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Research paper

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A Study on health status of selected adolescents in two different states of South India by biochemical assessment

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Abstract

Children need to be educated on weight management, balanced diet, selection of right food, proper eating habits and weight related health issues both under nutrition and over nutrition. It is recommended that the nutrition education should be imparted in a way that children are also involved in an activity, take interest in learning and in future apply it in daily life. Adequate nutrition is a significant requirement for adolescent because it affects their growth and development. Furthermore, nutritional status can have an effect on their response to illness. Because of this, researchers are interested in the relationship of nutrient intake in childhood to the development of later chronic disease. A nutritional assessment should be conducted on adolescent so that their nutrition status in turn their health status can be identified. In order to determine whether children who participate in a structured childcare setting are receiving proper nutrition for adequate nutritional status, researchers must use nutritional assessments reviewing anthropometric measurements, hemoglobin and blood lipid levels, blood pressure and dietary intakes etc. So out of interest in our article after studying the clinical aspects, biochemical analysis was done in the selected adolescents of Vijayawada and Chennai.

Key words: Haemoglobin, blood glucose, serum lipids, HDL, LDL, VLDL etc.

Introduction

Kalamka (2001) conducted a study to identify various health problems of the adolescents and the factors influencing them. Every adolescent was subjected to through clinical examination and anthropometric measurement including hemoglobin. Higher prevalence of

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anemia was seen in female than male adolescents. There was statistically significant association between age and habit of chewing tobacco, and gutka in adolescents and higher in nuclear families as compared to joint families. The percentage of morbid condition was higher in joint families (82.4%) than in nuclear families due overcrowding and poor sanitation.

Balasubramanian, (2005) assessed that the girls suffered the health consequences of their socio-economic status, poor personal hygiene and lack of nutrition. Improving awareness about self-care practices and care seeking behavior may prevent the reproductive morbidities that were the outcome of poor personal hygiene. In addition to awareness there is an urgent need for accessible health services for adolescent girls in rural areas. Serrano *et al*., (2010) evaluated body composition, anthropometric changes, biochemical and clinical characteristics of female adolescents. Excess adiposity in normal weight adolescents may be related to clinical and biochemical changes similar to those found in adolescents who are overweight.

Riley and Bluhm, 2012 explained high BP in children and adolescents. Overweight and obesity are strongly correlated with primary hypertension in children. Geier, 2012 evaluated the impact of a multidisciplinary clinic on weight management among adolescents with (polycystic ovary syndrome) PCOS. Interactions with the health psychologist and dietitian appeared to play a key role in successful weight control, supporting the importance of psychology and nutrition expertise in the management of this disorder.

An anthropometric profile for adolescents of South Gujarat, especially for lower middle and lower social class prompted Thakor Hitendra *et al.,* (2000) to research and studied the achievement of optimum growth during adolescence for maintaining good health thereafter. Goyle Anuradha and Shyam Prakash, (2010) contributed research paper on the effect of supplementation of micronutrient fortified biscuits on hemoglobin and serum iron levels of adolescent girls from Jaipur city. Singh *et al.,* (2006) conducted research to evaluate the prevalence of lifestyle-associated risk factors for no communicable diseases in apparently healthy school children in an urban school of Delhi using standard criteria. Venugopalan *et al.,* (2001) assessed children with congenital heart defects (patients), and an equal number of children with cleared cardiac murmurs (controls) attending the pediatric cardiology outpatient clinic at Muscat.

Biswas *et al*., (2002) carried out a study with the objectives of determining the prevalence of goiter among school children of vulnerable age groups in West Bengal and for identifying high-risk areas in the state for Information Education and Communication (IEC) activities. As

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Iodine deficiency disorders (IDD) constitute a public health problem affecting all vulnerable groups. No state in India is free from iodine deficiency. Basing on all the above studies, interest has been created to study certain biochemical aspects after clinical studies in our South India and the results are tabulated.

Materials and Methods

Biochemical assessment

A person may be ill from an inadequate diet and yet their body measurements can be within normal limits. The right biochemical test would show the deficiency. Nutritional Therapists have access to a wide range of scientific tests that can help to clarify underlining causes a problem, so it can be tackled more quickly and efficiently. Anthropometry mostly reflects under nutrition or over nutrition, too little or too much food energy. Biochemical tests are needed to demonstrate micronutrient status.

Biochemical methods are an essential part of nutritional assessment. An ideal test should be sensitive, specific, easy to carryout, noninvasive, preferably inexpensive. For each test blood or urine samples have to be collected, equipment and chemicals are required, and the skilled laboratory worker's time, and then reporting and interpreting the test. The choice of test depends on the purpose population survey or individual diagnosis. The biochemical estimations chosen in the current study involves following

- Hemoglobin
- Blood Pressure (BP)
- Serum Lipid profile
- Blood glucose levels

To estimate these in subjects, standard technique was used; the blood samples were collected by pathologist and tested in certified laboratories. Their comparative study was done with standards given for the specified age group and further between the 2 cities.

Estimation of hemoglobin

Anaemia is recognized as public health problem in India. Irrespective of age, sex and economic status a majority of population were shown to suffer from anaemia. Further, haemoglobin is used as a parameter to focus on the general nutritional situation in any community. Therefore in the present context Hb is included to examine its status in relation to differing nutritional status.

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For the estimation of haemoglobin a pinprick was made on the tip of the finger of the subject. Using Lambda pipette 20µl of blood was collected. It was transferred into a coded what man No.1 filter paper containing circles of 1cm diameter. While transferring the blood on to the area inside the circle, care was taken to avoid vigorous blowing which may result in bubble formation and loss of blood through spluttering of the bubbles.

The cyanmethaemoglobin Crossby Munn and Furth, (1954) method was employed to assess the haemoglobin content. The collection of blood samples was done following the field oriented techniques as given in the laboratory manual published by NIN (1983).

Estimation of blood pressures

Mercury sphygmomanometers provide the most accurate measurement of BP. BK1002-sized cuff is used, the bladder should encircle and cover two third of the length of the arm; if not, place the bladder over the brachial artery to prevent high readings from bladder that is too small. When the BP is taken, the cuff should be inflated to a pressure approximately 30 mm Hg greater than systolic, as estimated from the disappearance of the pulse in the brachial artery by palpation. Initial estimation of the systolic pressure by palpation avoids potential problems with an auscultatory gap. Korotk off sounds transiently disappear as the cuff is deflated. Once the cuff is adequately inflated, the following steps should be followed:

The stethoscope should be placed lightly over the brachial artery, since the use of excessive pressure can increase turbulence and delay the disappearance of sound. The net effect is that the diastolic pressure reading may be artefactual reduced by up to 10 to 15 mmHg London *et al.*, (1992).

The BP should always be taken with patient's arm supported at the level of the heart. Allowing the arm to hang down when the patient was sitting or standing will result in the brachial artery being 15cm below the heart. As a result, the measured BP will be elevated by 10-15 mmHg due to the added hydrostatic pressure induced by gravity Mitchell *et al.,* (1964).

Estimation of serum lipid levels

HDL-Cholesterol sample was estimated by the enzymatic method described by Cres Cenzio Izzo *et al.* (1981). VLDL and LDL cholesterol was estimated and calculated by Friedwald *et al.,* (1972) method. Triglycerides in the sample were estimated by using the diagnostic kit band on the enzymic method described by Jacobs and Vandemark (1960) Schetler and Nussel, *et al.,* (1975).

The sample was hydrolyzed by lipase to glycerol and fatty acids. Glycerol was converted

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to glycerol-3-phosphate which was catalyzed by glycerol kinase. The glycerol-3-phosphate was oxidized by glycerol phosphate oxidase to dihydroxy acetone phosphate and hydrogen peroxide. In this reaction hydrogen peroxide was produced in equimolar concentration to the level of triacylglycerol phosphate in the sample. The hydrogen peroxide reacts with 4-aminoantipyrine and 3, 5 dichloro-2-hydroxy benzene sulfuric acid in the presence of peroxidase to produce red quinoneimine. The intensity of color is proportional to the concentration of triglycerides in the sample. To 10 ml of sample, 1 ml of enzyme reagent was added, mixed well and incubated for 10 minutes at 37ºC. 10µl of Triglycerides standard and distilled water (blank) were also processed similarly. The absorbance was measured at 505 nm. Against blank by using merck analyzer. The concentration of Triglycerides in the sample was expressed as mg/dl.

Blood glucose levels

3 ml of distilled water and 0.5 ml of blood were taken in a dry test tube and mixed well. 1.5 ml of 10 % Trichloroacetic acid was added, thoroughly mixed, and allowed to stand for 10 minutes before it was filtered into a dry test tube. Standard glucose solutions were taken in 6 test tubes in the range of 0.2 to 1 ml, 1 ml of protein – free filtrate was taken in a 7^{th} test tube. To all these tubes, 5 ml of toluidine was added and mixed thoroughly. The tubes were kept in boiling water bath for 10 minutes, cooled and the optical density read at 620 mm in a colorimeter Hyvarinen and Nikkila, (1962).

Results and Discussion

Biochemical status of subjects - Hemoglobin status

Data of haemoglobin count of adolescents from both the places the blood samples were taken from randomly selected students out of 300 children from Vijayawada and 300 from Chennai shown in table 1 and Fig 1. It was observed that for boys from both the cities the mean value of Hb for normal and overweight was more than 12 gm/dl that was under normal range. Whereas underweight boys of Vijayawada showing moderate range (8.0-10.9gm/dl) hemoglobin counts. Among girls the Hb count was under mild range (11-11.9gm/dl) and moderate range.

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Table: 1 Data related to haemoglobin status of adolescents of Vijayawada and Chennai

S No	Category	No. of Sample	Normal (12 gm/dl or higher)			Mild (11-11.9gm/dl)			Moderate (8.0-10.9gm/dl		
			Mean ±SD	Range	SE	Mean ±SD	Range	SE	Mean ±SD	Range	SE
BOYS											
1	VNB	22	15.09 ± 1.09 0.17	15.10 to 10.7	0.22						
2	VOB	28	13.09 ± 1.03 0.19	14.6 to 10.7	0.20						
3	VUB	34							9.39 ± 1.36 0.06	9.6 to 5.06	0.19
4	CNB	29	13.09 ± 1.03 0.04	15.6 to 9.10	0.22						
5	COB	19	13.03± 1.08 0.89	15.10 to 10.7	0.24						
6	CUB	28				11.15 ± 1.05 0.45	11.01 to 10.09	0.20			
GIRLS											
7	VNG	38	12.02± 0.93	13.28 to 10.78	0.22						
8	VOG	21				11.02 ±0.93	13.1 to				

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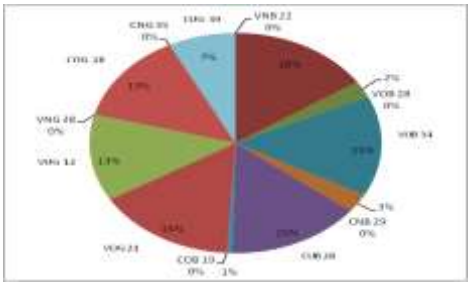
						0.52	8.98	0.20			
9	VUG	12				11.02 ± 0.98 0.45	12.11 to 9.25	0.30			
10	CNG	35	13.02 ± 0.93 0.52	13.10 to 10.98	0.22						
11	COG	28				11.46 ±0.98 1.09	13.8 to 10.6	0.18			
12	CUG	39							8.02± 1.93 0.52	10.21 to 7.98	0.15

When CR test as applied it showed insignificant difference between the hemoglobin count of boys-boys and girls-girls when compared to Vijayawada and Chennai, as the ($p>0.01$, $p>0.05$) calculated value is less than the table value at both the levels among boys and girls, thus the hypothesis (H_3) was accepted.

Fig: 1 Graphitic Representation of hemoglobin count of adolescents



Blood glucose

The blood glucose was taken from randomly selected students. Table 2 and Fig 2 shows the normal reading for blood glucose levels between 90 to 120mg/dl. It was observed that the mean value of glucose level for boys and girls from Vijayawada was within normal range

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only in case of overweight boys and girls from Chennai it was higher >90 to 120 mg/'dl.

CR test was applied it showed no significant difference between the mean level of boys-boys when compared to Vijayawada and Chennai as the $p>0.01$, $p>0.01$ significant difference was observed among overweight girls as calculated value $_w$as more than the table value at both the levels ($p<0.01$, $p<0.05$) thus the hypothesis (H_3) was accepted for overweight boys and rejected for girls..

Table: 2 Mean glucose values of adolescents in Vijayawada and Chennai

S No	Category	No. of Sample	Blood Glucose 90 to 120 mg/dl			Blood Glucose >90to 120 mg/dl		
			Mean ±SD	Range	SE	Mean ±SD	Range	SE
BOYS								
1	VNB	22	98.6 ± 10.59 0.84	120 To 82	3.89			
2	VOB	28	96.6 ± 11.59 0.94	120 To 82	3.66			
3	VUB	34	88.9 ± 13.49 1.94	120 To 82	3.76			
4	CNB	29	94.8 ± 9.59 0.94	125 To 80	2.96			
5	COB	19				124.72 ± 13.22	125 To 82	3.98
6	CUB	28	82.6 ± 12.69 0.94	125 To 80	3.54			

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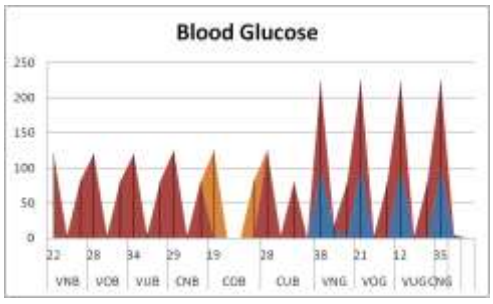
GIRLS								
7	VNG	38	98.16 ± 14.59	125 to 80	4.21			
8	VOG	21	100.16 ± 14.59 4.89**	125 to 80	3.21			
9	VUG	12	98.16 ± 15.59 5.89**	125 to 80	3.66			
10	CNG	35	100.16 ± 14.59 4.89**	125 to 80	4.21			
11	COG	28				127.07 ± 79.54	360 To 80	21.25
12	CUG	39	98.76 ± 13.59 4.89**	125 to 80	3.21			

C R Values Compared between two cities (two states) Table Value for 1%, 5% reported in Appendix

Fig: 2 Graphitic representation of blood glucose levels of adolescents



Serum lipids profile - Cholesterol and triglycerides

The blood lipid profile was taken from randomly selected students. In the table 3 and Fig 3 total cholesterol reading were explained in three levels normal, borderline and high risk. It was observed that for boys and girls (in both the cities) the mean value of cholesterol was

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within normal range <200mg/dl Standards**,** When CR test was applied it showed insignificant difference between the mean cholesterol level of boys-boys and girls – girls when compared within Vijayawada and Chennai as the ($p>0.01$, $p>0.05$) calculated value was less than the table value at both the levels thus the hypothesis (H_3) was accepted.

The triglycerides levels are shown in table 3 and Fig 4. The reading from normal to higher range where specified and the range comes under risk group. It was observed that for boys and girls from both the cities the mean value was within normal range standards. When CR test was applied it showed insignificant difference between the mean level of boys-boys and girls-girls when compared to Vijayawada and Chennai as the ($p>0.01$, $p>0.05$) calculated value was less than the table value at both the levels thus the hypothesis (H_3) was accepted for overweight boys and girls.

Table: 3 Total Cholesterol mean values for overweight and obese adolescents in Vijayawada and Chennai

S No	Category	No. of Sample	Cholesterol Normal >200			Triglycerides UP to 200		
			Mean ±SD	Range	SE	Mean ±SD	Range	SE
Boys								
1	VNB	22	162.2± 32.65	200 to 140	9.28	120.8± 32.82 0.58	189 to 89	10.25
2	VOB	28	154.4 ± 34.55 0.44	203 to 115	10.92	133.7± 33.92 0.07	180 to 98	10.72
3	VUB	34	132.45± 45.08	200 to 100	10.25	130.45± 41.52 0.25	182 to 100	9.52
4	CNB	29	178.52± 52.45	210 to 125	9.45	132.85± 32.52	190 to 98	9.57

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5	COB	19	160.18 ± 31.47	210 to 120	9.49	134.9± 43.48	225 to 85	13.11
6	CUB	28	145.29± 35.28	200 to 154	10.25	148.25± 38.35	200 to 96	11.24
Girls								
7	VNG	38	189.54± 28.54	200 to 158	8.59	159.25± 42.58	195 to 98	12.25
8	VOG	21	164 ± 32:03 1.12	196 to 115	9.24	169.91± 41.57 0.27	180 to 94	12
9	VUG	12	152.98± 41.24 2.54	192 to 100	8.56	179.65± 38.54	190 to 89	11.25
10	CNG	35	175.26± 36.12	200 to 156	9.57	189.26± 36.78	189 to 95	10.58
11	COG	28	151.42 ± 23.62	198 to 117	6.31	176.14± 72.01	190 to 90	12.24
12	CUG	39	189.25± 41.25	189 to 158	10.25	198.58± 85.25	200 to 99	11.25

C R Values Compared between two cities (two states) Value for 1%, 5% p>0.01, p>0.05

Triglycerides R Values Compared between two cities (two states) Table Value for 1%,5% reported in Appendix p>0.01, p>0.05

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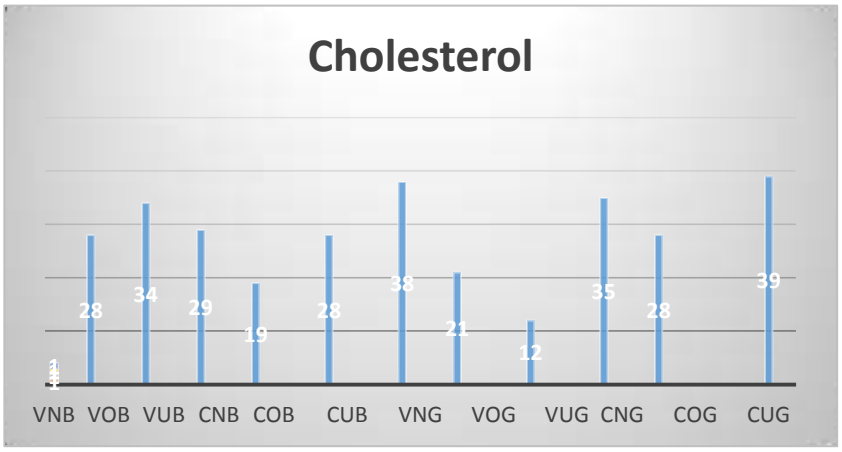
Fig: 3 Cholesterol levels of adolescents



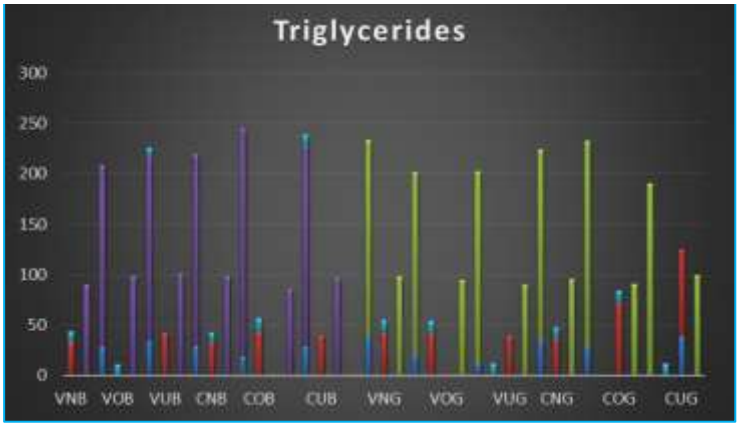


Fig: 4 Triglycerides for adolescents

HDL, LDL, VLDL

The normal range of HDL, LDL VLDL was showed in table 4 and Fig 5. Readings higher than the specified range comes under risk group. It was observed that for boys and girls from both the cities the mean value was within normal range for all the lipids standards. When CR test was applied it showed insignificant difference between the mean level of boys-boys and girls – girls when compared within Vijayawada and Chennai, as the ($p>0.01$, $p<0.05$) Calculated value was less than the table value at both the levels, for all the three lipids. Thus, the hypothesis (H_3) was accepted for all the groups.

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Table: 4 HDL, LDL and VLDL mean values adolescents in Vijayawada and Chennai

Category		No. of the student for Lipid profile test	HDL	LDL	VLDL
			Normal	Normal	Normal
			35-75 mg/dl	60-40 mg/dl	<40 mg/dl
VNB	Mean ±SD	22	54±7.89 (2.39)	52±16.40 (4.25)	32.45±10.20 (5.26)
	Range		45	60	35
			35	40	29
	SE		4.52	3.25	4.25
VOB	Mean ±SD	28	44±6.83 (0.10)	89±26.40 (6.64)	26.3 ± 7.42 (0.99)
	Range		55	90	40
			35	54	20
	SE		2.16	8.35	2.34
VUB	Mean ±SD	34	41±6.40 (0.48)	44±25.80 (5.29)	39.45±6.48 (2.59)
	Range		50	80	40
			29	50	30
	SE		3.56	6.23	2.69
CNB	Mean ±SD	29	52±6.89 (3.39)	50±10.40 (3.25)	30.45±9.20 (4.26)
	Range		45	60	35
			35	40	29
	SE		3.52	4.25	5.25
COB	Mean ±SD	19	44.27 ±5.25	82.09 ± 22.50	31 ±13.60
	Range		53	126	67
			35	60	20
	SE		1.58	6.78	4.1
CUB	Mean ±SD	28	40±7.40 (2.48)	42±20.80 (4.29)	35.45±5.48 (3.59)

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	Range		50	80	40
			30	50	30
	SE		4.56	5.23	4.69
VNG	Mean ±SD	38	35.08±5.75 (2.01)	52.75±10.01 (2.38)	33.5±10.76 (1.65)
	Range		60	50	35
			30	40	20
	SE		2.66	2.46	2.55
VOG	Mean ±SD	21	42.08±5.75 (1.01)	83.75±12.01 (1.38)	39.5±15.76 (0.65)
	Range		50	104	65
			35	61	18
	SE		1.66	3.46	4.55
VUG	Mean ±SD	12	35±10.40 (3.48)	42±10.80 (3.29)	29.45±7.48 (4.59)
	Range		40	60	40
			30	50	30
	SE		3.56	3.23	3.69
CNG	Mean ±SD	35	40.08±7.75 (1.01)	45.25±9.01 (1.38)	31.5±976 (0.65)
	Range		50	60	35
			35	40	30
	SE		2.66	3.46	4.55
COG	Mean ±SD	28	40.07 ±3.98	75.85 ±17.04	35.57 ±14.63
	Range		47	105	65
			35	52	18
	SE		1.06	4.55	3.91
CUG	Mean ±SD	39	37±11.40 (4.48)	44±9.80 (4.39)	30.45±9.48 (3.48)
	Range		40	60	40
			30	50	30

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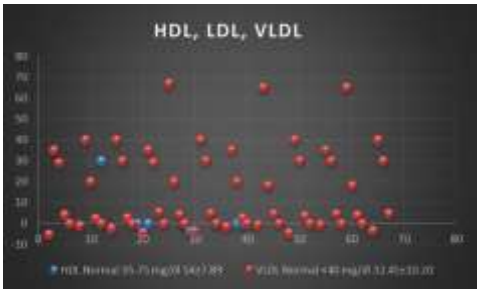
	SE		4.56	4.23	4.69

CR Values Compared between two cities (two states) Table value for 1% 5% p>0.01, p>0.05

Fig: 5 HDL, LDL and VLDL of adolescents



The hypothesis (H_3) for blood lipid profile was accepted for all the groups when compared within two cities Vijayawada and Chennai.

Conclusion

Mean of hemoglobin count of boys and girls showed insignificant difference when compared within Vijayawada and Chennai as the (p>0.01, p>0.05), the hypothesis (H_3) was accepted. Gender comparison detailed that girls Hb count was under middle range (ll-11.9gm/dl) for boys it was-normal (12gm/dl or high). Only 11.33% of boys and girls showed problems of skin allergy in Chennai, in Vijayawada it was 6% in both the genders. The hypothesis (H_3) for blood lipid profile was accepted as statistical assessment confirmed no significant difference between blood levels of overweight boys and girls when compared within cities. The hypothesis (H_3) for blood glucose levels was partially accepted as statistical assessment confirmed significant difference between the glucose levels of girls when compared within cities. The blood glucose level of Chennai girls was higher than Vijayawada and also from the normal range. Finally all the above health issues were discussed with the selected adolescents and strongly health education was imparted for happy future.

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