

# Anthropometry and Prevalence of Common Health Problems among School Going Children in Surathkal, Karnataka

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## ABSTRACT

**Aims:** To measure the anthropometric data of school children and to compare with the CDC and Agarwal centile Growth charts. The prevalence of thinness, stunting, overweight and obesity were estimated. Children were also screened for hypertension, refractory errors, dental problems, skin disease and other abnormalities.

**Design:** Study was conducted in November in a central school in Surathkal, Dakshina Kannada, Karnataka, India. All children from nursery up to 10<sup>th</sup> standard were screened.

**Materials and Methods:** Weight and Height were measured using standard equipment and plotted on CDC and Agarwal Charts. BMI was calculated and plotted on both charts. Blood Pressure (BP) was taken using mercury sphygmomanometer by a trained nurse. Vision was tested using Snellens chart by refractionist. Dental evaluation was done by dentist.

**Statistical analysis:** Chi-square test and Student's unpaired t test were used for statistical analysis. A statistical package

SPSS version 17.0 were used.  $p < 0.05$  was considered as significant.

**Results:** Total 755 children were screened. Among these 392 (51.9%) were females and 363 (48.1%) were males. Eighty five (11.3%) children had short stature and 283 (37.5%) had under nutrition when plotted on CDC chart. Values were lower when plotted on Agarwal charts. Thinness was more prevalent than obesity and overweight. Majority were normotensive though hypertension was noted in 6(0.8%) children and prehypertension in 14(1.9%). 112 children (16.3%) had undetected refractory error. Common skin disease noted was T.Versicolor in 27 children. Common dental problem noted was Caries teeth (22.9%).

**Conclusion:** Weight and height were below the CDC centile charts. Under nutrition was more prevalent than overweight and obesity. Majority were normotensive. High prevalence of undetected refractory error and caries teeth were noted. Prevalence of skin disease was low.

**Keywords:** Dental caries, Obesity, Refractory error, Stunting, Thinness

## INTRODUCTION

Children are the wealth of any country. Special attention should be given to meet the needs of this group. A child spends most of the time in school between the ages of 6 to 15 y. School is an ideal place for learning and growing up for the child.

In developing country like India due to poverty and prevailing socio-cultural milieu a substantial number of school children from paediatric age to adolescents suffer from various diseases which can be prevented if diagnosed and treated early and preventive measures taken in time. The school going age is a formative period, physically as well as mentally, transforming the child into a promising adult. Poor health and nutritional status will affect work capacity as well as cognitive functions.

School health screening is an important aspect of any community health programme. It consists of tools applied to healthy pupils to detect those with particular health problem that require further evaluation by a specialist. There are many health problems among school children in developing countries like India. Little attention is paid to this important issue.

Screening includes screening for general health, assessment of anaemia/nutritional status, visual acuity, hearing problems, dental check up, common skin conditions, heart defects, physical disabilities, learning disorders, behavioural problems etc.

The physical growth of children is reflected by different anthropometric measurements especially weight and height. Anthropometry is used to characterize growth patterns and body composition. Growth patterns are indicators of nutritional status of children and are important in developing intervention programmes.

## AIM AND OBJECTIVES

1. To assess the nutritional status of the study population and to know the prevalence of under nutrition, stunting as well as overweight and obesity.
2. To compare the growth centiles on the CDC and Agarwal centile charts.
3. To estimate the prevalence of undiagnosed refractory error using Snellen chart.
4. To estimate the prevalence of dental caries.
5. To screen for common health problems affecting these children.

## Epidemiological significance

Development of children and quality of their learning depends on a number of factors, including their own health status. Health promoting behaviour inculcated by the school not only contributes in physical development and health care of students, its spin-off improves awareness about health issues among the parents and local community as well.

School health screening provides a unique opportunity to positively impact the health of students-

- It acts as a safety net for children who might not have regular access to primary care
- Prevent medical, psychosocial, and academic consequences of missed diagnoses
- Provide an additional point of contact to develop rapport, educate, and evaluate the overall well-being of students

Age	Sex	N	Mean wt	Std. Deviation	Mean height	Std. Deviation
4.01 – 6	Male	80	15.40	2.979	105.80	5.995
	Female	72	15.11	2.876	105.25	6.567
6.01 -8	Male	76	20.34	3.938	119.86	6.572
	Female	79	20.28	4.138	119.20	5.730
8.01 – 10	Male	64	25.80	6.454	130.00	6.631
	Female	62	25.95	5.202	131.15	7.481
10.01 -12	Male	55	32.02	7.994	140.55	7.259
	Female	61	33.69	8.176	143.28	8.019
12.01- 14	Male	48	40.90	10.674	152.71	8.287
	Female	67	42.57	10.047	154.21	8.041
14.01- 16	Male	40	51.70	10.049	166.43	7.696
	Female	51	47.82	10.961	157.55	8.608

[Table/Fig-1]: Mean weight and height

Centile	Weight		Height	
	Agarwal No. (%)	CDC No. (%)	Agarwal No. (%)	CDC No. (%)
<3 <sup>rd</sup>	72(9.5)	229(30.3)	23(3.0)	85(11.3)
3 <sup>rd</sup> -97 <sup>th</sup>	654(86.7)	521(69)	701(92.9)	661(87.5)
>97 <sup>th</sup>	29(3.8)	5(0.7)	31(4.1)	9(1.2)

[Table/Fig-2]: Weight and height centiles compared on Agarwal and CDC charts

Centile	Male		Female		Total	
	Agarwal No. (%)	CDC No. (%)	Agarwal No. (%)	CDC No. (%)	Agarwal No. (%)	CDC No. (%)
Underweight/ thinness	87(24)	148(40.8)	93(23.8)	135(34.4)	180(23.8)	283(37.5)
Normal	225(62)	184(50.6)	259(66)	225(57.3)	484(64.1)	409(54.2)
Overweight	38(10.4)	20(5.5)	33(8.4)	25(6.4)	71(9.4)	45(5.9)
Obesity	13(3.6)	11(3.1)	7(1.8)	7(1.9)	20(2.7)	18(2.4)

[Table/Fig-3]: BMI plotted on agarwal and CDC BMI centile charts

The Health screening aims to identify and address important health barriers to learning. Identifying health problems early will improve a child's overall development and assist with his or her ability to learn at school. It will also make parents aware of health problems their children are experiencing and help them to deal with it.

## MATERIALS AND METHODS

The present study was a cross-sectional descriptive study undertaken in a central school in Surathkal, Dakshina Kannada district, Karnataka state, India, in November 2011. This area consists of immigrants from different states of the country in view of the various industrial factories, Engineering and Medical Colleges in the vicinity. The present school was selected as this is the only central school in this area and shows a fair representation of children of all social levels. Since the information on school going children of this region is lacking, the present investigation was undertaken with the objective to assess the nutritional status of these children and to screen for the common health problems affecting them.

Total of 755 school children aged between 4 and 16y from nursery till 10<sup>th</sup> standard were examined. All children attending school at the time of survey were included. Expert Team included paediatrician, dentist, refractions and trained nurses. Children were examined for

1. Weight in kilograms
2. Height in centimetres
3. Estimation of Body Mass Index (BMI)
4. Measurement of systolic and diastolic blood pressure
5. Examination for dental problems
6. Vision using Snellens chart
7. Skin diseases
8. General examination

Age	Sex	N	SBP Mean	SBP(Std. Deviation)	DBP (Mean)	DBP(Std dev)
4.01 – 6	Male	80	86.55	10.448	54.88	7.290
	Female	72	85.00	9.786	53.06	5.474
6.01 -8	Male	76	85.92	8.971	57.82	8.969
	Female	79	83.04	6.860	55.22	7.228
8.01 – 10	Male	64	87.19	7.657	55.63	7.533
	Female	62	85.32	6.457	54.03	6.392
10.01 -12	Male	55	88.91	8.536	59.82	8.496
	Female	61	90.66	8.538	60.59	8.597
12.01- 14	Male	48	97.29	9.618	64.58	7.426
	Female	67	95.52	9.736	63.43	7.697
14.01- 16	Male	40	101.50	10.013	70.25	6.597
	Female	51	99.02	8.545	66.47	6.877

[Table/Fig-4]: Mean Systolic and diastolic blood pressure readings

Problems	Number
Vitamin deficiency	3
Rickets	1
Abnormal CVS	4
Absent DAOM(Depressor Angularis Oris Muscle)	1
Adenoma sebaceum	1
Alopecia	1
Blepharitis	4
Deviated nasal septum (DNS)	3
Habitual torticollis	1
Anaemia	5
Limb shortening	1
Ptosis	1
Scoliosis	1
Syndromic	1

[Table/Fig-5]: Abnormalities noted on general examination

Date of birth was taken from the school record and decimal age was calculated. Body weight was measured in minimal clothing to the nearest 0.1kg using a beam scale. Height was recorded in centimetres on a stadiometer. BMI was calculated using the formula weight (kg) divided by height in meter<sup>2</sup>. Height, weight and BMI were plotted on CDC (<http://www.cdc.gov/growthchart>) and Agarwal (<http://www.indianpediatrics.net/mar2007>) centile charts.

Blood Pressure (BP) measurements were taken by a trained nurse using mercury sphygmomanometer and appropriate sized cuff. The normative values were based on the 'Fourth report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents'. On the basis of these Blood Pressure (BP) centiles were computed for each age group, gender wise both for systolic and diastolic BP. Abnormal values were rechecked and confirmed thrice after adequate rest.

The examination of skin was done by naked eye and torch was used whenever needed. Students were screened for eye disorders by visual acuity testing and anterior segment torch light examination. A Snellens chart was hung on the wall and students were made to stand at a distance of six meter. Readings more than 6/9 were taken as having refractory error. Head to toe examination was done for deformities, scoliosis and systemic examination was done for gross abnormalities.

Dental evaluation was done by an experienced Dentist. Dental examination mirrors, explorers and a doctor's-pen-light were used for intra-oral examination.

## Reference standards

Short stature was defined as height below 3<sup>rd</sup> centile for the age and gender. Tall stature was defined as height >97<sup>th</sup> centile for age and sex. Normal weight for height was defined as BMI greater than 5<sup>th</sup> centile but less than 85<sup>th</sup> centile. BMI values less than 5<sup>th</sup> centile is considered as thinness, 85<sup>th</sup>-95<sup>th</sup> centile as overweight and more than 95<sup>th</sup> centile as obesity.

Hypertension was defined as SBP and/or DBP ≥ 95<sup>th</sup> centile for age, gender and height centile. Prehypertension was defined as BP reading > 90<sup>th</sup> centile and less than 95<sup>th</sup> centile.

Children noted to have abnormalities during screening were asked to come to hospital for detailed evaluation and investigations.

## STATISTICAL ANALYSIS

Chi-square test and Student's unpaired t-test was used to do this analysis. A statistical package SPSS vers. 17.0 were used.  $p < 0.05$  was considered as significant.

## RESULTS

Total of 755 children from nursery up to 10<sup>th</sup> standard were examined. Among these 392 (51.9%) were females and 363 (48.1%) were males. Age group ranged from 4 to 16y.

### Weight and height for age

Mean weight and height are listed on [Table/Fig-1]. Mean height and weight of boys and girls were similar till 10 y of age. From 10 till 14 y, weight and height of girls were more than boys. After 14y, boys had higher weight and height than girls. This may be due to early onset of puberty in girls. On Agarwal chart 72 (9.5%) had weight <3<sup>rd</sup> centile and 29 (3.8%) weighed >97<sup>th</sup> centile. On CDC chart, 229 (30.3%) were <3<sup>rd</sup> centile and 5(0.7%) were >97<sup>th</sup> centile. The number of children with weight <3<sup>rd</sup> centile were significantly higher when CDC chart was used as compared to Agarwal charts ( $p < 0.001$ ) [Table/Fig-2].

Children with short stature was noted to be significantly higher when plotted on CDC chart (11.3%) compared to Agarwal charts (3%). Incidence of both tall and short stature was similar among both the sexes.

### BMI

Thinness was significantly higher on CDC chart (37.5%) compared to Agarwal (23.8%) chart ( $p < 0.001$ ). Seventy one (9.4%) were overweight on Agarwal chart in comparison with 45 (5.9%) on CDC and this difference was statistically significant ( $p = 0.024$ ). Incidence of obesity was similar on both the charts (2.6 and 2.4%). The difference in the incidence of under nutrition, overweight and obesity was statistically insignificant between males and females [Table/Fig-3].

### Blood Pressure

Majority of children had normal BP readings. Mean BP values are shown in [Table/Fig-4]. Six of the children (0.8%) were hypertensive and 14 (1.9%) had pre hypertension [Table/Fig-4].

### Other Abnormalities

Other abnormalities noted on examination include anemia, blepharitis, vitamin deficiency, DNS, Alopecia, Adenoma sebaceum, Absent DAOM, Torticollis, ptosis, limb shortening and scoliosis [Table/Fig-5]. Cardiovascular abnormalities were noted in 4 children.

### Prevalence of skin disease

Major skin condition noted was T versicolor in 27 children (3.6%) followed by acne, atopy and impetigo.

## Vision

Four children complained of dimness of vision and 3 were noted to have squint during examination.

Snellens was performed on 686 students as LKG students were not cooperative for the same.

127(18.5%) had visual defects on Snellens chart. Among these 15 were already on spectacles. 112 (16.3%) had undetected refractory error.

## Dental problems

Among the dental problems, highest prevalence was caries (22.9%) followed by calculus (15%), malocclusion (7.4%) and cross bite (1.5%).

## DISCUSSION

School health screening programmes are often the best way to detect problems that interfere with student's education. Screening should be carried out by trained individuals and appropriate referrals should be made if needed.

Anthropometric data are widely used to estimate the nutritional status of children. The height and weight of a child are useful indices of development, reflecting the various influences on growth, including nutrition [1]. Height and weight of healthy children varies in different parts of the world, due to varied ethnicity and cultural background. Centile charts have been developed to represent height and weight in a standard format. These centile charts represent the average population of children from certain areas along with standard deviations. CDC (Centre for Disease control) and NCHS charts are such examples of such charts used worldwide [2]. Agarwal charts are recommended for use by the Growth Monitoring Guidelines Consensus Meeting of the IAP [3]. 2007 Affluent Indian Growth Charts is also available for growth monitoring [4]

In our study, weight and heights were plotted on both CDC and Agarwal charts. Children with weight <3<sup>rd</sup> centile and stunting were significantly higher when plotted on CDC charts than on Agarwal chart. This could emphasize environmental and ethnic or genetic influence on growth. Hence, use of CDC charts is likely to over diagnose prevalence of under nutrition and stunting in Indian children. In Study by Aziz S et al., on Pakistan children prevalence of stunting was 14% [5].

BMI is the ratio of an individual's weight to height in metres squared ( $\text{kg}/\text{m}^2$ ) and is used to estimate a person's risk of weight-related health problems. It is often used to assess weight status, because it is relatively easy to measure and correlates with body fat. After BMI is calculated for a child or adolescent, it is plotted by age on a gender-specific chart (see [www.cdc.gov/growthcharts](http://www.cdc.gov/growthcharts) for the CDC's BMI-for-age growth charts for girls and boys aged 2–20y). Childhood obesity is increasingly being observed with changing lifestyles in families. The most important consequences of childhood obesity are its persistence into adulthood with all its health risks. Obesity among children is gradually becoming a major public health problem in India. The magnitude of overweight ranges from 9% to 27.5% and obesity from 1% to 12.9% among Indian children [6].

Investigator, year of study, place of study	Target population	Observation made
Prajapati et al., 2010 [7], Gandhinagar	1206 students aged 10-19 years	5.2% were underweight and 15.2% were overweight
Vera R et al., [6], Lucknow city	407 children from 5 <sup>th</sup> to 12 <sup>th</sup> grade	4.17% were overweight and 0.73% were obese.
Bharathi DR et al., [8], 2008, Wardha city	Children from 5th to 10th standard from 31 middle and high schools	Overweight noted in 3.1% and obesity in 1.2% of children
Thakre SB et al., [9], 2011, Nagpur city	1524 school children aged 5-16 years	9% were overweight and 5.5% had obesity

[Table/Fig-6]: Nutritional status of school going children in various studies



Different studies have shown varying prevalence of overweight and obesity [Table/Fig-6].

In our study thinness was more prevalent than overweight and obesity. However, percentage of children with overweight and obesity were higher in comparison to study by Vohra et al., [7] and Bharathi et al., [8]. Higher number of children fell into the category of overweight and obesity when Agarwal charts were used compared to CDC charts. Thinness was present in 40.8% males and 34.4% females on CDC Chart. This was in comparison with the Study by Anand K who reported thinness in 43.8% of boys and 30.1% girls [10]. Study by Prajapati et al., showed overweight to be more prevalent than undernutrition [6].

Elevated blood pressure in childhood may be early expression of essential hypertension in adulthood [11,12]. Hypertension has its origin in childhood but goes undetected unless specifically looked for during this period [13]. A variety of studies conducted in different parts of the world revealed a vast range in the prevalence of hypertension in children showing as high as 22% to as low as 0.6% [14]. In our study, overall prevalence of hypertension was 0.8% and pre hypertension was 1.9%. This was significantly less compared to study by Durrani A M on school children 12-16y in Aligarh where the overall prevalence of hypertension was 9.4% [15]. They recommend that children should be regularly screened so that remedial measures can be initiated as early as possible.

Skin disorders are among the most frequent ailments of schoolchildren in both developing and industrialized countries. The school environment makes children vulnerable to cross transmission of communicable skin diseases among themselves and their families [16]. Prevalence of skin disease was 4.8% of which T.Versicolor accounts for the majority (3.6%). Study on Saudi Arabia children by Wafa Y Al Saeed et al., revealed high incidence of skin disease (98.6%) and the most common disease noted was pigmentary disorders [17]. Study by Valia RA on Varanasi school children observed high prevalence of skin diseases (54%) and the commonest one noted was pediculosis capitis [18]. The reason for the high incidence was thought to be due to the low socioeconomic state of these children. The lower incidence of skin diseases in the present study is probably because of better hygienic practices.

School children are affected by various eye disorders like refractive errors, squint, Vitamin A deficiency and eye infections. Most children do not complain of defective vision, as they may not realise such conditions as a problem. This warrants early detection and treatment of these problems to prevent future blindness. Col A Dutta reported high prevalence of uncorrected errors of visual acuity among adolescent children [19]. Mukherjee et al., stated the importance of early detection and treatment of refractive errors to prevent permanent disability [20]. Myopia was the main type of undetected refractive error in our study (16.3%). This is much higher compared to the study by Padhye AS who reported myopia to be 3.16% in urban children and 1.45% in rural children [21]. Study by Anwar HN on Pakistani school children also reported low prevalence of myopia (4.38%) [22]. Study by Prasanna K on 1300 children in Karnataka reported Vitamin A deficiency as the commonest ocular morbidity (33.8%) and uncorrected refractive error as the second commonest morbid condition (5.6%) [23]. Madhu Gupta et al., at Shimla identified refractive error as the commonest morbidity among children (22%) in their study [24]. Prajapati et al., also had similar observation with a prevalence of 40.1% in their study at Gandhinagar [6]. Other ocular morbidities observed in our study were blepharitis in four children and ptosis in one child.

There are many problems that may affect a school-age child's teeth requiring dental care. The commonest dental problem noted in the study was caries teeth in 22.9% children followed by calculus in

15%. Dental caries is a major health problem with high prevalence globally involving people of all regions and society. Several prevalence studies have been conducted and reported on different occasions on the dental caries and the treatment needs in developing countries such as India. Study by Dhar V reported higher prevalence of caries (46.75%) among children in rural areas of Udaipur district [25]. In study by Batwala V on African children the prevalence of calculus was higher (25.9%) and was more common in males, government schools and among day scholars [26]. Other dental problems noted in our study were malocclusion (7.4%), cross bite, retained tooth and diastema tooth.

## CONCLUSION

In the present study, weight, Height and BMI of these children were below the CDC centiles. Though thinness was more prevalent, overweight and obesity are also emerging nutritional problems that may be the consequence of emerging patterns of life style and diet in response to social and cultural changes. Majority were normotensive though small percentage had elevated readings highlighting the need of BP monitoring in school children. The present study has provided a clear indication of the magnitude of disorders of visual acuity among these children. Causes of higher prevalence should be identified. The awareness among school teachers should also be improved and they should play an active role in identifying the ocular problems and referring them for timely management. Oral hygiene was poor with high caries prevalence demonstrating a lack of established oral hygiene practices. A comprehensive community focussed oral health care intervention that includes oral health education and strengthening of school health programme is needed to improve the oral health status of children in Suratkhil. The prevalence of skin disease was low.

Looking at the results of the study, it can be concluded that there is a need to implement intervention programmes effectively to improve the nutritional status of school age children of Suratkhil region. School health screening should be started for regular health screening and health cards for each student should be maintained. It is advisable to start school based programmes where:

- There should be regular class hours on healthy food habits, nutritive value of different food items, life style and behavioural modification
- Teachers should be motivated to explain the health related problems through nonconventional ways like shortplay, videoclips, games etc.

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