

# Nutritional Status of Adolescents Fed Lacto-Ovo And Non-Vegetarian Diets in Babcock University High School and Isanbi Comprehensive High School, Ilishan-Remo Ogun State

Ani Ime. F.1, Ajuzie Nnenna.C.1, Adeoye Bolade.K.1, Adeyeye Joshua. A., 1 Abi Bifisseh A.1

**Abstract**— Adolescent is the transition period between childhood and adulthood, a window of opportunity for the improvement of nutritional status and correcting poor nutritional practices. Lacto-ovo vegetarians are allowed the consumption of milk and egg. The aim of this study was to assess the nutritional status of adolescents fed lacto-ovo vegetarian and non-vegetarian diets in both private and public schools. The population used was 200 students. A semi structured questionnaire was used to obtain information regarding socio-demographic characteristics of the respondents, anthropometric data, dietary pattern and nutrient intake (24hour dietary recall). Descriptive and inferential statistics were used and statistical tools which included, Total Dietary Assessment (TDA), WHO Anthroplus (2006), and SPSS Version20.0, to analyze the data. 98% of the vegetarian and 89% of the non-vegetarian were between the ages of 14-16 years and (2%) of the vegetarian and (11%) of the non-vegetarian were between the ages of 17-19 years. From the anthropometric data, (84%) of the vegetarian and (86%) of the non-vegetarian were normal, (12%) and (10%) of the vegetarian and non-vegetarian respectively were overweight, (4%) and (1%) of the vegetarian and non-vegetarian were obese and 3% of the non-vegetarian were underweight. About two-third of the respondents (66.5%) ate three times in a day, (18.5%) ate 2-3 times in a day, (9.5%) ate more than three times in a day, while just 5.5% ate twice in a day respectively. 99% of the vegetarians had a fixed timing of meals as contrary to their non-vegetarian counterparts that had varied timing of meals (52%) fixed and 43% respectively. There was no difference in the nutrients intake (carbohydrates, protein, fat, calcium, iron, zinc and vitamin B12) of lacto-ovo vegetarian and non-vegetarian respondents, except for energy, in which the lacto-ovo vegetarian had a higher intake, there was no significant difference in the anthropometric status of adolescents fed lacto-ovo vegetarian and non-vegetarian diets.

**Index Terms**— Nutritional status, Adolescents, Lacto-ovo vegetarian, Non-vegetarian

## 1. INTRODUCTION

Children between the ages of 10 and 19, and young people between the ages of 10 and 24 are adolescents [9]. According to the United Nations Children's Fund (UNICEF), there are 1.2 billion adolescents in the world and adolescence is characterized by vigorous growth, during which the total nutrient requirements are higher than in other phases in the life span, thus making this segment of the population vulnerable [7],[8],[10]

Although these increased dietary needs are seldom met by adolescents, overweight is an emerging problem among young people in both low- and high-income countries [3]. Nutritional status is a requirement of health of a person convinced by diet, the levels of nutrients containing in the body and normal metabolic integrity. Normal nutritional status is managed by adequate food consumption and normal utilization of nutrients. Malnutrition is caused by imbalance of food intake and faulty utilization of nutrients. Vegetarianism is the practice of following a plant-based diet including fruits, vegetables, cereals, grains, nuts and seeds with or without dairy products and eggs. A vegetarian does not eat meat including red meat, game, poultry, fish, crustacean, shellfish and products of animal slaughter such as animal derived gelatin and rennet. Vegetarianism is considered a healthy viable diet. The

American Dietetic Association and the Dietitians of Canada have found a properly planned vegetarian diet to satisfy the nutritional needs for all stages of life and large-scale studies have shown that "mortality from ischemic heart disease was 24% lower in vegetarians than in non-vegetarians [4].

Vegetarian dietary patterns are quite diverse and due to food availability and there is evidence that well-planned vegetarian diet provides numerous health benefits and is appropriate for all stages of life cycle. Proportion of vegetarian or people consuming vegetable-based diet is increasing globally, considering health hazards of diet from animal sources.

Lacto-ovo vegetarians consume dairy products, eggs, grains, vegetables, fruits, legumes seeds and nuts, but not meat and fish [12]. Nutritional status in adolescents is one of the health aspects that need attention. Adolescents live in critical life phase that can impact on their dietary habits affecting both nutrient intake and needs. Some nutrients are at greater deficiency risk mainly iron, calcium and protein during this period [13]. Though caloric and protein requirements are maximal during this period including iron, calcium and vitamins, it has been discovered that the main nutrition problems affecting adolescents include undernutrition, even specific nutrient deficiencies, such as

zinc and foliate [14]. Diet plays a major role in determining the nutritional status of individuals, hence, the importance of dietary intake in adolescents. It also implies that an inadequate nutrient intake can lead to nutrient deficiencies in adolescents. Much of nutrient inadequacies are expected among adolescents feeding on lacto-ovo vegetarian diets except it is well balanced. Some studies have reported that vegetarians tend to have lower Body Mass Index (BMI), Iron deficiency anemia and osteoporosis including other disorders [15], [1].

**2. METHODS**

This research was carried out at Babcock University High School and Isanbi Comprehensive High School both in Ilishan-Remo Ogun State which is in the South-Western region of Nigeria.

**2.1 Study Design Sample Size Determination**

A purposive sampling method was used, a total number of 100 students each from Babcock University High School and Isanbi Comprehensive High School participated in the study. It is a comparative study between the adolescents fed lacto-ovo vegetarian and non-vegetarian diet.

**2.2 Method of Data Collection**

A semi-structured questionnaire in line with the objectives of the study was used to obtained data on students. The questionnaire consisted of 4 parts which included (1) Socio-demographic characteristics of the respondents (2) Anthropometric data (3) Dietary pattern (4) Nutrient intake (24 - hour dietary recall)

**Anthropometric Measurement**

Anthropometric measurements are used to assess the size, shape and composition of the human body. Anthropometric measurements include weight, height, body mass index (BMI),

**Height**

A height meter was used to measure the heights of the students, shoes were removed. The students stood with their feet flat and made sure the legs were straight and also shoulders were leveled. They looked straight ahead.

The recording of the student’s height was accurately recorded to the nearest 0.1 centimeters.

**Weight**

A bathroom scale was used for the measurement, the pointer was on zero and the scale was firm on the floor.

The student’s shoes and heavy clothing were removed. The students stood with both feet on the center of the scale. The weights of the students were recorded.

**Nutrient Intake**

This was determined by using a structured 24hr dietary recall questionnaire.

**STATISTICAL ANALYSIS**

Data collected was subjected to; Descriptive statistics; Mean, Frequency and Percentages Inferential statistics; Chi square test, t-test Statistical tools; Total Dietary Assessment (TDA), WHO Anthroplus and Statistical Package for Social Sciences (SPSS) version 20.0

**3. RESULTS**

**TABLE 1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS**

VARIABLES	VEGETARIA N	NON- VEGETARIA N	TOTA L
	F (%)		
AGE (Years)			
14 - 16	98 (98.0)	89 (89.0)	197 (93.5)
17 - 19	2 (2.0)	11 (11.0)	13 (6.5)
SEX			
Male	50 (50.0)	50 (50.0)	100 (50.0)
Female	50 (50.0)	50 (50.0)	100 (50.0)
RELIGION			
Christianity	95 (95.0)	83 (83.0)	178 (89.0)
Islam	5 (5.0)	16 (16.0)	21 (10.5)
Others	-	1 (1.0)	1 (0.5)
TRIBE			
Yoruba	70 (70.0)	80 (80.0)	150 (75.0)
Hausa	2 (2.0)	-	2 (1.0)
Igbo	28 (28.0)	20 (20.0)	48 (24.0)
FAMILY TYPE			
Monogamy	92 (92.0)	78 (78.0)	170 (85.0)
Polygamy	8 (8.0)	22 (22.0)	30 (15.0)
FATHER’S OCCUPATIO N			
Civil Servant	43 (43.0)	23 (23.0)	66 (33.0)
Business man	55 (55.0)	60 (60.0)	115 (57.5)
Artisan	1 (1.0)	5 (5.0)	6 (3.0)
Unemployed	1 (1.0)	4 (4.0)	5 (2.5)
Petty trader	-	8 (8.0)	8 (4.0)

MOTHER'S OCCUPATION			
Civil Servant	29 (29.0)	15 (15.0)	44 (22.0)
Business woman	69 (69.0)	53 (53.0)	122 (61.0)
Artisan	-	4 (4.0)	4 (2.0)
Unemployed	-	5 (5.0)	5 (2.5)
Petty trader	2 (2.0)	23 (23.0)	25 (12.5)
MODE OF LIVING			
Living in the boarding house	100 (100.0)	-	
Living with parents	-	92 (92.0)	92 (46.0)
Living with guardian	-	8 (8.0)	8 (4.0)
FAMILY SIZE			
2 - 5	49 (49.0)	23 (23.0)	72 (36.0)
6 - 9	47 (47.0)	63 (63.0)	110 (55.0)
> 9	4 (4.0)	14 (14.0)	18 (9.0)
Total	100 (100.0)	100 (100.0)	200 (100.0)

**TABLE 1.b SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS CONT'D**

VARIABLES	VEGETARIAN F (%)	NON-VEGETARIAN	TOTAL
FATHER'S EDU. LEVEL			
SSCE	1 (1.0)	66 (66.0)	67 (33.5)
OND	1 (1.0)	6 (6.0)	7 (3.5)
HND	7 (7.0)	6 (6.0)	13 (6.5)
BSC	30 (30.0)	14 (14.0)	44 (22.0)
MSC	26 (26.0)	-	26 (13.0)
PhD	35 (35.0)	8 (8.0)	43

MOTHER'S EDU. LEVEL			
SSCE	3 (3.0)	78 (78.0)	81 (40.5)
OND	1 (1.0)	6 (6.0)	7 (3.5)
HND	9 (9.0)	7 (7.0)	16 (8.0)
BSC	41 (41.0)	4 (4.0)	45 (22.5)
MSC	21 (21.0)	1 (1.0)	22 (11.0)
PhD	25 (25.0)	4 (4.0)	29 (14.5)
TOTAL	100 (100.0)	100 (100.0)	200 (100.0)

**TABLE 2 ANTHROPOMETRIC DATA OF THE RESPONDENTS**

CLASSIFICATION	VEGETARIAN	NON-VEGETARIAN	TOTAL	P-VALUE
Underweight	-	3 (3.0)	3 (6.0)	0.000*
Normal	84 (84.0)	86 (86.0)	170 (85.0)	
Overweight (>+1SD)	12 (12.0)	10 (10.0)	22 (11.0)	
Obesity (>+2SD)	4 (4.0)	1 (1.0)	5 (2.5)	
Total	100 (100.0)	100 (100.0)	200 (100.0)	

• Significant P<0.005

**TABLE 3 DIFFERENCES IN MEAN OF ANTHROPOMETRIC CHARACTERISTICS OF THE RESPONDENTS**

VARIABLE	VEGETARIANS MEAN±SD	NON-VEGETARIANS	P-VALUE
Age (Months)	174.96±9.05	183.36±13.44	0.000*
WEIGHT (kg)	64.30±13.19	52.07±7.45	0.000*
HEIGHT	162.47±8.51	158.85±8.28	0.003*

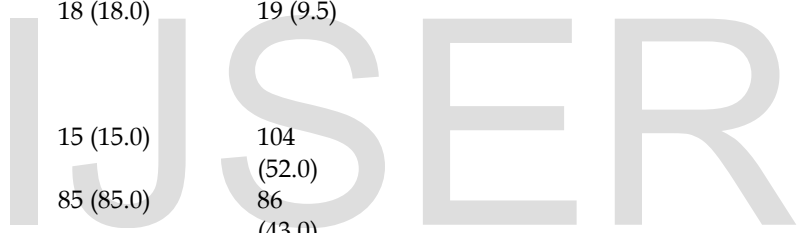
(cm)			
HEIGHT	1.62±0.09	1.91±0.29	0.000*
(m)			
BMI	24.27±4.03	20.59±2.54	0.000*
(kg/m <sup>2</sup> )			
BMI for	4.88±9.61	1.54±4.32	0.002*
Age (z-score)			

---

P<0.05

**TABLE 4 DIETARY PATTERN OF THE RESPONDENTS**

DIETARY PATTERN	VEGETARIAN	NON VEGETARIAN	TOTAL
	F (%)		
FREQUENCY OF MEALS			
Twice/day	5 (5.0)	6 (6.0)	11 (5.5)
Thrice/day	76 (76.0)	57 (57.0)	133 (66.5)
2 - 3 times/day	18 (18.0)	19 (19.0)	37 (18.5)
> 3 times/day	1 (1.0)	18 (18.0)	19 (9.5)
TIMING OF MEAL			
Fixed	99 (99.0)	15 (15.0)	104 (52.0)
Irregular	1 (1.0)	85 (85.0)	86 (43.0)
Total	100 (100.0)	100 (100.0)	200 (100.0)



**Table 5 FOOD CONSUMPTION PATTERN OF THE RESPONDENTS**

FOOD GROUPS	VEGETARIAN N	NON VEGETARIAN N	TOTAL L
	F (%)		
<b>FRUIT</b>			
Never	5 (5.0)	2 (2.0)	7 (3.5)
< 3 times/week	77 (77.0)	77 (77.0)	154 (77.0)
> 4-6 times/week	18 (18.0)	21 (21.0)	39 (19.5)
<b>VEGETABLES</b>			
Never	11 (11.0)	3 (3.0)	14 (7.0)
< 3 times/week	82 (82.0)	65 (65.0)	147 (73.5)
> 4-6 times/week	7 (7.0)	32.0	39 (19.5)
<b>BREAD &amp; CEREALS</b>			
Never	1 (1.0)	2 (2.0)	3 (1.5)
< 3 times/week	37 (37.0)	50 (50.0)	87 (43.5)
> 4-6 times/week	62 (62.0)	48 (48.0)	110 (55.0)
<b>MILK AND MILK PRODUCTS</b>			
Never	1 (1.0)	3 (3.0)	4 (2.0)
< 3 times/week	31 (31.0)	69 (69.0)	100 (50.0)
> 4-6 times/week	68 (68.0)	28 (28.0)	96 (48.0)
<b>LEGUMES</b>			
Never	23 (23.0)	14 (14.0)	37 (18.5)
< 3 times/week	65 (65.0)	53 (53.0)	118 (59.0)
> 4-6 times/week	12 (12.0)	33 (33.0)	45 (22.5)
<b>MEAT, FISH &amp; EGG</b>			
Never	-	2 (2.0)	100 (48.7)
< 3 times/week	100.0	49 (49.0)	49 (24.6)
> 4-6 times/week	-	49 (49.0)	51 (25.7)

<b>SOFT DRINKS, SWEET &amp; SNACKS</b>			
Never	9 (9.0)	1 (1.0)	10 (5.0)
< 3 times/week	3 49 (49.0)	44 (44.0)	93 (46.5)
> 4-6 times/week	42 (42.0)	55 (55.0)	97 (48.5)
<b>ROOT &amp; TUBERS</b>			
Never	54 (54.0)	6 (6.0)	60 (30.0)
< 3 times/week	3 40 (40.0)	66 (66.0)	106 (53.0)
> 4-6 times/week	6 (6.0)	28 (28.0)	34 (17.0)
<b>TOTAL</b>	<b>100 (100.0)</b>	<b>100 (100.0)</b>	<b>200 (100.0)</b>

**TABLE 6 NUTRIENT INTAKE OF THE RESPONDENTS**

NUTRIENTS	VEGETARIAN Mean±SD	NON VEGETARIAN	P- value
Calories	2360.66±984.91	1673.35±719.02	.001*
Protein	84.78±39.00	58.41±42.39	.010*
Carbohydrates	429.81±211.49	287.83±122.30	.001*
Dietary fiber	31.02±13.93	56.06±155.93	.385
Fat	39.09±20.21	33.56±27.66	.358
Vitamin A	334.98±201.72	323.37±848.79	.082
Vitamin C	13.69±14.36	3.87±6.25	.000*
Vitamin B1	1.23±0.59	0.84±0.99	.081
Vitamin B2	1.40±0.63	0.87±1.16	.029*
Vitamin B3	13.53±6.38	7.43±8.07	.001*
Vitamin B6	0.64±0.40	0.32±0.38	.001*
Folate	320.99±155.62	196.79±241.22	.016*
Vitamin B12	1.75±1.03	1.42±2.82	.550
Calcium	469.07±328.11	214.18±258.61	.001*
Phosphorus	645.43±309.36	392.59±486.74	.015*
Sodium	1244.99±569.09	1187.93±1639.32	.856
Potassium	492.93±336.04	390.92±376.41	.244
Zinc	5.88±2.11	6.79±4.47	.301
Iron	19.80±13.40	15.41±11.75	.150
Magnesium	101.01±48.42	89.87±54.17	.376
P<0.05			

**TABLE 7. MACRO NUTRIENTS INTAKE OF THE RESPONDENTS BY GENDER**

NUTRIENTS	R D A M A L E	RD A FE M AL E	MALES MEAN±SD	p -	FEMALES MEAN±SD	p- v al u e

			VEG ETAR IANS	NON - VEG ETA RIAN S		VEG ETA RIAN S	NON - VEG ETA RIAN S	
Calorie (kcal)	2500	2200	2392.2±125	1660.1±544	0.8	2334.9±868	1545.1±626	0.8
Protein (g)	45	46	90.5±48.8	57.4±38.9	0.8	84.1±39.7	51.1±36.3	0.8
Fat (g)	N	NS	35.0±19.4	31.0±23.0	0.6	42.0±22.4	32.8±29.8	0.6
Carbohydrate (g)	N	NS	444.2±245.1	290.2±92.1	0.6	416.6±196.1	262.6±94.1	0.6
Fiber (mg)	N	NS	36.5±21.5	62.4±176.3	0.6	30.4±15.6	56.2±165.7	0.6

+++ - Excess (>120%)

++ - Adequate (80 - 120%)

+ - Inadequate (< 80%)

**TABLES 8. VITAMIN INTAKE OF THE RESPONDENTS BY GENDER**

NU	R	RD	MEA	P-	MEA	P-		
TRI	D	A	N	V	N ±	V		
EN	A	FE	±SD	A	SD	A		
TS	M	M		L		L		
	A	AL		U		U		
	L	E		E		E		
	E							
Vita min A (mcg)	1000	1000	341.1±224.8	660.1±382.8	.19	329.8±190.2	926.2±689.9	.174
Vita min	50	50	9.5±9.2	3.0±6.4	.064	14.6±15.4	3.4±5.9	.002

			VEG ETA RIAN S	NON - VEG ETA RIAN S		VEG ETA RIAN S	NON - VEG ETA RIAN S	
C (mg)	1.1	1.1	1.5±0.8	0.7±0.9	.061	1.2±0.6	0.7±0.9	.081
Vita min B1 (mg)	1.3	1.3	1.54±0.8	0.8±1.2	.01	1.4±0.7	0.8±1.2	.043
Vita min B2 (mg)	17	15	15.1±6.6	6.8±8.2	.014	12.4±6.4	6.7±8.1	.011
Vita min B3 (mg)	1.4	1.4	0.5±0.3	0.3±0.4	.091	0.7±0.4	0.3±0.4	.002
Vita min B6 (mg)	10	15	390.6±241.6	161.9±203.8	.024	311.4±169.9	161.3±202.7	.009
Vita min B12 (mcg)	2.0	2.0	1.8±1.1	0.96±2.26	.255	1.7±1.1	1.5±3.2	.771

+++ - Excess (>120%)

++ - Adequate (80 - 120%)

+ - Inadequate (< 80%)

**TABLES 9. MINERALS INTAKE OF THE RESPONDENTS BY GENDER**

NU	R	RD	MEA	P-	MEA	P-	
TRI	D	A	N±S	V	N±S	V	
ENT	A	FE	D	A	D	A	
S	M	M		L		L	
	A	AL		U		U	
	L	E		E		E	
	E						
			MAL E VEG ETA RIA		MAL E NON VEG - VEG	FEM ALE VEG ETA RIA	FEM ALE NON - VEG

			N	ETA RIA N		N	ETA RIA N	
Calcium (mg)	1200	1200	465.8 ±240. 7+	187.6 ±259. 8+	.01 4*	441.1 ±357. 4+	200.5 ±262. 5+	.01 1*
Phosphorus (mg)	1200	1200	684.2 ±329. 9+	340.2 ±497. 3+	.06 2	615.4 ±313. 7+	373.3 ±506. 3+	.05 6
Sodium (mg)	NS	NS	1464. 9±94 8.8	861.6 ±108 3.7	.16 9	1460. 9±11 42.3	1008. 7±16 06.6	.27 4
Potassium (mg)	NS	NS	478.9 ±217. 9	313.7 ±350. 3	.18 5	542.7 ±404. 1	364.4 ±365. 1	.11 9
Zinc (mg)	15	12	6.5±3 .2+	7.4±4 .8+	.60 3	2.3±0 .5+	4.4±0 .9+	.41 8
Iron (mg)	12	15	21.0± 12.3+	16.2± 12.2+	.35 0	17.8± 13.5+	15.5± 12.3+	.55 4
Magnesium (mg)	270	280	111.8 ±46.3 +	89.4± 55.4+	.30 4	96.1± 48.1+	87.1± 56.8+	.55 9

\*P<0.05

- +++ - Excess (>120%)
- ++ - Adequate (80 - 120%)
- + - Inadequate (< 80%)

IJSER

#### 4. DISCUSSION

The socio-demographic characteristics of the respondents in the study showed the age range between 14-19 years. Most of the respondents were Christians. 100% of the vegetarian's respondents were living in a boarding house, while 92% of the non-vegetarian were living with their parents and 8% with their guardian. Majority of the parents of the respondents were educated. Anthropometric data showed that majority of the respondents were within normal weight. Majority (99%) of the vegetarian respondents had a fixed time of meals and 1% had irregular. While 85% of the non-vegetarian respondents have irregular timing of meal and 15% had fixed timing of meal. The energy intake for non-vegetarians male (1660.1kcal) and female (1545.1kcal) did not meet the RDA of (2500kcal) and (2200kcal) respectively, this may be due to the fact that 50% consumed bread and cereals less than three times in a week and 60% consumed milk and milk product less than three in a week. The vegetarian respondents had adequate energy intake, although [4] reported inadequate energy intake among young adult on lacto-ovo vegetarian diet. All the respondents met their protein requirements compared to the RDA, this could be due to the fact that 100% of the vegetarian respondents consumed eggs less than three times in a week, 65% consumed legumes less than three times in a week and 68% consumed milk and milk products more than 4-6 times in a week, while 69% of the non-vegetarian consumed milk and milk products less than three times in a week, 53% consumed legumes less than three times in a week and 49% consumed meat, fish and eggs more than 4-6 times in a week. [16] also reported adequate intake of protein for adolescents. All the vegetarian respondents met their vitamin B12 requirements compare to the RDA, this could be due to the fact that , 100% consumed eggs less than three times in a week, and 68% consumed milk and milk products 4-6 times in a week, while 49% consumed meat, fish and eggs and 69% consumed milk and milk product less than three times a week. All the respondents did not meet their calcium requirements compare to the RDA, although a study carried out by [5], showed that the male vegetarian have adequate intake of calcium. All the respondents met their iron requirements compare with the RDA, [6] reported that non-vegetarian female had adequate intake of iron. All the respondents did not meet their zinc requirements compare to the RDA; this agrees with [11] who reported inadequate intake of zinc by the adolescents.

#### CONCLUSION

There was no difference in the nutrient intake of lacto-ovo vegetarian and non-vegetarian respondents, except for energy, in which the lacto-ovo vegetarian had a higher intake. And there was no difference in the anthropometric status of adolescents fed lacto-ovo vegetarian and non-vegetarian diets.

#### REFERENCES

- [1] Americanheart.org (AHO) (2009) "Vegetarian Diets"
- [2] Craig W. and Mangels A. R. (2009). Position of the American Dietetic Association: Vegetarian Diets. *J Am Diet Assoc.*;109 (7):1266-1282.
- [3] Carin Napier and Wilna Oldewage- Theron (2015) Dietary intake and nutritional status of adolescent girls and young women in Durban, South Africa. *Journal of Family Ecology and Consumer Services Vol 43*
- [4] Ngozi Elizabeth O., Onabanjo Oluseye O., Akinlade Ademola R., Adeoye Bolade K., Ani Ime F. (2018) Nutritional Status of Lacto-ovo Vegetarian Young Adults of Babcock University in Ogun State. *Journal of Nutritional Health & Food Science.*
- [5] Shahla Shafiee and Mohsen Mesgarani (2015) Assessment of Nutritional Status among Adolescents boys in an urban population. *Global Journal of Health Science, Vol. 7.*
- [6] Seema Choudhary, C.P. Mishira and K.P.Shukla 2010 Dietary Pattern and Nutrition Related Knowledge of Rural Adolescents Girsles. *Indian Journal. Prev. Soc. Vol.41 No. 3*
- [7] Trusswell AS, Hill ID. (2002) Course manual for adolescent health. Part-II: Indian perspective. In: Bhavne SY, editor. *Adolescent health.* New Delhi: Indian Academy of Pediatrics, Pg5-17
- [8] World Health Organization (2010)
- [9] World Health Organization (2009)
- [10] Yearul K., Hussain, M.S., Farzana S., Wahida O. (2010) Dietary patten, nutritional status, anaemia and anaemia-related knowledge in urban adolescent college girls of Bangladesh. *Journal of the Pakistan Medical Association vol 60:No.8*
- [11] Yusnusa S. and L.U.S. Ezeanyika (2013) Protein-Energy intake and Nutritional Status of in-school adolescents in Baham. *Journal of Nutritional Disorders and therapy.*
- [12] Dunham L. and Kollar L. M. (2006) Vegetarian eating for Children and Adolescents. *J. Pediatr. Health Care.* 20 (1) : 27-34
- [13] World Health Organization (2005)
- [14] Lieu P. T., Heiskala M., Peterson P. A., Yang Y. (2001). The Roles of Iron in Health and Disease. *Mol. Aspects Med* 2:1-87 [ Pub Med].
- [15] Mattson Mark P. (2002). *Diet-Brain: Connection Impact on Memory, Mood, Aging and Disease.* Kluwer Academic Press.
- [16] Herman J. P., Mc Klveen J. M., Ghosal S., Kopp B., Wulsin A., Makinson R., Scheiman J., and Myers B. (2016). Regulation of the hypothalamic-



pituitary-adrenocortical stress response. Compr.  
Physiol 6 (2): 603-621

IJSER