

## Assessment of Nutritional Status among Adolescent Rural Females

Dr. T. Rajini Samuel M.D<sup>1\*</sup>, Dr. Balaji Rajagopalan M.D<sup>2</sup>, Ms. Nathani Tejaswi<sup>3</sup>

<sup>\*1</sup>Assistant Professor of Biochemistry, Shri Sathya Sai Medical College and Research institute, Sri Balaji Vidyapeeth Deemed to be University, Tamilnadu, India

<sup>2</sup>Professor & HOD of Biochemistry, Shri Sathya Sai Medical College and Research Institute, Tamilnadu, India

<sup>3</sup>2<sup>nd</sup> MBBS Student in Shri Sathya Sai Medical College And Research Institute

**\*Corresponding Author:** Dr. T. Rajini Samuel M.D, Assistant Professor of Biochemistry, Shri Sathya Sai Medical College and Research institute, Sri Balaji Vidyapeeth Deemed to be University, Tamilnadu, India

**Abstract:** Adolescence is a transitional period from Childhood to Adulthood, so the nutritional requirement is higher during this period. Anaemia an indicator of poor nutrition and health continues to be a major public health problem worldwide. In this current study, 100 adolescent rural females (in the age groups 10-19 years) were selected and their body mass index was calculated. The haematological indices like RBC, Hb, PCV, MCV, MCH and MCHC levels were estimated from the collected venous blood sample using standard automated counter. Based on their Body Mass Index (BMI) values the 100 individuals were classified into 3 groups namely low BMI, normal BMI and high BMI groups. Similarly, the 100 individuals were classified into 3 different age groups like 10-13 years of age, 14- 17 years of age and 18- 19 years of age. The individuals were classified based on the haemoglobin values into normal, mild anaemia, moderate anaemia and severe anaemia. One-way ANOVA statistical analysis test was applied and found that the prevalence of anaemia in the 3 different BMI and age groups were not statistically significant for p value <0.05. The prevalence of anaemia is seen irrespective of the age groups and body mass index. The total number of anaemic patients is 45% which includes mild (32%), moderate (12%) and severe anaemic (1%). The study concludes that anaemia is more common in adolescent rural females so early diagnosis, proper treatment, health education and social awareness about anaemia are necessary.

**Keywords:** Anaemia, adolescent females, rural population

### 1. INTRODUCTION

Adolescence is a transitional period of physiological, psychological and social maturity from Childhood to Adulthood, so the nutritional requirement is higher during this period.<sup>1, 2, 3</sup> Adolescence, as defined by the World Health Organization (WHO), is the period in human growth and development that occurs after childhood and before adulthood, from ages 10 to 19 years. Nutritional status is one of the strongest indicators of the standard of living in developing world. The adolescents require more nutrition for growth and they are more susceptible to environmental factors. The demographic details, socioeconomic status, parent's education, type of family, food habits, exposure to sunlight and school education all influence the nutritional status of the individuals. Increased physical work, parasitic infections and other infectious diseases may impose additional physiological stress on nutritional requirements.<sup>1, 2, 3</sup>

Anaemia is one of the most common health problems in India which is much more prevalent in the rural population than the urban. It is an indicator of poor nutrition and poor health with major consequences affecting the physical, social and economic development of a population. Previous study revealed the prevalence of anaemia among pregnant, lactating females and children and reported that the prevalence of anaemia varies from 50-90% in different parts of India. In case of both males and females, the prevalence of anaemia was the highest among those with severe under-nutrition.<sup>1, 2, 3</sup>

Hard physical work, as commonly seen in low-income populations, may impose additional physiological stress on nutritional requirements in adolescence. Girls are particularly at high risk because of gender discrimination.<sup>3</sup> Haematological parameter like haemoglobin (Hb) is generally

known to be affected by socioeconomic conditions, especially through nutrition, as the nutritional status largely depends upon the socioeconomic condition.<sup>2,3</sup> A previous study reported that under-nutrition is better assessed as thinness (low body mass index for age) than as wasting (low weight for height).<sup>3</sup>

During adolescence, anaemia is more prevalent especially in girls where they are exposed to risk of onset of menarche.<sup>4,5,6</sup> Adolescent girls with inadequate nutrition is associated with future adverse health and pregnancy outcomes including Maternal and Infant mortality rate.<sup>6</sup> Health education about anaemia and conducting Social awareness programs in the rural population may help in prevention of nutritional deficiencies among adolescent rural females.

## 2. MATERIAL AND METHODS

The project was selected by the ICMR Short Term Studentship (STS) program 2018 and the final report was accepted. **ICMR STS 2018 Reference ID is 2018- 00161.**

### Project Details:

- **Student:** Ms. Nathani Tejaswi , 2<sup>nd</sup> M.B.B.S Student
- **Guide:** Dr. T. Rajini Samuel M.D , Assistant Professor of Biochemistry
- **Co-Guide:** Dr. Balaji Rajagopalan M.D , Professor & HOD of Biochemistry

Institutional Ethics Committee (IEC) clearance was obtained before the commencement of the study. This Cross-Sectional Study was done for a period of 2 months and the study included 100 Adolescent rural females (10-19 years of age) selected from the Medical Camps organized by our ShriSathyaSai Medical College and Research Institute for the rural population. Informed consent was obtained for all the individuals. Adolescent females with chronic illnesses were excluded from the study.

Anthropometric measurements such as height and Weight were taken for all the hundred individuals and the Body Mass Index (BMI) used to evaluate the nutritional status of the individuals was calculated by the following formula.

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m}^2\text{)}$$

Venous blood samples were collected for all the hundred individuals in the vacutainer tube (containing EDTA) for estimation of haematological indices like RBC number (million RBCs per micro-litre of blood), Haemoglobin (Hb in grams per decilitre of blood), Hematocrit (HCT or PCV %), Mean Corpuscular Volume (MCV in fl), Mean corpuscular haemoglobin (MCH in pg/cell) and Mean corpuscular haemoglobin concentration (MCHC in g/dl) using standard automated counter.<sup>7</sup>

The 100 individuals were classified into **3 groups** based on their **BMI (Body Mass Index)** values.

**1<sup>st</sup> group:** Low BMI ( <18.5 kg/m<sup>2</sup>)

**2<sup>nd</sup> group:** Normal BMI (18.5 – 24.9 kg/m<sup>2</sup>)

**3<sup>rd</sup> group:** High BMI (≥25 kg/m<sup>2</sup>)

Similarly, the 100 individuals were classified into **3 groups** based on their **ages**.

**1<sup>st</sup> group:** 10-13 years of age

**2<sup>nd</sup> group:** 14- 17 years of age

**3<sup>rd</sup> group:** 18- 19 years of age

Anaemia is classified based on the haemoglobin values as normal (Hb: 12-14 g/dl), mild anaemia (Hb values: 10-11.9 g/dl), moderate anaemia (Hb values: 7-9.9 g/dl) and severe anaemia (Hb values: < 7 g/dl).

All the Data's were entered in Excel Sheet, Statistical analysis was made through Statistical Package for Social Sciences software 17version. Statistical significance is to be set up to p value less than 0.05. One way ANOVA statistical analysis test was employed to test for age difference in weight, height and BMI. Also, the same test was used to find the significance in the prevalence of anaemia in different BMI groups and different age groups.

## 3. RESULTS AND DISCUSSION

The assessment of nutritional status of adolescent females has been the least investigated area of research particularly in rural and tribal areas of India. The prevalence of anaemia among pregnant and

lactating females varies from 50-90% in different parts of India. The prevalence of anaemia was the highest among those with severe under-nutrition. The nutritional status largely depends upon the socioeconomic condition.<sup>1, 2, 3</sup> Anaemia in childbearing females increases the risk of maternal morbidity and mortality, perinatal and neonatal mortality, inadequate iron stores for the newborn, premature delivery and low birth weight.<sup>4, 5, 6</sup>

The current study focused on adolescent rural females because only fewer studies were done in rural population compared to urban population. Also their food habits, lifestyle, education, family type and socio-economic status will be different.

In our study, 100 adolescent rural females were selected. Height and weight were measured and Body mass index (BMI) values were calculated. The mean and standard deviation for the haematological indices like RBC, Hb, PCV, MCV, MCH and MCHC were calculated and entered separately for each groups. For the groups based on BMI, it is shown in the **table 1** and for groups based on age, it is shown in the **table 2**.

**Table1.** 3 BMI Groups (Low BMI, Normal BMI & High BMI)

1 <sup>st</sup> group: Low BMI (<18.5 kg/m <sup>2</sup> )						
	RBC	Hb	PCV	MCV	MCH	MCHC
Mean	4.22	11.87	36	85.38	27.71	31.80
StdDev	0.23	1.41	3.42	7.99	3.28	1.63
2 <sup>nd</sup> group: Normal BMI (18.5 – 24.9 kg/m <sup>2</sup> )						
	RBC	Hb	PCV	MCV	MCH	MCHC
Mean	4.26	11.79	36.37	85.21	27.57	31.4
StdDev	0.30	1.41	3.63	8.49	4.00	1.74
3 <sup>rd</sup> group: High BMI (≥25 kg/m <sup>2</sup> )						
	RBC	Hb	PCV	MCV	MCH	MCHC
Mean	4.38	11.52	36.44	82.77	25.55	31
StdDev	0.32	1.13	3.00	8.37	3.28	1.11

**Table2.** 3 AGE GROUPS (10-13, 14-17 & 18-19 years of age)

1 <sup>st</sup> group: 10-13 years of age						
	RBC	Hb	PCV	MCV	MCH	MCHC
Mean	4.21	11.73	35.64	84.35	27.21	31.92
StdDev	0.24	1.37	3.60	7.11	2.91	1.14
2 <sup>nd</sup> group: 14- 17 years of age						
	RBC	Hb	PCV	MCV	MCH	MCHC
Mean	4.18	11.68	36.14	86.51	27.68	31.28
StdDev	0.32	1.31	3.16	8.87	4.09	1.52
3 <sup>rd</sup> group: 18- 19 years of age						
	RBC	Hb	PCV	MCV	MCH	MCHC
Mean	4.34	11.86	36.58	84.19	27.29	31.43
StdDev	0.26	1.44	3.74	8.26	3.89	1.88

The prevalence of anaemia in the 3 BMI groups and in the 3 age groups was shown in the **tables 3 and 4** respectively. The number of cases of anaemia for each ages (10 -19 years of age) is shown in the **table 5**.

**Table3.** No of Anaemia Cases in 3 Different BMI Groups

Cases Based on Hb values	Low BMI (21)	Normal BMI (70)	Severe BMI (9)	Total(%)
Normal	12	39	4	55
Mild Anaemia	7	21	4	32
Moderate Anaemia	2	9	1	12
Severe Anaemia	0	1	0	1
Total (%)	21	70	9	100%

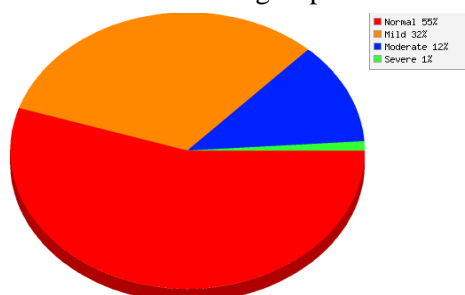
**Table4.** No of Anaemia Cases in 3 Different Age Groups

Cases Based on Hb values	10-13 years (14)	14-17 years (35)	18-19 years(51)	Total (%)
Normal	9	17	29	55
Mild anaemia	4	14	14	32
Moderate anaemia	1	3	8	12
Severe anaemia	0	1	0	1
Total (%)	14	35	51	100%

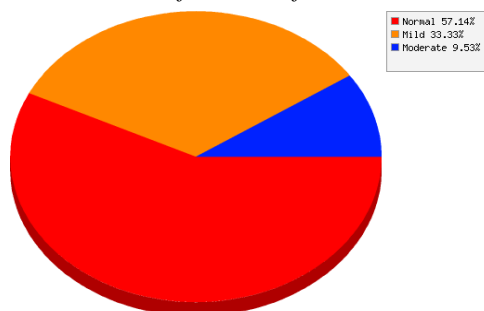
**Table5.** No of Anaemia Cases in Each Age Group

Cases Based on Hb values	10yrs (2)	11yrs (1)	12yrs (2)	13yrs (9)	14yrs (5)	15yrs (11)	16yrs (8)	17yrs (11)	18yrs (31)	19yrs (20)
Normal	1	1	1	6	4	4	5	4	18	11
Mild anaemia	1	0	1	2	1	6	3	4	10	4
Moderate anaemia	0	0	0	1	0	1	0	2	3	5
Severe anaemia	0	0	0	0	0	0	0	1	0	0
<b>Total</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>9</b>	<b>5</b>	<b>11</b>	<b>8</b>	<b>11</b>	<b>31</b>	<b>20</b>

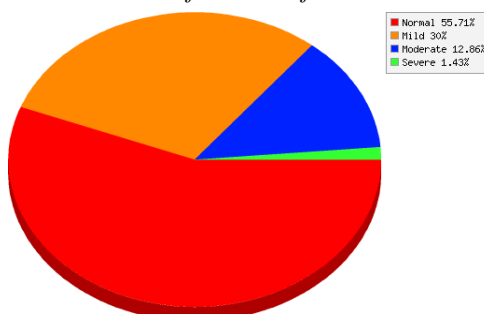
The prevalence of anaemia in the total 100 cases is shown as a pie chart in the figure1. The prevalence of anaemia for the BMI groups (low, normal and High) were shown in the figures 2,3 and 4 respectively. Similarly, the prevalence of anaemia for the three age groups were shown in the figures 5,6 and 7 respectively. One-way ANOVA statistical analysis was performed and shown in the table 6. A significant difference was found for weight and height in the 3 different age groups, but not for BMI (Body Mass Index). Similarly, one-way ANOVA test clearly depicted that the prevalence of anaemia were not statistically significant in the different BMI groups and different age groups.



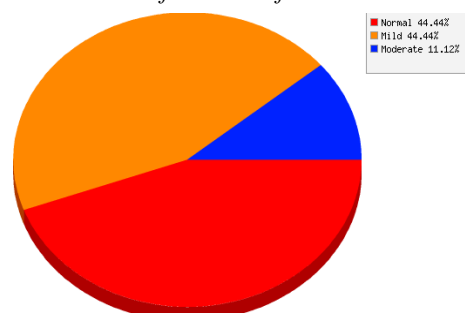
**Figure1.** Prevalence of Anaemia for the Total 100 Cases



**Figure2.** Prevalence of Anaemia for the Low BMI Cases



**Figure3.** Prevalence of Anaemia for the Normal BMI Cases



**Figure4.** Prevalence of Anaemia for the High BMI Cases

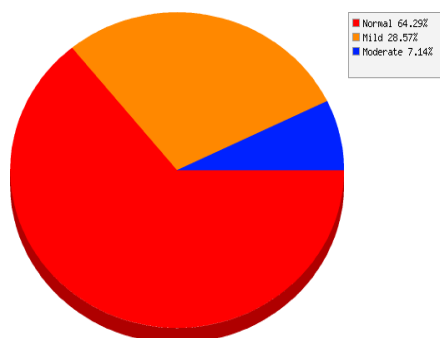


Figure5. Prevalence of Anaemia for the Age Groups 10-13 Years of Age

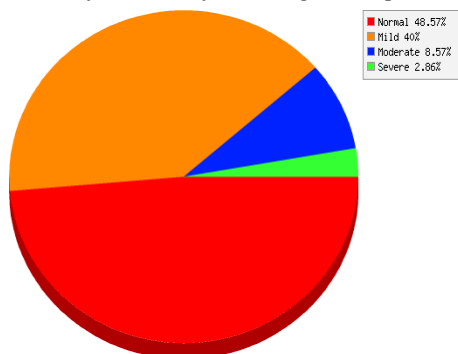


Figure6. Prevalence of Anaemia for the Age Groups 14-17 Years of Age

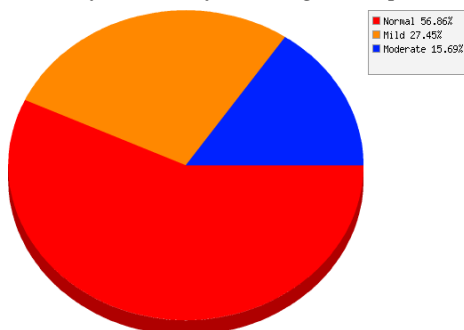


Figure7. Prevalence of Anaemia for the Age Groups 18-19 Years of Age

Table6. ONE WAY ANOVA Statistical Analysis

ONE WAY ANOVA Statistical analysis			
Parameter	f-ratio value	p-value	significance at $p < .05$
Weight for the 3 age groups 10- 13, 14- 17 &18-19 years of age	15.49142	< .00001	Significant
Height for the 3 age groups 10- 13, 14- 17 &18-19 years of age	9.98349	.000114	Significant
Body Mass Index (BMI)for the 3 age groups10-13, 14- 17 & 18-19 years of age	1.6768	.192345	Not Significant
Prevalence of anaemia in 3 groups based on BMI: Low BMI , Normal BMI , High BMI	0.20146	.817875	Not Significant
Prevalence of anaemia in 3 groups based on age groups: 10-13, 14-17 & 18- 19 years of age	0.19626	.822126	Not Significant

The total number of anaemic patients is **45%**; which includes mild anaemia (**32%**), moderate anaemia (**12%**) and severe anaemia (**1%**).

#### 4. CONCLUSION

The prevalence of anaemia is seen irrespective of the age groups and body mass index. So, anaemia is more common in adolescent females especially in the rural population. Early diagnosis, proper treatment, health education and social awareness about anaemia among the adolescent rural females and their family members may help in preventing the complications in their later part of the life especially to decrease the maternal and infant morbidity and mortality.

## SOURCE OF SUPPORT

ShriSathyaSai Medical College and Research institute, Sri BalajiVidyapeeth Deemed to be University

## ACKNOWLEDGEMENT

We thank the Management and Administration of Shri Sathya Sai Medical College and Research institute, Sri Balaji Vidyapeeth Deemed to be University for helping in doing this ICMR STS 2018project. We also thank Mr. M. Veerabathiran, Senior Technician in the Central Clinical Laboratory, Biochemistry Department for helping in processing of samples.

## REFERENCES

- [1] Das DK, Biswas R. Nutritional status of adolescent girls in a rural area of North 24 Parganas district, West Bengal. *Indian J Public Health*. 2005; 49(1):18-21.
- [2] KankanaDe ,Subal Das , Kaushik Bose , Raja ChakrabortyNutritional status of rural Bengalee girls aged 10-18 years of Salboni, PaschimMedinipur, West Bengal, India *Asian J. Biol. Life Sci.* 2013; 2(1):68-72
- [3] Kankana De A Comparative Study on Nutritional Status of Adolescents Girls of Different Rural Area of West Bengal *Anthropol.*, 2016; 4(4):1-3
- [4] Dey L, Biswas R, Ray K, Bhattacharjee S, Chakraborty M, Pal PP Nutritional status of school going adolescents in a rural block of Darjeeling, West Bengal, India *theHealth* 2011; 2(3): 75-7
- [5] Suprava Patel, Puja Dhuppar and Bhattar Nutritional Anemia Status in Adolescent Girls in Rural Schools of Raipur, India *Med Chem (Los Angeles)* 2017 ;7(4): 853-856
- [6] Kareena Sharma and AishwaryaMirzaEffect of maternal iron status on placenta, fetus and newborn *Glob. J. Med. Med. Sci.* 2017 ;5 (2): 146-150
- [7] Rajini Samuel, NathaniTejaswi, PulluruNithin Kumar, KolanatiPrudhvi, Nurukurti Surya Sravani, BurraGovardhini, BakkaAlekyia, BalajiRajagopalanClinical Significance of Screening for Anaemia in Diabetic Patients *Int. J. Pharm. Sci. Rev. Res.*, 2018; 48(2) :20-24

**Citation:** Dr. T. Rajini Samuel M.D et al. "Assessment of Nutritional Status among Adolescent Rural Females" *International Journal of Clinical Chemistry and Laboratory Medicine (IJCCLM)*, vol. 5, no. 1, pp. 17-22 2019. <http://dx.doi.org/10.20431/2455-7153.0501003>

**Copyright:** © 2019 Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium provided the original author and source are credited.