Growth, Nutritional status and Anemia in Indian Adolescents

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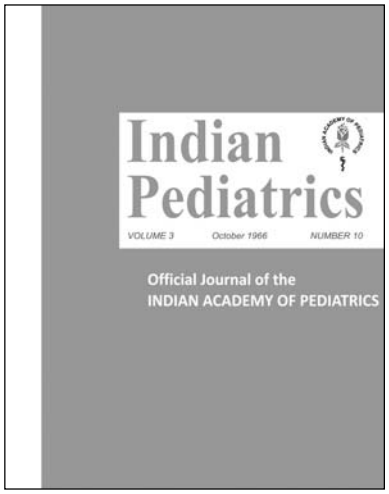
The 35-paged October issue of *Indian Pediatrics* comprised of three research papers current literature and news. The research paper being discussed in this section was based on a study of the sociological, anthropometric, hematological and biochemical parameters of school-aged children [1]. This visionary school-based study may have paved the way for many a landmark research on Indian school children that followed in the next fifty years.



THE PAST

This cross-sectional observational study to evaluate the aforementioned parameters of 9- to 18-year-old school children (*n*=475) of Calcutta was conducted by Chaudhari, *et al.* [1] in 1962. Children born to Bengali Hindu (*n*=251) or Punjabi Sikh (*n*=224) parents who during partition had migrated from East Bengal and West Punjab, respectively, were recruited from schools. Their work-up included measurement of weight and height, and estimation of hemoglobin (Hb), packed cell volume (PCV), serum iron, iron binding capacity, coefficient of iron saturation, serum proteins and serum copper.

Most Bengali Hindu fathers were salaried office workers with a monthly per capita income of below Rs. 50 in 67% and above Rs. 101 in 6%. Most (69.5%) Punjabi Sikh fathers were businessmen with monthly per capita income of above Rs. 101 in 40% and below Rs. 50 in 28 %. The weight and height of Punjabi Sikh boys was significantly higher than Bengali Hindu boys, but for girls it was not statistically significant. The average Hb, PCV, total proteins and serum albumin were significantly lower in Bengali Hindu boys and girls compared to their Punjabi Sikh counterparts. Indicators of iron status and serum copper levels were below normal in all children, especially in girls. The authors concluded that these results were attributable to the more nutritive diet of Punjabi Sikh children due to better socio-economic circumstances.

Historical Background and past knowledge: Once it was realized that growth monitoring could identify deviation from normal and thus ill-health, the search for the ideal 'reference' of the same age and sex started intensively. Various researchers started to develop normative data worldwide. It was recognized that growth patterns changed with time thus necessitating periodic updating of the data. The Iowa charts were used in America in the forty's and the Tanners charts in the United Kingdom in the fifties. Harvard data (1930 – 56) became popular globally in the sixties after being adapted by World Health Organization (WHO) [2]. In 1977, National Centre for Health Statistics (NCHS) and Centers for Disease Control (CDC) integrated data of three cross-sectional NCHS surveys of 2-18 year olds (1960- 1975) with longitudinal data of 0 -23 month olds from the Fels Research Institute (1929 -75) [3]. The result was the creation of percentile-based graphs (weight, height and head circumference) of children from birth till 18 years. In 2007, the WHO reconstructed the NCHS original reference data of 5-19 year old children by applying state-of-art statistical methods and merged it with the WHO MGRS under-five data [4].

On the national front, many Indian growth charts were also being developed. The earliest charts were created by Indian Council of Medical Research (ICMR) based on a nationwide cross sectional study from 1956 to 1965 [5]. Agarwal, *et al.* [6] in collaboration with Nutrition Foundation of India developed growth charts for children from birth to 5 years based on data of affluent urban children from seven Indian states between 1989 and 91 (*N*=2,664, 54.2% boys). During the same period (1988-91), ICMR conducted a cross -sectional growth study of affluent Indian children between 5 years to 17/ 18 years (girls/ boys) from eight states (*N*=22,850) [7]. In 2007, the Indian Academy of Pediatrics (IAP) published the first Growth Monitoring Consensus Guidelines which

recommended annual assessment of height, weight and body mass index (BMI) in children between 9 to 18 years and use of Agarwal charts.

In 2007, Khadilkar, *et al* [8] collected data related to weight, height and BMI from children (age 5-18 y) of 11 schools in 5 geographical zones (*N*=18,666). At the same time (2006-2009), Marwaha, *et al*. [9] were also conducting a cross sectional study of 5-18 year old school going children of 19 cities in 4 zones. They used the data of the affluent children (*N*=64,629) to create the growth curves. An increase in obesity was noted in both these data sets.

THE PRESENT

In 2015, IAP decided to update the growth charts for 5–18 year olds [10]. This included children from 14 cities in 5 geographical zones (*N*=33991). Height, weight and BMI curves were constructed with the same strategy used for the 2007 WHO curves. There was a significant increase in all parameters for both genders when compared with the previous IAP charts. The latest IAP guidelines recommend the use of the 2006 WHO charts for children under the age of five years, and revised 2015 IAP growth chart for older children [11].

Unfortunately, neither the National Family Health Survey (NFHS) nor the 'Children of India' survey conducted by the Ministry of Statistics and Program Implementation collects data related to adolescent malnutrition; though the prevalence of anemia is determined. Irrespective of the reference norm or classification system used, one truth is starkly apparent. Anemia and malnutrition in children above five years of age is highly and widely prevalent throughout India. Thinness, underweight and stunting is more common in the lower socioeconomic strata, overweight and obesity in the higher, and anemia in both. The WHO and the Global Nutrition Report use country profile indicators which signify when malnutrition is a significant public health problem based on prevalence in under-five children and women [12]. The only parameters that are used for older children are anemia, overweight and obesity. Surprisingly the parameters of undernutrition which is so prevalent in developing countries are not included.

Even today, many issues remain unresolved pertaining to the growth and nutritional status of children between 5 to 18 years. The ideal growth chart is yet to be developed. International policy makers are yet to incorporate public health indicators specific for undernutrition of this group. The NFHS data does not include assessment of BMI in their national and state-wise surveys.

It cannot be disputed that several national and state schemes are currently operational to reduce malnutrition in school- aged children. However these have been functional since years and the situation remains status quo. In any case, we as individuals can definitely make a tangible difference by pledging to monitor the growth of all children irrespective of age and however busy we may be, so that those at risk can be identified early and appropriate intervention can be started.

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