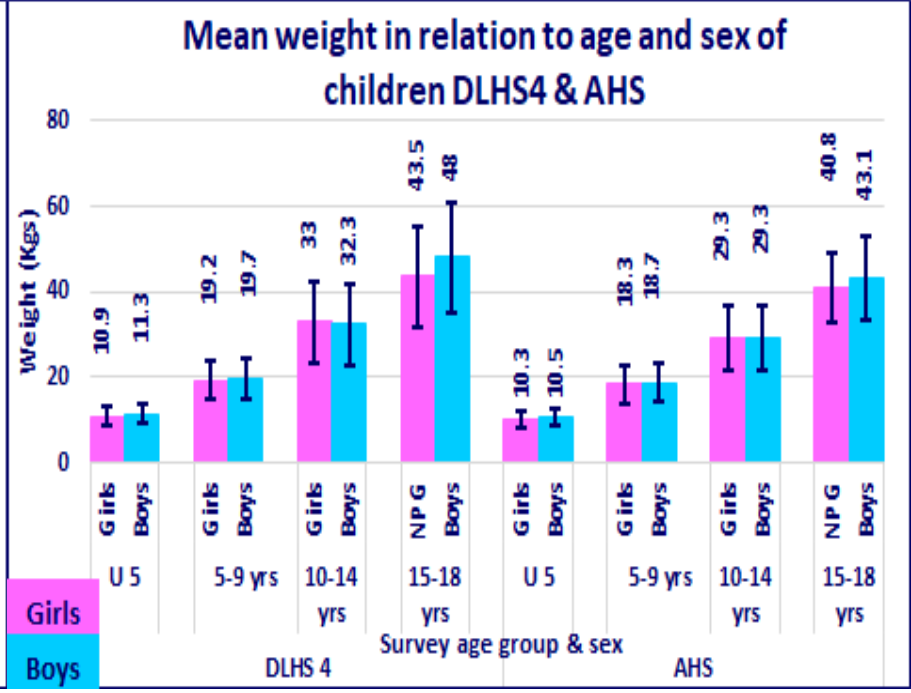
All anthropometric equipment were centrally procured and tested for accuracy.

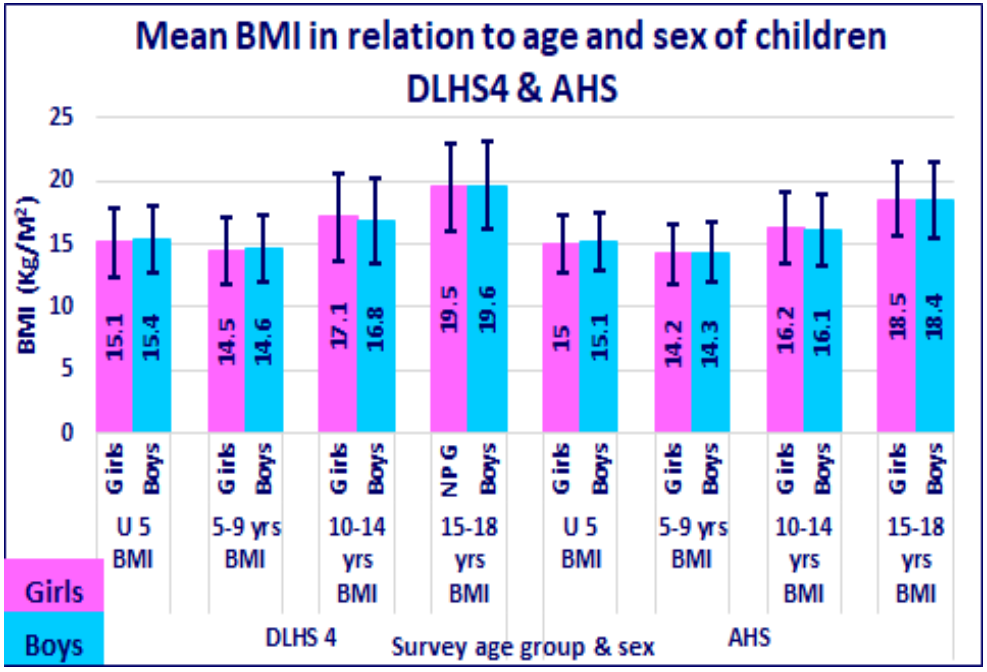
Survey personnel were para-professionals & were trained in taking measurements.

The length/height measurements in the survey were taken by personnel with required accuracy in measurements. As an internal quality assurance measure duplicate measurements were carried out in 10% of the children measured.

DLHS4 & AHS CAB measured height & weight in over 5.5 lakh children







Data on mean height, weight and BMI of pre-school in different states in AHS/DLHS4 were comparable to these indicators from same states in pre-school children from NFHS4.

Mean height weight and BMI in pre-school children in AHS states were lower as compared to DLHS4 states

Boys in the 15-18 year were taller than girls both in AHS and DLHS 4 states

NUTRITIONAL STATUS OF PRESCHOOL AND SCHOOL AGE CHILDREN

When under-nutrition was the major nutritional problem in children, underweight and stunting rates were used to assess prevalence of under-nutrition in children

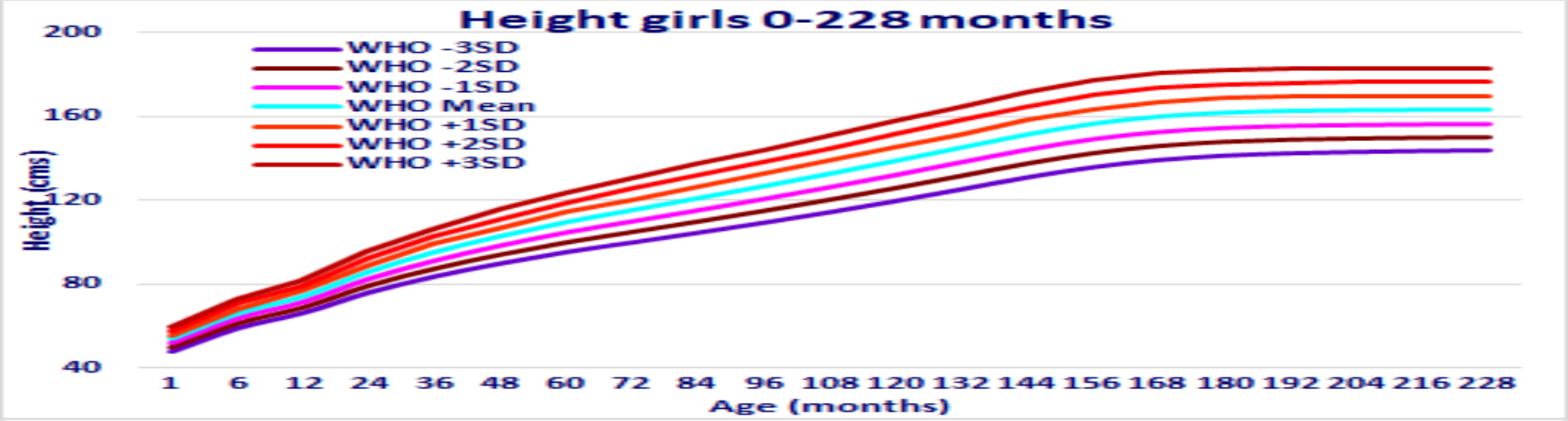
With the emergence of dual nutrition burden, countries where stunting was common started to report that some stunted underweight children were overweight for their height and had risk factors associated with cardiovascular diseases in adult life.

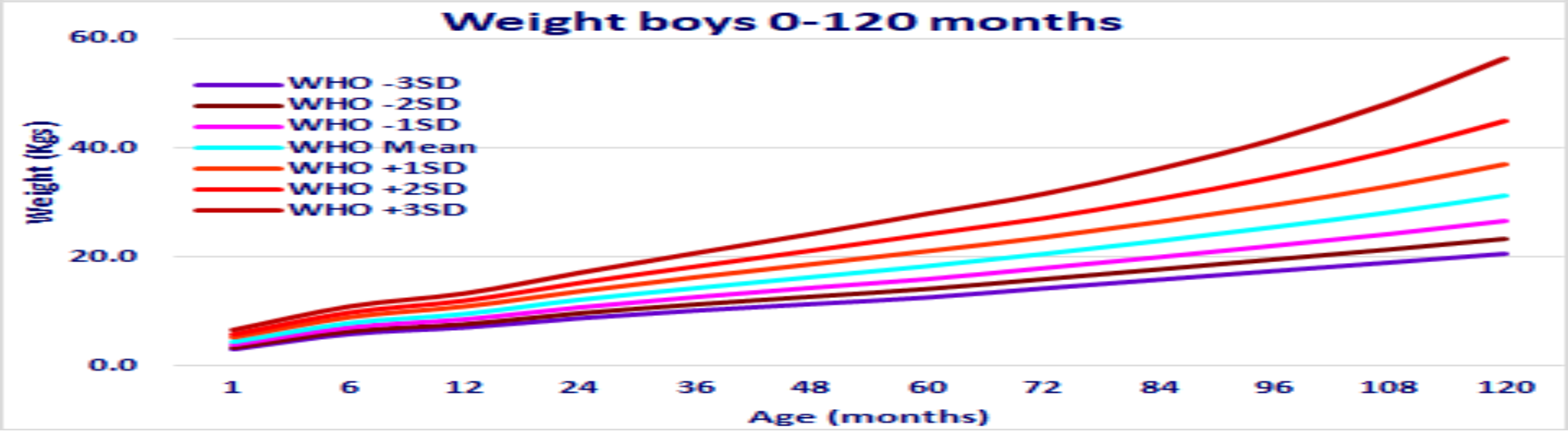
In adults BMI has been used as the parameter for assessing both under-nutrition (<18.5) and over-nutrition (>25 over-nutrition; >30 obesity).

In children BMI varies with age and because of lack of standards, BMI-for-age was not used for assessing nutritional status in children.

WHO developed child growth the standards for 0-18 years which in addition to height-for-age and weight-for-age provided BMI-for-age and recommended that these should be used to assess both under- and over-nutrition in children.

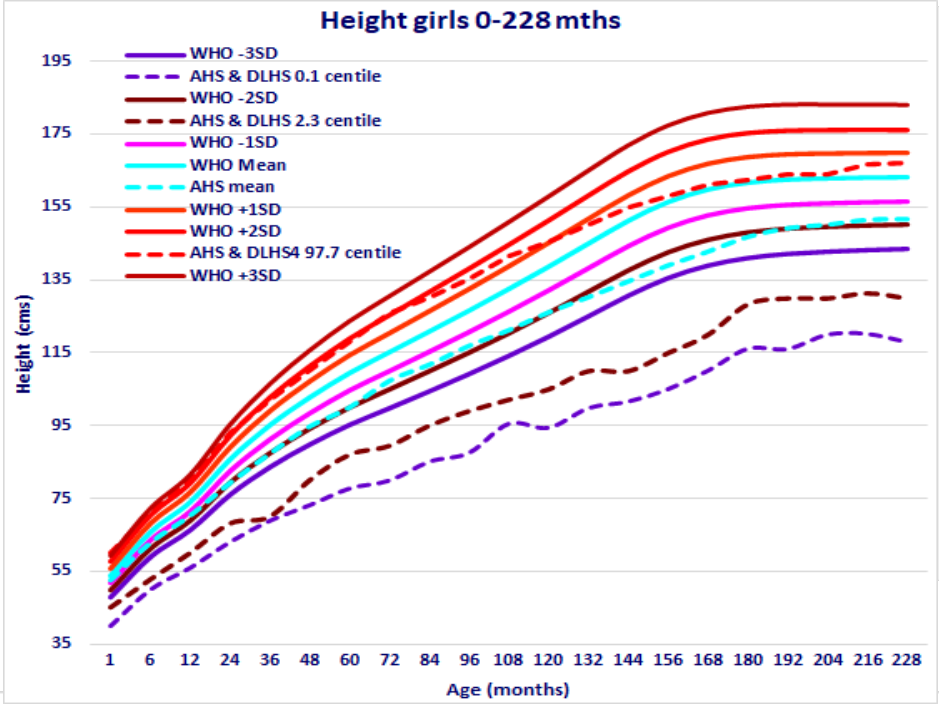
India has accepted this recommendation.

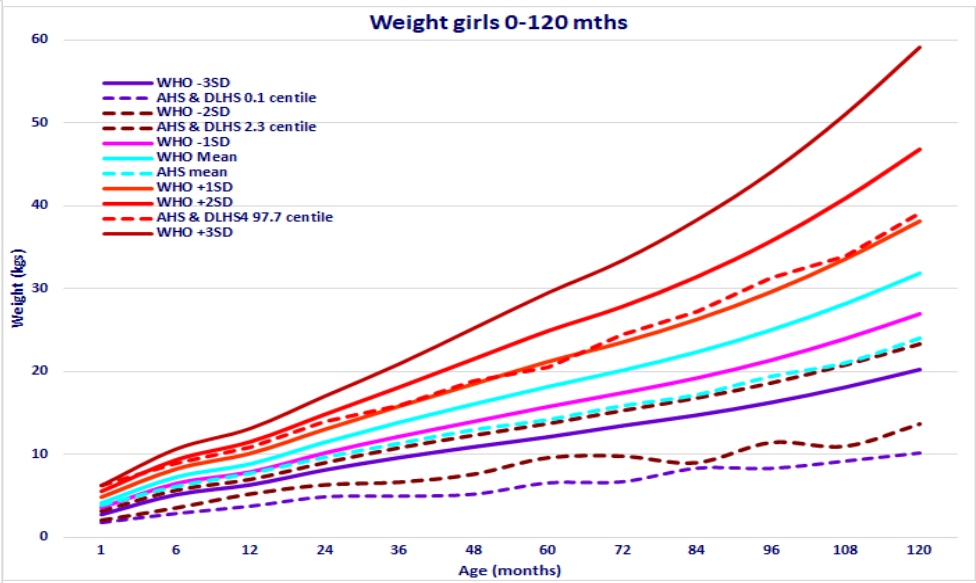


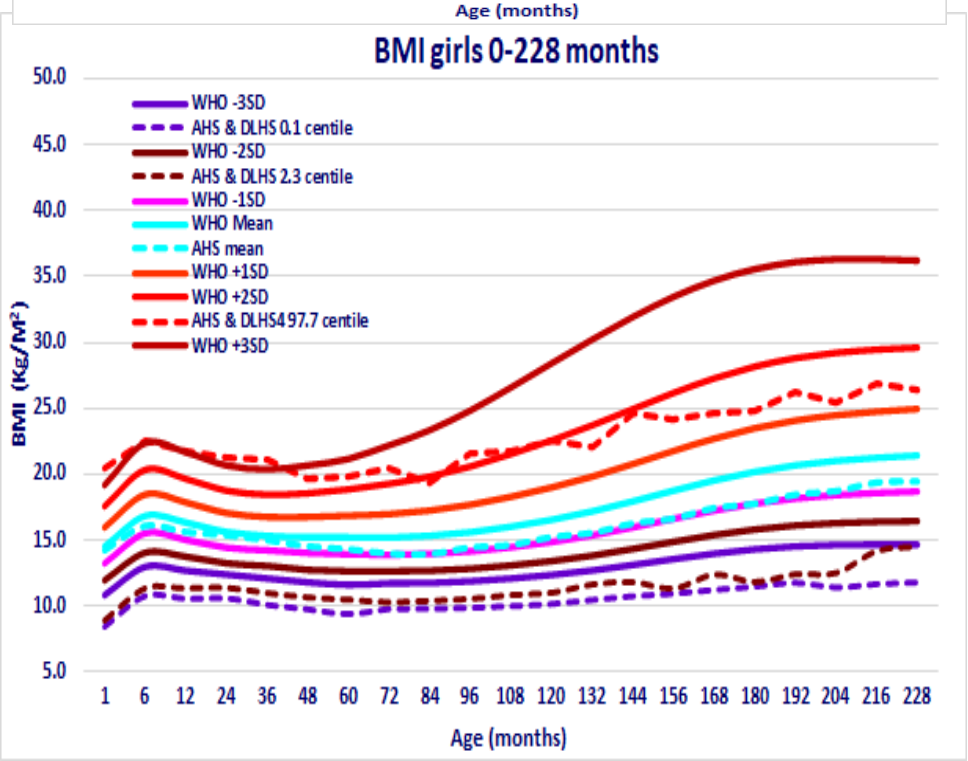


WHO merged the cross-sectional sample of MGRS growth standards (18-71 months) with the 1977 NCHS/WHO data so that there was a smooth transition of growth curves from 0-18 years.

From these data WHO developed the weight-for-age and height-for-age growth charts providing the growth trajectories; the figure above shows the mean, -1SD, -2SD, -3 SD, +1SD, +2SD and +3SD between 0-18 years.





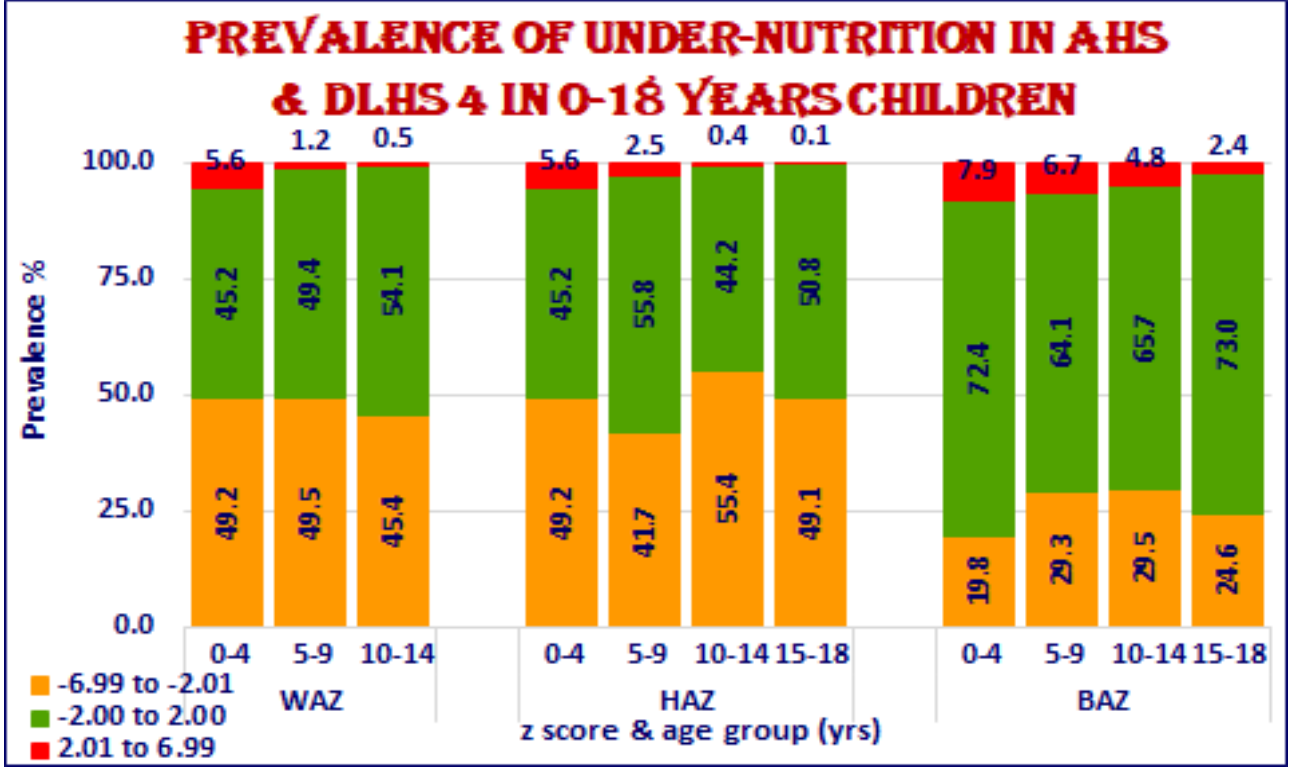


Mean weight, height and BMI for age from AHS and DLHS4 children were computed and plotted against the WHO growth curves for 0-18 years

Mean height for age in girls (and boys) in AHS and DLHS4 children follows the WHO - 2SD curve between 1-18 years

Mean weight for age in girls (and boys) in AHS and DLHS4 children follows the WHO - 2SD curve between 1-18 years

Mean BMI for age in girls (and boys) in AHS and DLHS4 children follows the WHO - 1SD curve between 6-18 years

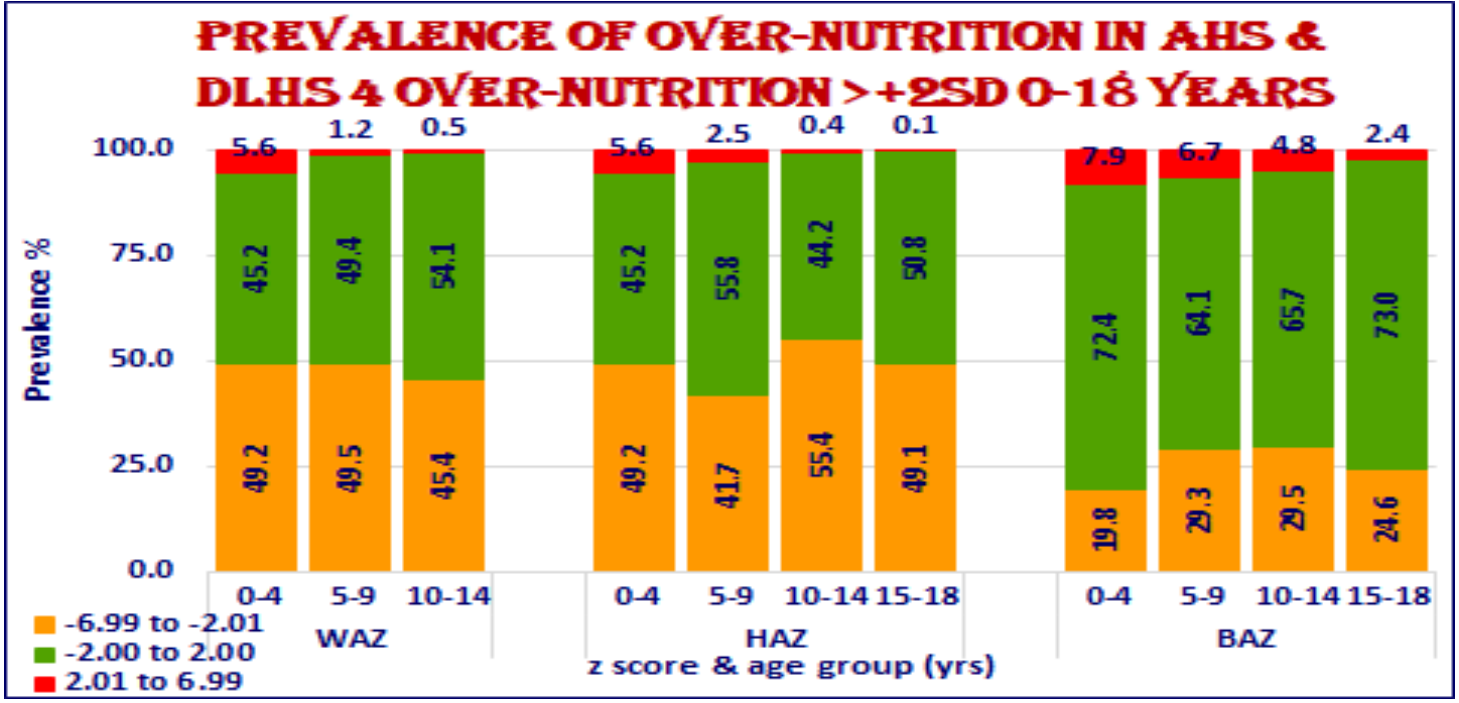


Prevalence of under-nutrition as assessed by stunting, underweight and wasting (defined as <-2 HAZ, WAZ and BAZ) across different age groups is given in the figure above.

Stunting rates are the highest and wasting rates are the lowest across age groups.

Stunting, underweight and wasting rates increase with age in children.

Similar trends have been reported in NNMB surveys and smaller studies.



Prevalence of tallness, overweight and over-nutrition as assessed by height, weight and BMI (defined as >+2 HAZ, WAZ and BAZ) across different age groups is given in the figure above.

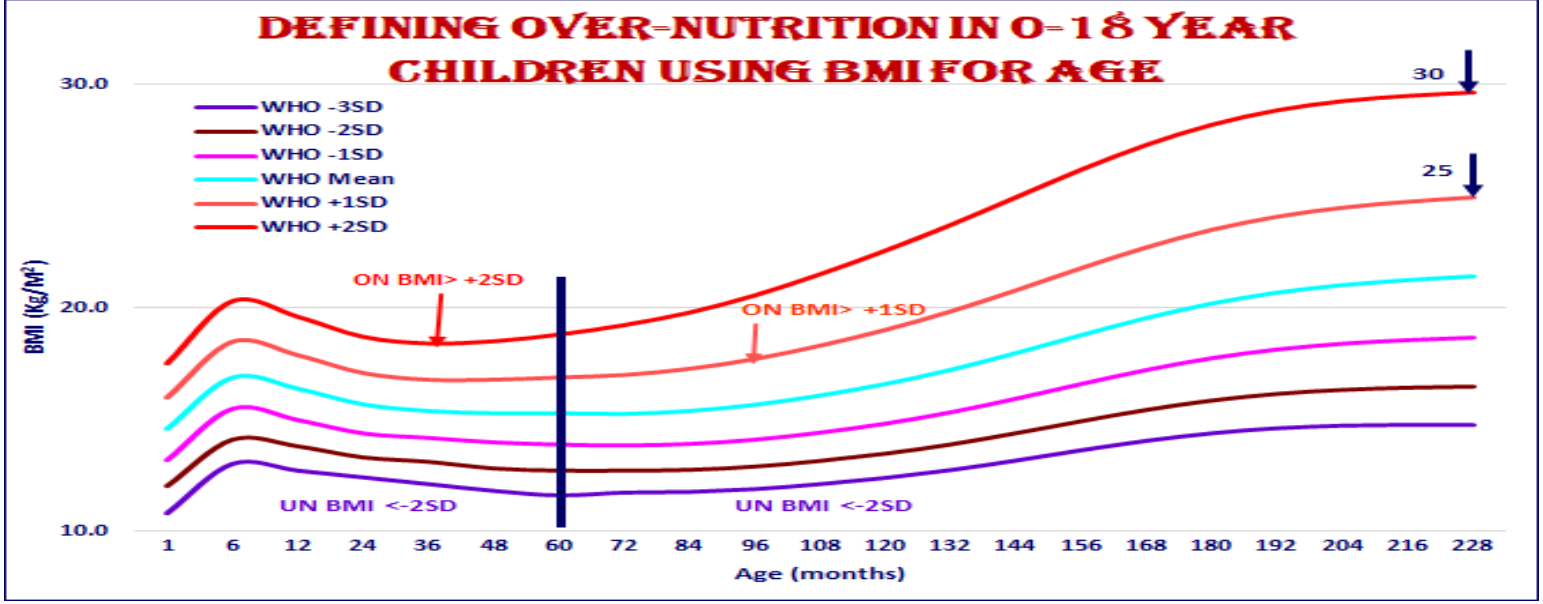
Very few children are tall even in the under-five age group; there is a further reduction in tall children with increasing age

Overweight and over-nutrition rates are highest in the under-five age group and show a progressive reduction with increase in age.

It is reassuring to note that over-nutrition rates in children across age groups is low

Cohort studies in India have shown that rise in BMI in pre-school children is associated with over-nutrition and higher risk of NCD in adult life

It is imperative to halt and later reverse over-nutrition rates in U5 children



Across all age groups under-nutrition was defined as weight, height or BMI for age <-2SD

But there was a problem in defining the BMI for age cut-offs for over-nutrition

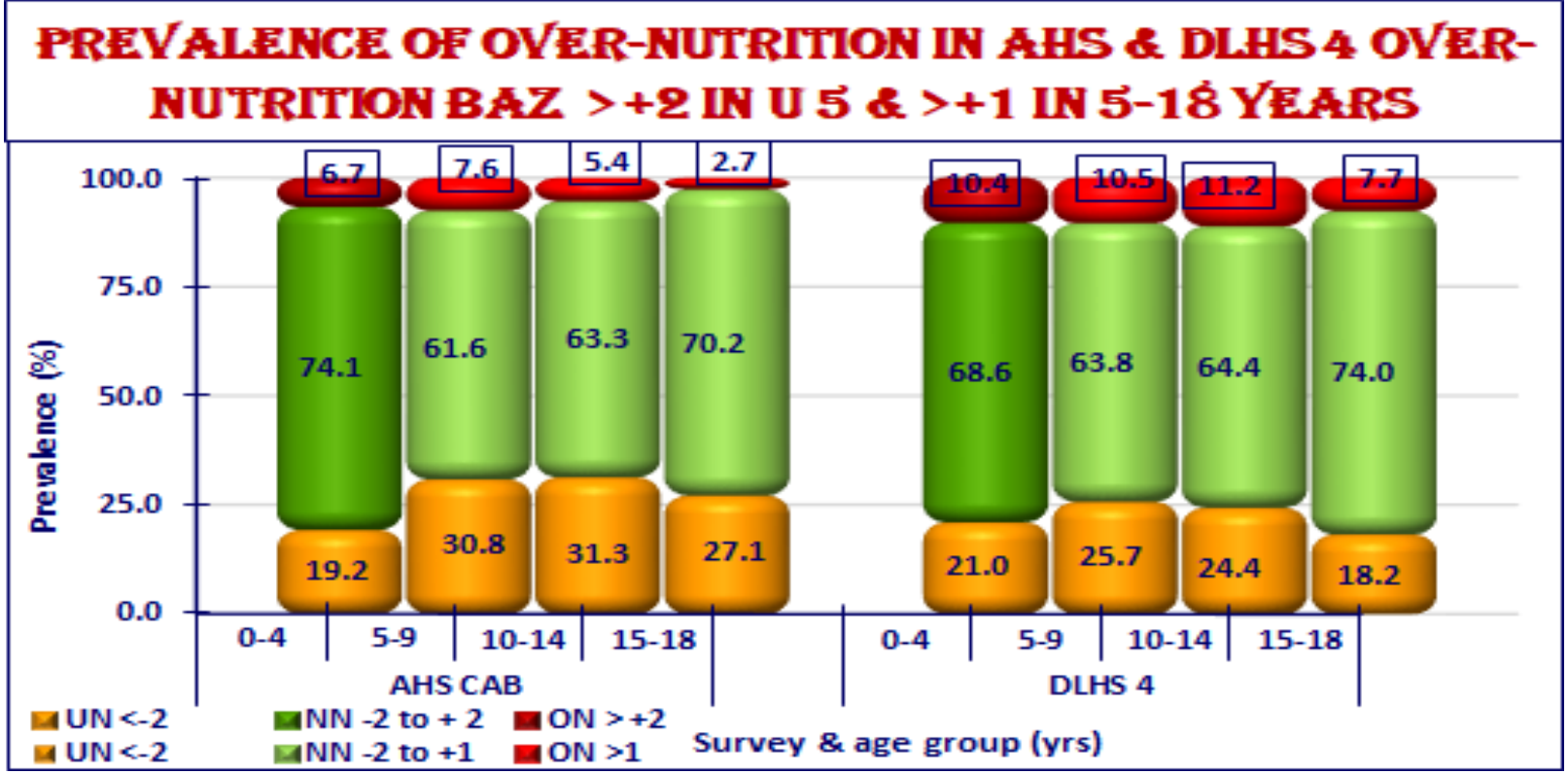
For under-five children over-nutrition was defined as BMI for age >+2SD.

When the BMI for age growth trajectories for 0-18 years were developed, it was found that at 19 years the mean +1SD value corresponded to BMI of 25 which was the cut-off in adult for over-nutrition

WHO expert group decided that for under-five children BMI of >+2SD and for 5-18 years BMI of >+1SD will be used for defining over-nutrition

This ensured smooth transition from school age BMI cut-off with BMI adult cut-off for over-nutrition

But the transition in over-nutrition rates between pre-school and school age was abrupt and substantial

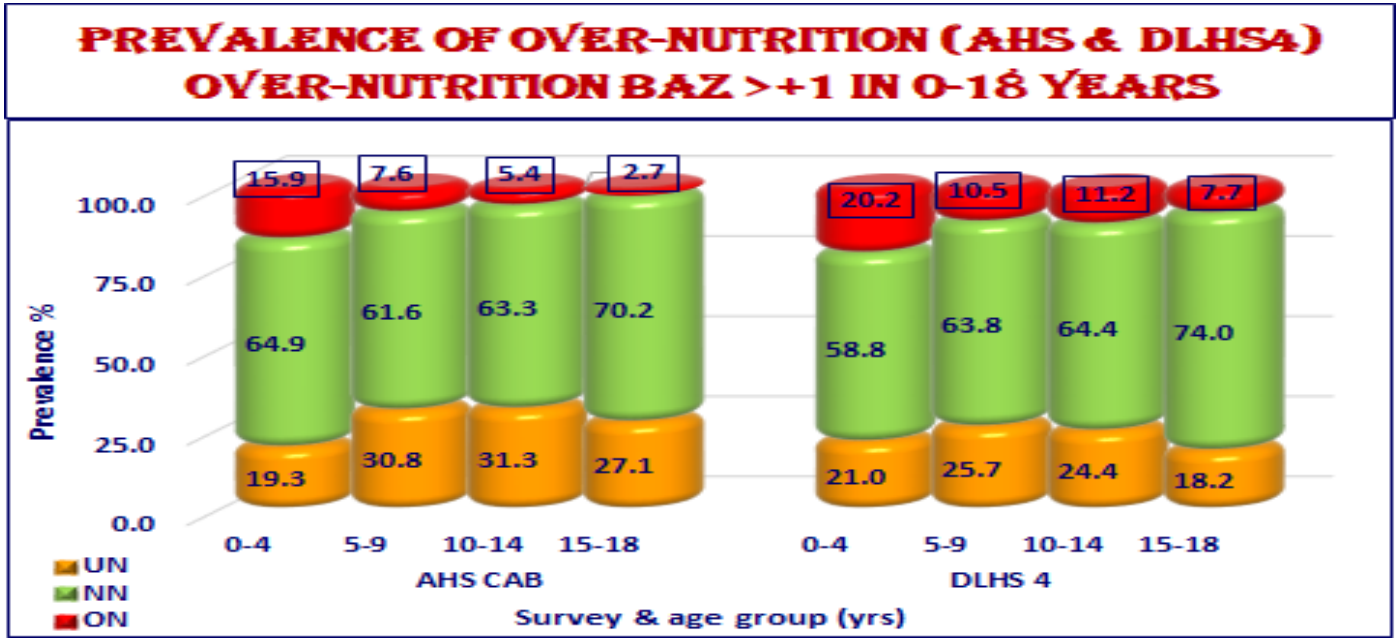


If prevalence of over-nutrition is computed using BAZ >+2 in U5 and BAZ >+1 in 5-18 years over-nutrition rates in 0-4, 5-9 and 10-14 years are similar; over-nutrition rates in 15-18 year children were lower.

By following these dual criteria, there is an inevitable increase in the number of over-nourished children who need attention because of inclusion of larger proportion and number of 5-18 year old children.

The focus of attention may shift from detection and management of over-nourished pre-school children to school age children in whom it is easier to asses BMI for age and initiate interventions

This in turn may have adverse effect on efforts to halt the rise in adult adiposity and risk of NCD



WHO and CDC have used the same data base (NCHS survey data) for computing height, weight and BMI for 5-18 year children.

When faced with the problem of need to harmonise the cut-off used in adolescents for defining over-nutrition with those of in adults, CDC in 1990s took a decision to use the same cut-off for defining over-nutrition in children across the age groups: 85th centile (corresponding to BAZ +1) and 95th centile (corresponding to BAZ+2).

Prevalence of over-nutrition in children in 0-18 year age group using these criteria is shown in figure above.

In under-five children prevalence of under-nutrition is similar to over-nutrition both in AHS and DLHS4 states.

In under-five children BAZ >+1 has not been shown to be associated with any increase in risk of over-nutrition or NCD risk in adult life.

POLICY AND PROGRAMME IMPLICATIONS

If the dual WHO norms are used, the prevalence of over-nutrition was similar between 0-4, 5-9 and 10-14 year age groups. If this norm were used the focus of intervention to halt over-nutrition may shift to school age because:

- the number of children in school age is three times that of pre-school children, and
- measurement of height and computation of BMI is easier in school age children
- interventions to halt and reverse over-nutrition are available and can be implemented through the school health programme.

If BAZ >+1SD is used the prevalence of over-nutrition is high in all age groups; in pre-school children prevalence of over-nutrition is almost as high as under-nutrition.

Ongoing programmes in India to improve nutritional status of pre-school children are currently focussed mainly on reduction in under-nutrition; these may require massive modification if the country is to embark on detection and management of dual nutrition burden in large number of pre-school children. This may result in slowing down the progress both in reduction in under- and over-nutrition.

If BAZ >+2 is used across 0-18 years for the definition of over-nutrition, prevalence of over-nutrition in Indian children across all age groups was low. Efforts can be mainly focussed on trying to detect and mange relatively small number of over-nourished pre-school children and ensuring that there is no further rise over-nutrition in the 5-18 years age group.

Long term follow-up studies in India have shown that both under- and over-nutrition in 0-4 year age group are associated with higher risk of over-nutrition in adolescence and adult life and higher risk of non-communicable diseases in adult life.

Therefore, in India, it might be preferable to use the uniform BAZ >+2 for definition of over-nutrition so that the focus of interventions is aimed at early detection and effective management of the relatively small number of under-five children with under- or over-nutrition; the other focus could be on relatively small number of over-nourished children in 5-18 year age to halt and later reverse over-nutrition.

THANK YOU!