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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

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Effect of Family Size on Body Weight and Packed Cell Volume (PCV) of Adolescent Female Secondary and University Students in Abia State of Nigeria

J.U. Anyika and C.A. Echendu
Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture, Umudike, P.M.B. 7267, Umuahia, Abia State, Nigeria

Abstract: The need to determine the effect of family size on body weight and Packed Cell Volume (PCV) of adolescent female secondary and university students in Abia State, Nigeria, is very important for this study. One hundred and sixty adolescent girls aged 10-19 years were used for the study. Data for this report was obtained from a cross-sectional survey of two boarding secondary schools [one school from Umuahia North Local Government Area (LGA) and the other from Ikwuano LGA] and two tertiary institutions (one school from Umuahia North LGA and the other from Ikwuano LGA) in Abia State, Nigeria. A structured self-administered questionnaire designed to collect information on socio-economic status of adolescent girls was given to the respondents in their schools. A sample of 160 adolescent girls was used for body weight and iron status of the blood. Forty adolescent girls were systematically selected from each school. Pearson's correlation was used to determine the interrelationship between variables. Results showed that the secondary school girls had larger family size than their university counterparts (41.75% vs 40.0%) respectively. The secondary school adolescents also had lower mean body weight which differed significantly from those of the university students ($p<0.05$). The mean PCV of both the secondary school and university students were low and comparable ($p>0.05$). For the secondary school students, Pearson's correlation showed that family size had negative but significant relationship with PCV ($r = -0.362$, $p<0.05$). Body weight had negative but significant relationship with PCV ($r = -0.164$, $p<0.05$). For the university students, family size had negative but significant association with body weight and PCV ($r = -0.380$, $p<0.05$ and $r = -0.008$, $p<0.05$) respectively. This study showed that family size had an effect on body weight and PCV of both secondary school and University adolescent girls in Abia State.

Key words: Secondary school, university, adolescents, body weight, PCV

INTRODUCTION

The World Health Organization (WHO) recently defined adolescents as persons aged 10-19 years old (WHO, 2000). Interest in adolescent health issues have grown dramatically in the past decade, beginning with the International year of Youth in 1985 and the World Health Assembly in 1989, when discussions by the world focused on the health of the youth. The reasons for this burgeoning interest are varied and include the large population of adolescents- 1200 million or about 19% of the total world population which makes them a formidable group (Kurz and Johnson-Welch, 1994).

Adolescence is a particularly unique period of life because it is a time of intense physical, psychological, and cognitive development. Adolescence is a transition phase to adulthood. The age of adolescence encapsulates a window of time when bodies are metamorphosing and evolving into that of an adult. It is a time when the adolescent tries to establish his own identity yet desperately seeks to be socially accepted by his peers (Lulinski, 2001). During adolescence hormonal changes accelerate growth in height. Growth is faster than at any other time in the individual's life except the first year (Brasel, 1982). Increased nutritional needs at this juncture relate to the fact that adolescents gain up to 50% of their adult weight, more than 20% of their adult height and 50% of their adult skeletal mass during this period (Brasel, 1982). The adolescents therefore face series of serious nutritional challenges which would impact on this rapid growth spurt as well as their health as adults. However, the adolescents remain a largely neglected, difficult-to-measure, hard-to-reach population. Consequently, their needs, particularly those of adolescent girls are often ignored (Kurz and Johnson-Welch, 1994).

At this developmental stage, calcium and protein requirements are maximal. Increased physical activity, combined with poor eating habit and other considerations, for example, menstruation, oral contraceptive use and pregnancy contribute to accentuating the potential risk for adolescents of poor nutrition. The main nutritional problems affecting adolescent populations worldwide and Nigeria in particular include under-nutrition in terms of stunting and wasting. Others are deficiencies of micronutrients such as iron and vitamin A, calcium deficiency, obesity and other specific nutrient deficiencies (Kurz and Johnson-Welch, 1994).

What happens, or does not happen, during adolescence has implications that last throughout a lifetime and affect both individual and public health. What sets adolescents apart from children is the increasing autonomy they demonstrate. Their own decisions, behaviors and relationships increasingly determine their health and development (WHO, 1999).

Anemia is the most common indicator used to screen for iron deficiency. Iron deficiency is most common among groups of low socioeconomic status (UNICEF/UNU/WHO, 2001). Food prices are of increasing importance in their effect of food choice behaviors. The main cause of an iron poor diet is poverty. Meat and fish which are reliable sources of iron are costlier than those of the vegetable sources. Individuals with a predominantly vegetable based diet risk iron depletion because the iron stores found in vegetables are not easily absorbed as those from meat sources. This is due to high intake of phytate and polyphenols in vegetable based diet which militate against iron absorption (ADA, 2002). The overall economic problems affect food choices by lowering family purchasing power. Related factors include the decline in overall agricultural productivity in many countries and problems of food distribution. The lower meat consumption by families is based mainly on economic factors. The consequences of low socioeconomic status that effectively raise anemia rates include a lack of food security, inadequate or lack of access to health care and poor environmental sanitation and personal hygiene (ADA, 2002).

The objective of this study therefore is to determine the effect of family size on weight and PCV of adolescent female secondary and university students in Abia State of Nigeria.

MATERIALS AND METHODS

Study area: This study was conducted in Umuahia North and Ikwuano Local Government Areas (LGAs) of Abia State, Nigeria. Umuahia North LGA occupies a land mass of 14.464 square kilometers while Ikwuano LGA occupies a land mass of 268.710 square kilometers. Majority of the indigenes in Abia State are farmers and others are civil servants, teachers, business men and craftsmen.

Population and sample-size determination:
The sample size was calculated using the formula:

$$n = \frac{Z^2 P(100 - P)}{X^2}$$

Since the sample was large n> 30 an acceptable margin of error (Z) of 1.96 at 95% Confidence Interval was used. Since Z = 1.96, it was approximated to 2.

P = Percentage of adolescent girls assumed not to have low body weight and poor iron status. P was taken to be 62% since National Micronutrient Survey (1993) found prevalence of poor iron status in women of reproductive age to be 62%.

100- P = Percentage of adolescent girls assumed to have normal body weight and optimal iron status.

X = Width of Confidence Interval or required precision level taken to be 5%.

n = Sample size

This gave the sample size of 376.96 which was approximated to 377.

This figure for one school was increased to 400 to make up for drop-outs. A sub-sample of 160 adolescent girls (10% of total population) was used for body weight and iron status of the blood. Forty girls were systematically selected from each school.

Preliminary visits: List of all the Secondary Schools in Umuahia North and Ikwuano LGAs were gotten from Ministry of Education out of which, two Secondary School (one school from Umuahia North LGA and the other from Ikwuano LGA) with boarding facilities and two tertiary institutions (one from Umuahia North and the other from Ikwuano LGA) were selected. Preliminary visits were also made to the Principals of schools and the Head of Departments of the chosen Universities. The purpose of the study and methods of the study were explained to them and their cooperation was sought. Informed consent was gotten from both the parents and students especially for detailed study (blood analysis).

Sampling: Names of all the boarding schools in Umuahia North and Ikwuano LGAs of Abia State were compiled and a random selection of schools was done to select two secondary schools and two tertiary institutions with boarding facilities. The secondary schools selected were Girls Secondary School Umuahia in Umuahia North LGA and Senior Science School Ariam in Ikwuano LGA. The universities selected were Michael Okpara University of Agriculture Umudike (MOUAU) in Ikwuano LGA and Abia State University (ABSU), Umuahia Campus in Umuahia North LGA.

Data collection: The study used WHO (2000) definition of adolescents. The study used qualitative and quantitative data collection methods. The age groups were 10-13 years, 13.1 month-16 years, 16.1 month-19 years. A structured questionnaire was designed to collect information on socio-economic status of the adolescent girls used for the study. This was validated by lecturers in the Department of Human Nutrition and Dietetics and Department of Home Economics, MOUAU. The questionnaire was edited and ambiguous and unclear items were removed. The selected questionnaire items were pre-tested on eleven students

from Ibeku High School in Umuahia North LGA. This school was not involved in the main study. After the pre-test, the questionnaire was rearranged and typed for the main study distribution. The questionnaire was self-administered to the respondents in their schools by the researcher. The respondents indicated by marking √ to answers most suitable to them.

Anthropometric measurements

Weight measurement: Body weight of all the subjects that participated in the blood analysis study was taken using the procedures outlined by Jelliffe (1966). Subjects were weighed using a bathroom scale (Camry). The subjects had minimum clothing with no jewelry/shoes. The subjects stood erect on the scale and readings were taken to the nearest 100 g. Clothing weight was estimated and subtracted from the measured weight.

Blood analysis

Sample collection: PCV was determined using micro-haematocrit method (Baker, 1976). Fasting blood sugar sample was collected from subjects in sitting position by a physician. A torniquet was applied above the elbow joint to make the vein pronounced for less than one minute. The site of the venipuncture was swabbed with methylated spirit using absorbent cotton wool. The methylated spirit was allowed to dry without touching the site so as not to contaminate it. A disposable needle with syringe was inserted into the vein and the tourniquet was released before drawing the blood. Five millimeters of blood was drawn out into vacuum tube (syringe).

Micro-haematocrit determination of PCV: Heparinized micro-haematocrit tube of 7 mm long with width of 1 mm was filled with the collected blood. The empty end was sealed with plasticine. The sealed tubes were placed in the vertical grooves of the specially designed centrifuge called micro-haematocrit centrifuge and spun at a predetermined speed of 10,000 revolution per minute (rpm) for 5 min. The volume of packed cells as a portion of the total volume of blood was read with the haematocrit reader. The result was expressed as l/l whole blood.

Data analysis: Information gathered from the questionnaires, body weight and PCV were coded using the computer program Excel Microsoft worksheet and analyzed using the computer program statistical software package (SAS) Genstat discovery edition. Descriptive statistics such as frequencies and percentages were used to analyze the data on socio-economic characteristics. Data on socio-economic characteristics, body weight and iron status of adolescent secondary school girls were compared with those of adolescent university girls. Mean body weights of subjects were compared with the National Centre for Health Statistics (NCHS) standard (1983). Mean PCV was compared with the report of a WHO Scientific Group (1968). Pearson's correlation was used to determine the interrelationship between variables. Family size was correlated with body weight and PCV.

RESULTS AND DISCUSSION

Table 1 shows the socio-economic characteristics of the study sample. Majority of the secondary school adolescent girls 43% were within the age range 13.1-16.0 years old. All students in the university were above this age group. In both secondary school and university female adolescents, majority (38.87% and 53%) of the respondents respectively, claimed that their mother had University Education. Majority of the adolescent girls (41.75%) in the secondary school claimed that their family size were more than 6 while (47.62%) of their university counterparts agreed that their family size were 4-6.

The age range of University students was a reflection of their educational level. Although all were classified as adolescents, it is to be expected that the Universities would have older adolescents. Education has been shown in literature to be one of the important factors affecting the ability to make informed choices. Mothers require knowledge, understanding and self-confidence to make informed choices that are beneficial to their well-being and those of their children (Omotola *et al.*, 2005). Female literacy is now widely recognized as an important determinant of the health of a nation (Osmani, 1997).

Table 2 shows the mean body weight and PCV of the subjects. The secondary school adolescents had the lowest mean body weight which differed significantly from those of their university counterparts ($p<0.05$). The reference standard mean body weight (NCHS -2SD) was lower than the mean body weight of both the secondary school and university students. The mean PCV of the secondary school and university students were low and comparable ($p>0.05$).

The lower mean body weight of the secondary school adolescents was not surprising. In general, a female's adolescent growth spurt begins at age 10 or 11. The spurt's duration is about two and a half years. During the adolescent spurt, energy need is at its peak and declines soon after the growth spurt (Whitney *et al.*, 2001). Most of the secondary school adolescent girls are within the age of rapid growth spurt which might have made their weight to be lower than those of their university counterparts.

The laboratory picture of anemia may be due to a convergence of several insults both nutritional and non-nutritional which could be due to the adult growth spurt, flow of menstruation, malarial parasitemia, low intake of meat and compounded with greater exposure to

Table 1: Socio-economic Characteristics of subjects

	Secondary School		University	
Parameters	Freq.	%	Freq.	%
Age range				
10.0-13.0	303	37.88	-	-
13.1-16.0	344	43.0	-	-
16.1-19.0	153	19.12	800	100
Total	800	100	800	100
Educational Status of respondents				
Junior Secondary School (JSS)	499	62.38	-	-
Senior Secondary School (SSS)	301	37.62	-	-
University Education	-	-	800	100
Total	800	100	800	100
Mother's Educational Status				
No formal education	77	9.63	45	5.63
Primary School education	220	27.5	96	12.0
Secondary School education	188	23.5	235	29.3
Tertiary education	311	38.87	424	53.0
No response	4	0.5	-	-
Total	800	100	800	100
Family Size				
< 4	182	22.75	99	12.38
4-6	284	35.5	381	47.62
> 6	334	41.75	320	40.0
Total	800	100	800	100

Table 2: Mean body weight and PCV of subjects

Features	Secondary School	University	$LSD_{0.05}$
Weight (kg)	48.85	54.94	2.28
Body weight (-2SD NHCS*) (Kg)	34.72	41.75	2.63
PCV (l/l)	0.32	0.34	0.02

inhibitors of iron absorption such as tannins and phytates which interfere with absorption of iron from plant sources thereby leading to very low iron uptake in endemic areas (Bates and Heseker, 1994) such as Abia State of Nigeria are also contributory factors.

Table 3 depicts the correlation between family sizes, body weight and Packed Cell Volume (PCV) of secondary school subjects. When the data was subjected to Pearson's correlation, family size had negative but non-significant relationship with body weight ($r = -0.315$, $p>0.05$); its association with PCV was negative but significant ($r = -0.362$, $p<0.05$). The relationship between body weight and PCV was negative but significant ($r = -0.164$, $p<0.05$).

The large family size made it impossible for high bio-available iron and proteinous foods which are costly to be bought. This in-turn resulted in decreases in PCV as family size increases. It has been reported that family size was among the factors affecting nutritional status of rural household in Enugu state (Ene-Obong *et al*., 2003; Kalu and Ajagu, 1999). Quatromon *et al*. (1987) suggested that children from large family size were more likely to have nutrient deficiencies and chronic diseases which tend to retard growth.

Table 4 represents the correlation between family sizes, body weight and Packed Cell Volume (PCV) of university subjects. Family size had negative but significant relationship with body weight and PCV ($r = -0.380$, $p<0.05$, $r = -0.008$, $p<0.05$) respectively. As body weight increases, PCV increases. The increases were not significant ($r = 0.133$, $p = 0.05$).

Table 3: Correlation between family size, body weight and PCV of secondary school subjects

Factor	Family size	Body weight	PCV
Family size	1.0000	-0.103	-0.362**
		P>0.05	P<0.05
Body weight		1.0000	-0.164**
			P<0.05
PCV			1.0000

**r significant (P<0.05)

Table 4: Correlation between family size, body weight and PCV of university subjects

Factor	Family size	Body weight	PCV
Family size	1.0000	-0.380**	-0.008**
		P<0.05	P<0.05
Body weight		1.0000	-0.133
			P>0.05
PCV			1.0000

**r significant (P<0.05)

The increases in PCV as body weight increases among the university students were not surprising. A possible explanation could be that these students have passed the growth spurt. Also the university students have more autonomy and can cook their meals or go to the cafeteria and buy what they want.

Conclusion: This study showed that family size had effect on body weight and PCV of the secondary school and university adolescent girls.

REFERENCES

American Dietaetic Association (ADA), 2002. Position of the American Dietetic Association: The diet approach to communicating food and nutrient information. J. Am. Diet Assoc., 102: 100-108.

Baker, F.J., 1976. Introduction to medical laboratory technology. Butterworth and Co. (Publishers) Ltd. 88 Kindsway, London WC 23 6AB.

Bates, C.J. and A. Heseker, 1994. The effect of iron deficiency anaemia on scholastic achievement, behavioral stability and perceptual sensitivity of adolescents. Pediatr. Res., 7: 294-296.

Brasel, J., 1982. Changes in Body Composition During Adolescence. In: Adolescent Nutrition. Winick, M. (Ed). John Wiley and sons, New York.

Ene-Obong, H.N., I.F. Odoh and O.E. Ikwuagwu, 2003. Plasma vitamin A and C status of in-school adolescents and associated factors in Enugu state, Nigeria. J. Health Popul. Nutr., 21: 18-25.

Jelliffe, D.B., 1966. The assessment of the nutritional status of the community. WHO Monograph series No. 53. Geneva.

Kalu, O. and C.U. Ajagu, 1999. Economic study of determinant of nutritional status of rural households: a case study of Igbo-Etiti Local Government area of Enugu State (abstract). In: Book of abstracts: 30th Annual Scientific Conference of the Nutrition Society of Nigeria, held in Enugu, 1999, Enugu: Academic Publisher, NLHD 06.

Kurz, K.M. and C. Johnson-Welch, 1994. The nutrition and lives of adolescents in developing countries: Findings from the nutrition of adolescent girls research program. International Centre for Research on Women. 1717 Massachusetts Avenue. Washington, DC.

Lulinski, B., 2001. Eating challenges during the adolescent years. www.wolfrinke.com. Accessed 5/7/2005.

National Micronutrient Survey Nigeria, 1993. OMNI Opportunities for micronutrient interventions, University of Ibadan and USAID.

NCHS, 1983. National Centre for Health Statistics: Measuring change in nutritional status: Guidelines for assessing the nutritional impact of supplementary feeding programmes for vulnerable groups. WHO, Geneva.

Omotola, B.D., A.O. Grange, J.A. Adedoyin, B.I.C. Brai, E.B. Omotola and N. Njepuome, 2005. Breastfeeding practice in the first six months of life in EPE Local Government Area of Lagos State. Nig. J. Nutr. Sci., 26: 16-22.

Osmani, S.R., 1997. The Abraham Horwite Lecture. Poverty and Nutrition in South Asia. Papers from the ACC/SCN 24th Season symposium Kathmandu, March, 1997.

Quatromon, P.A., R.A. Cook, I. Parvanta and W.A. Halteman, 1987. Growth deficit among low income pre-school children in Maine. Nutr. Reports Int., 35: 517-524.

UNICEF/UNU/WHO guideline, 2001. Iron deficiency anaemia. Assessment, Prevention and control. A guide for programme managers. WHO/NHD/01.3. WHO, Geneva.

WHO, 1968. Nutritional Anaemia. WHO Technical Report series, No. 405 World Health Organization, Geneva.

WHO, 1999. Diet, Nutrition and Prevention of Chronic Diseases Technical Report Series 797. Geneva: World Health Organization.

WHO, 2000. The management of nutrition in major emergencies. World Health Organization, Geneva.

Whitney, E.N., C.B. Cataldo, L.K. DeBruyne and S.R. Rolfes, 2001. Nutrition for health and healthcare. L. Graham (Ed.) 2nd Edn. Wadsworth Thomson learning, Inc. USA.