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PREVALENCE OF IRON DEFICIENCY ANEMIA AMONG GOVERNMENT AND PRIVATE SCHOOL CHILDREN

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ABSTRACT

Anemia is a major public health problem in school children especially in developing country. Anemia, defined as a low blood hemoglobin concentration. School-age children are the most vulnerable population group for anemia. Hence the present cross-sectional study was planned to find the prevalence of Iron Deficiency anemia (IDA) among Government schools and also private schools children in Thiruporur, Kanchipuram (Dt), Tamil Nadu. The study population 1000 children (500 Government and 500 private schools) with inclusion and exclusion criteria fixed for sample selection. After getting written permission from the Chief Educational Officer (CEO), Chengalpattu, School Principal, the consent form was given to school children to be completed by parents. Basic anthropometric measurement like height, weight and BMI calculated. Haemoglobin level was estimated by using Sahli's method. Current study report reveals that prevalence of mild and moderate anemia was higher compared to severe anemia among government and private school children. Out of 292 male children 62.67 % children and out of 208 female children 66.82 % children in government school, 64.78 % male children (out of 230) and 65.92 % female children (out of 270) in private school affected with mild anemia. But compared to male children little more female children are affected with mild anemia in both government and private schools. The study concluded that anemia constitutes a major health problem, especially among school children. Considering the associated factors and the fact that these children are in a school environment, the promotion of healthy eating habits could be an important approach for reducing the prevalence of anemia. An awareness camp

conducted on nutrition, mainly focusing on the consumption of dietary sources of iron, are beneficial to reduce the burden of anaemia among children.

Keywords: Anemia, Food consumption, associated factors, school children, Hemoglobin

INTRODUCTION:

Anemia is a global public health problem affecting the majority of the population worldwide both in developed and developing countries with major consequences on human health as well as social and economic development. It is the world's second leading cause of disability of the whole global disease burden **[1-3]**. Anaemia (from the ancient Greek, anemia, meaning 'lack of blood') is defined as a decrease in the total amount of hemoglobin or in the number of red blood cells. One type of anaemia caused by a deficit in iron needed to produce healthy red blood cells is called iron deficiency anaemia (IDA). It is considered as a public health problem when the hemoglobin (Hb) value is below the population-specific Hb threshold. It can be classified as no, mild, moderate and severe public health problem when the prevalence is ≤ 4.9%, 5.0–19.9%, 20.0–39.9%, and ≥40%, respectively **[4]**.

The maximum prevalence of anaemia is seen in the world's quarter of the population, despite significant economic and scientific advances. 47.4% of preschoolers fall within this category. IDA affects 43% of preschoolers worldwide, particularly in underdeveloped nations, where prevalence rates are four times higher than in industrialized nations **[5]**. This high frequency is linked to inadequate sanitation, low socioeconomic status and high infant mortality **[6]**. The daily requirement for iron rises to 5–6 mg during the last two trimesters of pregnancy. At least 80% of Indian toddlers between the ages of 12 and 23 months were anemic, according to the third National Family Health Survey (NFHS) conducted in 2005-2006 **[7]**. Due to the needs of bodily growth and decreased dietary iron consumption, infants, children and adolescents need more iron for good health **[8-9]**.

The consequences of anemia in School children are unfavorable and adversely affects their cognitive performance and motor development leading to fatigue, low productivity, reduced work capacity, low cognitive function, retarded physical growth, impaired school performance, poor coordination of language and motor skills, and 5 to 10 points intelligent quotient deficit **[10-13]**. Hence, the present study was planned with the objective of assessing the prevalence of anemia in this age group school children.

This study has helped in early screening of anemia in these children so that appropriate interventions can be planned. This will in turn have a beneficial effect on the overall growth and development of these children in the long run.

MATERIALS AND METHODS:

Data collection tools and methods:

The present cross-sectional study which is planned to conduct both in Government schools and private schools in Thiruporur, Kanchipuram (Dt), Tamil Nadu. The sample size was distributed among the selected schools, proportionally based on student size in each school. After getting written permission from the Chief Educational Officer (CEO), Chengalpattu, School Principal the consent form was given to school children to be completed by parents. Participants were informed about the objectives of the study and experiments protocol. After that students were selected randomly proportional to the student size and their interest in each class. Anthropometric measurements and hemoglobin estimation were completed all the participants.

Study population:

1000 children (500students from government school and 500 students from private school) aged about 8 – 16 years including both boys and girls were taken up for the study.

Inclusion criteria:

- All children belonging to the age group of 8 – 16 years who are in government schools and in private school.
- Preliminary visits will be made to the schools and the class teachers instruct the children to obtain their parents' consent. Those children will be included.

Exclusion criteria

- Children belonging to the age not in the range of inclusion criteria limit.
- Children suffering from chronic illness.

Anthropometric measurements:

Anthropometric data were collected by recording age, weight, height and BMI calculation of the participants were done according to WHO guideline. All measurements were done in the school premises.

Weight measurement:

The weight of each student was measured with the help of digital weighting machine. The subjects were weighed with minimum of clothing and after removal of their school shoes **(Figure 1)**.

Figure 1: Weight measurement of the school children

Height measurement:

Height was measured with the help of non-stretch tape that was fixed in the flat wall. The respondents were asked to remain barefoot and the hair flat. Both feet were together with heels, buttocks, shoulders touching the wall. The respondents were asked to stand erect looking straight ahead the top of the ear and the outer corner of the eye was in line parallel to the floor. The hands were hanging by the sides in natural manner and a horizontal bar was allowed to rest flat on top of the head and height was recorded to the nearest 0.5 cm.

Body Mass Index (BMI):

It is calculated by dividing weight in kg by the square of height in meters. The calculations were compared with standard for classification of the sample.

BMI= Weight (kg) / Height^2 (m)

Since the height of respondents was recorded in centimeters, for the calculation, BMI heights in centimeters were first converted into height in meters.

Estimation of Hemoglobin by Sahli's method:

The estimation of Hemoglobin was done by the principle of the Sahli's hemoglobinometer, is a manual device that contains a hemoglobin tube, pipette and stirrer, as well as a comparator. Hydrochloric acid converts hemoglobin to acid hematin, which is then diluted until the color of the solution matches that of the comparator block.

RESULT AND DISCUSSION:

Anemia is one of the main public health issues affecting teenage females, particularly in rural parts of developing nations like India. Anemia Mukt Bharat (AMB) was introduced in India in 2018 with the goal of reducing anemia in the susceptible age groups, such as teenage girls, by utilizing a life cycle approach and offering mechanisms for both prevention and treatment. The weekly iron and folic acid supplementation (WIFS)

program, which combines bi-annual helminthic management with weekly supervised consumption of iron and folic acid supplements, is an evidence-based approach to the current anemia crisis among teenagers. A thorough communication effort is implemented in conjunction with these interventions to increase understanding and awareness of anemia.

There are 1000 children selected for the study purpose (From Government school 500 and Private school 500 children). They were grouped based on their age. **Table 1 and 2** presents the distribution of children in age wise and class wise among Government and private schools. In government and private school, the maximum number of participants shown interest and given consent form in the age group of 11 years to 14 years age group and a smaller number of children shown interest in the age between 8-10years. The adolescence is the most important period in human development about which poets, writers and historians have made occasional references and have held esteem the sacrifices made by the adolescences. It is the transaction period and turning point in the life of the individual **[14]**. Hence this study is focused on the school children in the age group of 8-16 years.

Figure 2 shows the distribution of children based on their height among Government and private schools. Based on the children height, grouped in to 120-130cm, 131-140cm, 141-150cm, 151-160cm and 161-170 cm. In government school (Total 500 children), observed that maximum number of children belongs to the height range of 131cm to 160cm, same way in private schools (Total 500 children) also observed that there are 31 children coming under 120 -130 cm, 131 children belong to 131-140cm, 151 children belong to 141-150cm, 116 children belong to 151- 160cm and 71 children comes under 161-170 cm height range.

Table 3 and 4 depicts the weight of the children among government and private school. In government school (total 500 children) there are 292 male children and 208 children female. Among male there are 35.27% children belongs to weight range of 51-60kg followed by 33% comes under 41-50 Kg, among female children maximum percentage comes under 41-50Kg. In private schools (Total 500), among the male children 38.69 % children comes under weight range of 41-50kg, followed by 26.08% children (51-60kg). In female children 33.70% children come under 41-50kg, next to that 28.88% children (51-60 kg), less percentage of children comes under other category of weight range.

Table 1: age & Class Wise Distribution of Children In Government Schools

Age group in years	Class	Male	%	Female	%
8.1-9 Years	4	6	2.05	8	3.84
9.1- 10 Years	5	7	2.39	9	4.32
10.1-11 years	6	61	20.89	25	12.01
11.1 - 12years	7	79	27.05	44	21.15
12.1-13 years	8	71	24.31	45	21.63
13.1 – 14 years	9	50	17.12	42	20.19
14. 1 – 15 years	10	18	6.16	25	12.01
15.1 – 16 years	11	0	0	10	4.080
Total		292	100%	208	100%

Table 2: Age & Class Wise Distribution of Children In Private Schools

Age group in years	Class	Male	%	Female	%
8.1-9 Years	4	10	4.34	14	5.18
9.1- 10 Years	5	15	6.52	11	4.07
10.1-11 years	6	43	18.69	64	23.70
11.1 - 12years	7	42	18.26	58	21.48
12.1-13 years	8	44	19.13	44	16.29
13.1 – 14 years	9	42	18.26	49	18.14
14. 1 – 15 years	10	31	13.47	26	9.62
15.1 – 16 years	11	3	1.30	4	1.48
Total		230	100 %	270	100%

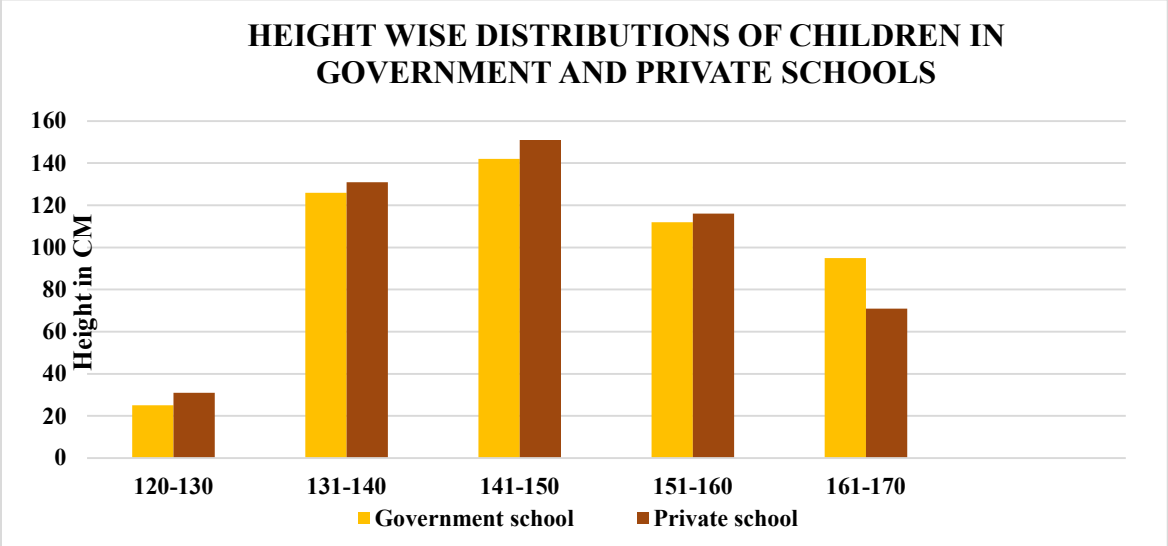

Figure 2: Height Wise Distributions of Children In Government And Private Schools

Table 3: Weight of the Children in Government Schools

Government school children Weight in KG	30 – 40Kg	41-50Kg	51-60Kg	61-70Kg	71-80Kg
Number of Male % (Total 292)	43 (14.72%)	98 (33%)	103 (35.27%)	23 (7.87%)	25 (8.56%)
Number of Female % (Total 208)	37 (17.78%)	87 (41.82%)	55 (26.44%)	16 (7.69%)	13 (6.25%)

Table 4: Weight of the Children in Private Schools

Private school children Weight in KG	30 – 40 Kg	41-50Kg	51-60Kg	61-70Kg	71-80Kg
Number of Male (Total 230)	36 (15.65%)	89 (38.69 %)	60 (26.08%)	26 (11.30%)	19 (8.26%)
Number of Female (Total 270)	39 (14.44%)	91 (33.70%)	78 (28.88%)	41 (15.18%)	21 (7.77%)

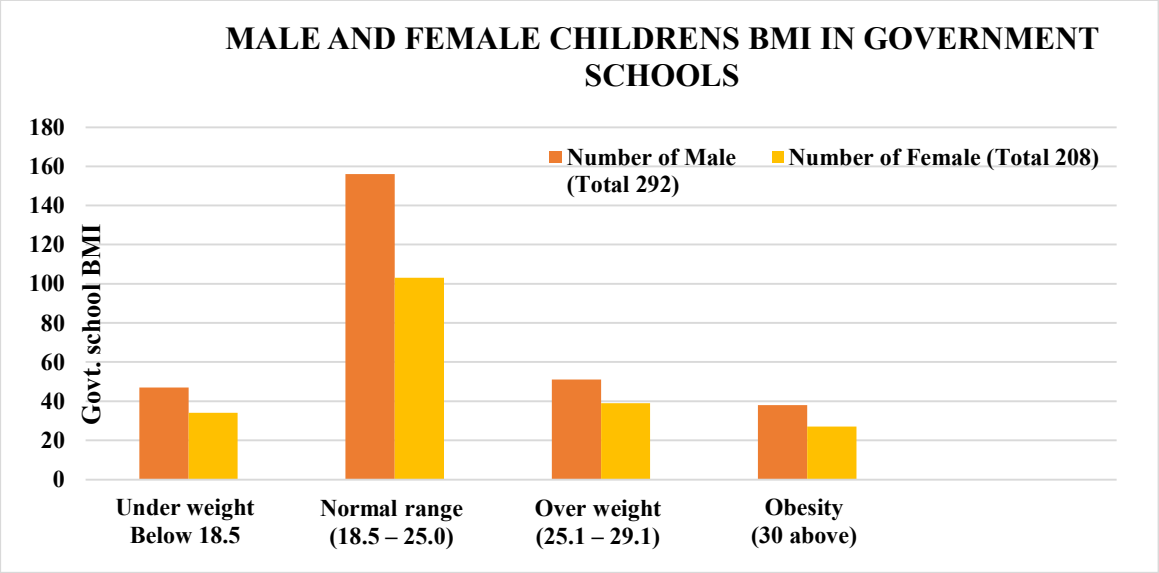

Figure 3: Male AND Female Children BMI In Government Schools

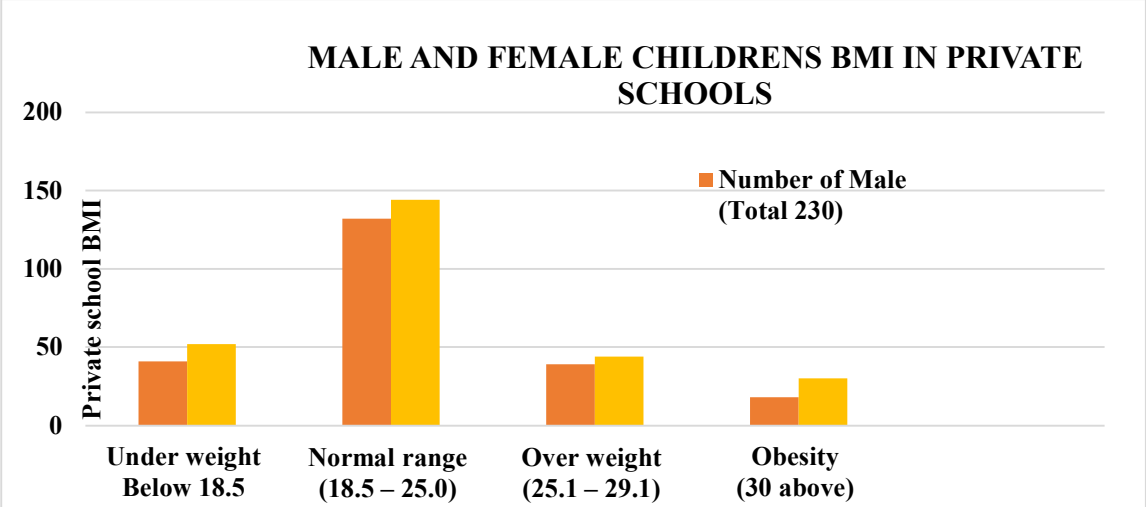

Figure 4: Male and Female Children BMI in Private Schools

From **Figure 3** and **Figure 4** clearly shows that, government and private school children BMI range. In government school nearly 53.42 % of the male children (156 children) come in normal BMI range, 20.95% children (51 children) comes under the overweight category, 16.09% (47children) children underweight and 13.01% children (38 children) in Obesity category according to their height. In female students 35.27% children in normal BMI followed by over weight (13.35%), underweight (11.64%) and Obesity (9.24 %) **(Figure 3)**. **Figure 4** shows the BMI level of male and female children in private school, 57.39% children normal range BMI, followed by underweight (17.82%), over weight (16.95%) and Obesity 7.82%. In Female children 53.33 % comes under the

normal range BMI, 19.25% underweight, 16.26% children comes under overweight and 11.11% under obese category. Yanoff *et al*. **[15]** reported that, an increase in the prevalence of iron deficiency in obese adults with significantly lower serum iron level and higher soluble transferrin receptor level than non-obese adults. In addition, fat mass was found as a significant negative predictor of serum iron concentration **[16]**. In our study we found that less percentage of the children belongs to obese category.

Table 5: Percentage of Hemoglobin Among Government and Private School Children

Type of school	Normal >12 g/dl	Mild anaemia 10-11g /dl	Moderate anaemia 7-10 g / dl	Severe anaemia Less than 7g / dl
Government school (Total 500)				
Male children (292 male)	61 (20.89%)	183 (62.67%)	32 (10.95%)	16 (5.47%)
Female children (208 female)	41 (19.71%)	139 (66.82%)	15 (7.21%)	13 (6.25%)
Private school (Total 500)				
Male children (230 male)	60 (26.08%)	149 (64.78%)	15 (6.52%)	6 (2.60%)
Female children (270 female)	65 (24.07%)	178 (65.92%)	19 (7.03%)	8 (2.960%)

Table 5, depicts the percentage of hemoglobin among the government and Private school children. Among the government school out of 500, there are 292 male and 208 female children participated in this event. Nearly 21 percentages of the male children having normal haemoglobin level, 62.67 % comes under the mild anemia category, 10.95 % and 5.4% comes in moderate to severe anemia category. At the same time out of 208 female children 19.71% having normal hemoglobin, 66.82% comes under the mild anemia, followed by moderate and severe anemia category. In private school, out of 500 children there are 230 male children and 270 female children participated. 26.08% of the male children having normal haemoglobin and 64.78% comes under mild anemia category, followed by moderate (6.52%) and severe anemia (2.60%). In female children, 24.07% having normal haemoglobin level, 65.92% comes under mild anemia category, followed by moderate and severe anemia category. At the population level, according to Balarajan *et al*. **[17]** hemoglobin concentration is the most common indicator, because it is inexpensive and easy with field-friendly testing. Hence this present study focused on estimating the hemoglobin level among the school children to find their health status. Study report by Finch, [**6**] says that inadequate Iron deficiency Anaemia affects 43% of preschool children worldwide, with prevalence rates four times higher in

developing countries than in industrialized countries. This high prevalence is associated with poor sanitary conditions, low socioeconomic status and high morbidity among infants. Verma Ma *et al.* **[18]** identified an overall prevalence of anaemia (57.5%,) in females reported that a high prevalence of anemia is more common in menarchal girls than those who did not attend menarche. In another study by Sheshadri **[19]** among 1, 500 rural girls (10-19 yrs.) from 10 villages in Gujarat, the prevalence of anaemia (Hb <12 g/dl) was reported to be 60%. A similar study conducted in Delhi observed that anaemia occurred in 46.6% of high socio-economic and 56% of lower middle socio-economic class girls [**20]**. Lwambo, *et al*. **[21]** from Tanzania, Al-Othaimeen, *et al*. **[22]** from Riyad and Abel, *et al.* **[23]** from Tamilnadu found higher anemia rates in school children. Mild anemia prevalence was high in our study. A study performed in peri-urban Bangladesh schoolgirls showed a similar anemia rate (27 per cent) to our results **[24]**. Domello *et al.,* 2002 **[25]** study also observed that higher percentage of female children having mild anemia, less percentage having normal haemoglobin level in government school and in private school when compared to male children. In general, anemia is more prevalent in women than in men, mostly because of menstruation, parasitic infestations, physical stress and inadequate nutrient intake **[26-30].** Our study also observed similar results. This may be due to lack of access to an adequate diet and/or the acquisition of constant parasitic infections, blood loss during menstruation, lower iron reserves, higher intestinal iron loss, lower iron absorption **[31]**.

CONCLUSION:

The conclusion drawn from this study is that the overall prevalence of iron deficiency anemia is still prevalent among school children both government and private school. This may be because the affluent socioeconomic strata are more likely to develop non-communicable diseases due to the widespread branding, advertising, and availability of junk food items that are low in nutrients and iron content. In our nation, anemia continues to be a serious health concern. Considering the associated factors and the fact that these children are in a school environment, the promotion of healthy eating habits could constitute an important approach for reducing the prevalence of anemia. It is recommended that public policy managers pay closer attention to these findings, in view of the associated damage to health, cognitive development and the quality of life of the individuals affected. While designing school-based intervention strategies, targeting anemia

prevention and nutritional supplementation is imperative in addition to the existing school-based deworming program. Moreover, health education that enhances the knowledge of women about child feeding practices should be given regularly.

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