



Nutritional Status of In-School Adolescents in Enugu State, Nigeria

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Abstract

The purpose of this study was to determine the nutritional status of in-school adolescents in Enugu State, Nigeria. Three specific objectives with corresponding research questions and two null hypotheses guided the study. A cross sectional survey research design was adopted for the study. The population for the study consisted of 147,969 in-school adolescents in public secondary schools in Enugu State. The sample size was 1,440 respondents selected using multi-stage sampling procedure. Portable Stadiometer and SECA 803 Digital Body Weight Scale for height and weight measurement were used as instruments for data collection. The data was analyzed using frequency and percentages to answer all the research questions while ANOVA and t-test were used to test the hypotheses. The results showed that 21.6%, 6.7% and 1.5% of in-school adolescents were underweight, overweight and obese respectively. The findings further indicated that in-school adolescents differed significantly in nutritional status according to age ($F = 47.257$, $p\text{-value}=.000$) and gender (female= ($\bar{x}=21.62$, $SD=4.17$) & male= ($\bar{x}=20.87$, $SD=6.52$); $t(1422) = -2.56$, $p=.011$). Based on the findings, the study recommended that Health education and sensitization campaign on promotion of normal nutritional status should be conducted by health educators and other health personnel regularly in schools and at designated places in the autonomous communities to educate the populace on the adequate nutritional intake especially during adolescence so as to avoid underweight, overweight and obesity.

Key words: Underweight, Overweight, Obesity, BMI, In-school adolescents

Introduction

Undernutrition and overnutrition are among the public health problems of adolescents globally. Poor nutrition among adolescents resulting in short stature and low lean body mass is associated with many concurrent and future adverse health outcomes (Dambhare, Bharambe, Mehendale & Garg 2010). United Nations Children's Fund (UNICEF) (2011) reported that more than 200 million school age children are stunted and underweight across the globe. Records show that Nigeria certainly has too much malnutrition; stunting rates are 33 percent and declining too slowly, wasting rates were 7 per cent in 2015 and are now surely significantly higher given the situation in the North East of Nigeria (Haddad, 2017). Report from Enugu State shows high prevalence of overweight, obesity and thinness among adolescents (Ani, Uvere & Ene-Obong, 2014). The above report suggests that adolescents in Enugu State are susceptible to poor nutrition.

Nutrition is an important factor for growth and maintenance of the body. Nutrition is the right feeding and use of food in the body for growth, repair and maintenance of the body tissues (Samuel, 2012). In the present study, nutrition refers to the right feeding and use of food in the body for growth, repair and maintenance of the body. The elements or substances which are necessary for the body metabolic functions are nutrients.

The food we eat supplies the body with nutrients for growth and development. Food nutrient is a nourishing substance or substance, which perform a variety of functions (Samuel, 2012). Samuel reiterated that there are six classes of nutrients namely: carbohydrates, protein, lipids (fats and oil), minerals, vitamins and water. The present study conceptualized nutrients as substances present in food which when eaten and absorbed in the body help to provide energy, promote normal growth, maintenance and repair. Human body needs specific

nutrients to function properly. The two main classes of nutrients are macronutrients and micronutrients (Thomas, 2015). The author further stated that macronutrients provide calories, the energy that the body needs to fuel daily life and they include carbohydrates, proteins and fats; micronutrients are the vitamins and minerals that are needed in smaller quantity to allow the body to function appropriately.

The amount of each essential nutrient that adolescents consume determines their nutritional status. Winstead (2009) defined nutritional status as the state of a person's health in terms of nutrients in his or her diet. The author further explained that how well the body function is a direct reflection of what the body ingests and the balance between the two. In this study, nutritional status referred to the condition of one's health in relation to the amount of nutrients contained in one's diet.

Literatures have shown that nutritional status can be determined using different methods. Srivastav, Mahajan and Grover (2013) submitted that Anthropometric measurements have become a popular measure for assessing a nutritional status among children and adolescents. Anthropometry involves the measurement of height and weight to determine the nutritional status of an individual using anthropometric indicators. The anthropometric indicators are generally considered as nutrition status indicators based on the international defined (standard) cut off points (WHO 1995; Cogill 2003; Gibson 2005; Hertberg 2009; & Johanna, 2010).

The anthropometric measurements used in this study to determine the nutritional status of in-school adolescents is the Body Mass Index (BMI). Akter & Sondhya (2013) defined BMI as a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity. Weight and height measurements are needed for computing BMI (weight (kg)/height (m²). Many adolescents in the area of study (Enugu State) appear to be too thin or too short for their age. Empirical evidence indicated that there was high prevalence of overweight, obesity and thinness among adolescents (Ani, Uvere & Ene-Obong, 2014). It therefore becomes necessary to determine the prevailing nutritional status of in-school adolescents in Enugu State. The findings of this study will be of immense help to researchers, health educators, nutritionist and dieticians, school managements, primary and post primary school teachers, parents and adolescents. Consequently, the following research questions were posed to guide the study;

1. What proportion of in-school adolescents in Enugu State are underweight, overweight and obese?
2. What is the difference in the proportion of in-school adolescents who are underweight, overweight and obese with regards to age?
3. What is the difference in the proportion of in-school adolescents who are underweight overweight and obese with regards to gender?

Hypotheses

1. There is no significant difference in the mean nutritional status (underweight, overweight, obese) of in-school adolescents with regard to age.
2. There is no significant difference in the mean nutritional status (underweight, overweight and obese) of in-school adolescents with regard to gender.

Methods

The cross-sectional survey research design was adopted in this study. The population for the study consisted of 147,969 in-school adolescents in 320 public secondary schools in Enugu state (Post Primary School Management Board-PPSMB & Science Technical Vocational Schools Management Board-STVSMB, 2017). The sample size for this study is 1,440 in-school adolescents. The sample size was determined using the suggestion of Cohen, Mannion and Morrison (2011) which stipulates that when the population is 100,000 and above at 95 per cent confidence level (5% confidence interval), the sample size should be 1,056 and above. The sample for the study was drawn using a multi-stage sampling procedure. Stage one involved the use of purposive sampling technique to select four education zones out of six education zones in Enugu State. Purposive sampling technique was deemed appropriate at his stage to ensure that LGAs located in the rural as well as in urban settings of the state was selected. Stage two involved the use of proportionate stratified random sampling technique to select 13 LGAs from the four zones which include 5 urban and 8 rural LGAs respectively. The third stage involved the use of proportionate sampling technique to select 32 schools used for the study; 12 schools and 20 schools from 5 urban and 8 rural LGAs respectively. Proportionately, five hundred and forty in-school adolescents from urban schools and nine hundred in-school adolescents from rural schools were selected. Proportionate stratified sampling technique was utilized at the fourth stage to select 774 male and 666 female in-school adolescents used for the study.

The instruments for data collection were the standardized portable Stadiometer and SECA 803 Digital Body weight scale used for height and weight Measurement respectively. Weight and height measurements are

needed for computing BMI (weight (kg)/height (m²). According to the reference of WHO, BMI below 18.5 was referred to as underweight, BMI under 16.00 was referred to as severe thinness, 17.00-18.49 as mild thinness, 18.50-24.99 as normal range and over 25.00 as overweight and BMI of 30 or more is considered obese. Frequencies and percentages were used for answering the two research questions while Analysis of Variance (ANOVA) and t-test statistics were used for testing the null hypothesis one and two respectively at .05 level of significance.

Results

What proportion of in-school adolescents who are underweight, overweight and obese in Enugu State?

Table 1: Proportion of in-school Adolescents who are underweight, overweight and obese (n=1424)

Nutritional status	F	%
Underweight	308	21.6
Overweight	96	6.7
Obesity	22	1.5
Normal	998	70.2

BMI Classification

Underweight – 1SD (equivalent to BMI <18.5 kg/m²)

Overweight: > + 1SD (equivalent to BMI ≥25 kg/m²)

Obesity: > + 2SD (equivalent to BMI ≥30 kg/m²)

Normal weight: 0 (equivalent to BMI ≥ 18.5-25 kg/m²)

Table 1 shows that low proportion of in-school adolescents were underweight (21.6 %), overweight (6.7%) and obese (1.5%)

What is the difference in the proportion of in-school adolescents who are underweight, overweight and obese with regard to age?

Table 2: Difference in the proportion of in-school Adolescents who are underweight, overweight and obese with regard to age (n=1424)

Nutritional Status	Age		
	10-13 years (n=447)	14-16 years (n=721)	17-19 years (n=256)
	f (%)	f (%)	f (%)
underweight	181(40.5)	118 (16.4)	9 (3.5)
Overweight	12 (2.6)	53 (7.4)	9 (3.5)
Obesity	3 (0.7)	14 (1.9)	5 (2.0)
Normal	251 (56.2)	536 (74.3)	211 (82.4)

Results in Table 2 showed that 40.5 per cent in-school adolescents aged 10-13 years; 16.4 per cent of in-school adolescents aged 14-16 years and 3.5 per cent of those aged 17-19 years were underweight. In addition, 12.1 per cent of in-school adolescents aged 17-19 years, 7.4 per cent of those aged 14-16 years and 2.6 per cent and 0.7 per cent of those aged 10-13 years were overweight. Furthermore, 2.0 per cent, 1.9 per cent and 0.7 per cent of adolescents aged 17-19 years, 14-16 years and 10-13 years were obese respectively.

The implication of this finding is poor growth and high rate of problems such as anorexia, anaemia, type 1 diabetes, hyperthyroidism, cancer, tuberculosis, gastrointestinal or liver problems among the middle and late adolescents which will still transit to adult population with low energy output and productivity if underweight is left unchecked among adolescents.

What proportion of in-school adolescents are underweight, overweight and obese with regard to gender?

Table 3: Difference in the proportion of In-school Adolescents who are Underweight Overweight and Obese with regard to Gender (n=1424)

Nutritional Status	Gender	
	Male (n=764) f (%)	Female (n=660) f (%)
Underweight	198 (26.7)	110 (16.2)
Overweight	26 (3.5)	70 (10.2)
Obesity	13 (1.8)	9 (1.3)
Normal	504 (68.0)	494 (72.3)

Results in Table 3 show that 26.7 per cent and 16.2 per cent of female and male in-school adolescents were underweight respectively. Furthermore, 10.2 per cent and 3.5 per cent of female and male in-school adolescents were overweight respectively. Also, 1.8 per cent and 1.3 per cent of male and female in-school adolescents were obese.

The implication of this finding is that the effort that has been made by relevant bodies on adolescents' nutritional to curb underweight, overweight and obesity among adolescents is yielding fruit. However there is need for improvement. There should be more sensitization campaign in schools and in strategic places about nutritional requirements of male in-school adolescent as differing from female and the need for provision and adequate nutritional intake by both adolescents male and female.

Table 4: One-Way Analysis variance of Difference in the Mean Nutritional Status of In-school Adolescents According to Age (n=1424)

Source	df	SS	MS	F	P
Between Groups	2	2716.861	1358.431	47.257	.000
Within Groups	1421	40847.786	28.746		

Significant at $p < .05$; MS= Mean Square, SS=Sum of Squares, df = degree of freedom

Table 4 shows the results of one-way ANOVA of difference in the nutritional status of in-school adolescents according to age. The results show that there was significant difference in the nutritional status of in-school adolescents based on age [F (2, 1421) = 47.257, P=.000]. Since the p-value is less than 0.05 level of significance, the null hypothesis was rejected.

Table 5: Summary of t – test Analysis of Difference in the Mean Nutritional Status of In-school Adolescents According to gender (n=1424).

Variable	N	\bar{x}	SD	S.EM	T	df	95% C.I.		P
							Lower	Upper	
Gender									
Male	741	20.87	6.52	.239	-2.560	1422	-1.3245	-.1753	.011
Female	683	21.62	4.17	.159					
Total	1424								

*significant at $p < 0.05$, S.EM=standard error of mean, C.I. =confidence interval

Table 5 shows the results of an independent samples t–test analysis of difference in the nutritional status of female and male in-school adolescents. There was a significant difference in the nutritional status scores for males (\bar{x} =20.87, SD=6.52) and females (\bar{x} =21.62, SD=4.17), $t(1422) = -2.56$, $P = .011$. Since the p-value is less than 0.05 level of significance, the null hypothesis was rejected.

Discussion

The finding in Table 1 revealed that low proportion of in-school adolescents was underweight, overweight and obese. This finding was not expected, thus a surprise because a study carried out in Enugu State and in some other states across Nigeria indicated low prevalence of underweight, overweight and obesity. The result of the study showed that the campaign and sensitization in the social media about the menace of chronic diseases associated with underweight, overweight and obesity is yielding positive result. This result is in consonance with the finding of Ani, Uvere and Ene-Obong (2014) supported by Akingbade and Sanusi (2016) who reported low prevalence of overweight, obesity and thinness among adolescents in Enugu State, Nigeria. However, the finding of this study was at variance with Talianova, Reruchova, and Slaninova (2010) who reported that the number of adolescents who were overweight (obesity) or, conversely, underweight (cachexia) was on the increase in Czech Republic of Central Europe. The discrepancy between the findings possibly may be as a result of socio-economic differences between Europe and Enugu State. Europe is one of the high income and developed countries with western culture that predisposes their citizens especially adolescents to poor nutrition, eating of more sugar sweetened foods and synthetic foods. Nigeria is among the developing countries and so prevalence of underweight, overweight and obesity may be high in relation to developed countries. The finding of this result indicated that every effort that the government and non-governmental organization, health personnel and other concerned bodies are making to prevent underweight, overweight and obesity in the study area is having impact. The implication of this finding is that if good nutritional status is promoted in adolescents, there will be significant reduction in nutrition-related diseases and associated premature death.

Findings in Tables 2 and 3 showed that in-school adolescents differ in their nutritional status with regards to age. In-school adolescents aged 10-13 years (40.5%) were more underweight compared to those aged 14-16 years (16.4%) and 17-19 years (3.5%). Furthermore, 12.1 per cent, 7.4 per cent and 2.7 per cent of in-school adolescents aged 17-19 years, 14-16 years and 10-13 years respectively were overweight while low proportion of in-school adolescents aged 17-19 years (2.6%), 14-16 years (1.9%) and 10-13 years (0.7%) were obese. This finding is not surprising. It is expected of those aged 10-13 years to be more vulnerable because of lack of experience about their nutritional needs. Besides adolescents commences the development of secondary sex characteristics and other physiological changes that demands extra nutrients at early adolescents. A person's nutritional status should be according to BMI-for-age. On the other hand, it was surprising that those age 17-19 years should be overweight and obese. At age 17-19 years, adolescents should be old enough to take responsibility of achieving optimal health, as experience has shown that age plays a significant role in acquisition of facts or knowledge and in this case, the knowledge about the consequences of overweight and obesity and need for healthy growth and development. This finding is in line with that of Akingbade and Sanusi (2016) which revealed that the prevalence of underweight was higher among participants in their early adolescence stage, while the prevalence of overweight and obesity were higher among participants in their later adolescence stage. The finding however contradicts that of Manyang, El-Sayed, Doku, and Randall (2014) who reported that overall being overweight was more prevalent among younger adolescents and decreases with age. The authors further stated that overweight and obesity in adolescents now co-exist with underweight, stunting and wasting which historically were associated with the developing world. The finding of the present study also contradicts the report of Sarkar, Manna, Sinha, Sarka and Pradha (2015) which revealed that significant association was found between different age groups. Well (2012) explained the paradox of these extremes as the double burden of malnutrition among adolescents in developing countries. Manyang, El-Sayed, Doku and Randall (2014) in their submission suggested that several factors were not associated with weight status suggesting the need to explore other potential factors for overweight and underweight, including genetic factors and socioeconomic status. The implication of this finding was that there is likelihood for adolescents to develop poor nutritional status at every stage if they are not properly informed and encourage in taking adequate responsibility for their health. There is a need to organize sensitization campaign that will capture different age groups about adequate nutritional status, teaching them how to achieve and maintain normal BMI-for-age.

Data in Tables 3 and 4 showed that low proportion of male in-school (26.7%) and female in-school (16.1%) adolescents were underweight; 10.2 per cent and 3.5 per cent of female and male in-school adolescents were overweight while 1.8 per cent and 1.3 per cent of male and female in-school adolescents were obese respectively. This finding indicated that male and the female in-school adolescents differ significantly in their nutritional status. This finding is not surprising and therefore expected because of the differences in the physiological make up and nutritional requirements of male and female. Nevertheless it is surprising that male adolescents should be underweight more than the female. It is expected that female should be underweight more than the male due to gender disparity. The male tend to expend more energy through physical activities. Higher prevalence of underweight among female in-school adolescents was expected because to literatures poor dietary habits such as

skipping of meal which is more prevalent among female adolescents. Also some culture prohibits female folks from eating certain food like gizzard and as a result they may suffer under nutrition which could result to underweight. This finding coincides with the results of Omobuwa, Alebiosub, Olajide and Adebimpe (2014) and Esimai and Ojofeitimi (2015) which revealed that there was a significant difference in the mean BMI of males and females by the period of adolescence and that the mean BMI of females was significantly higher than the males during the early and mid-adolescents. However, the findings are in sharp contrast to that of Srivastav, Mahajan and Grover (2013) that the difference of thinness among the boys and girls was not found to be statistically significant. This finding also contradicts the finding of Rhode (2015) which revealed that females are discriminated in the family in that they are offered less quality food and health care. As a result, they become more malnourished as compared to male. Furthermore, the finding of the present study was also in line with that of Esimai and Ojofeitimi (2015) and Akingbade and Sanusi (2016) who found out that prevalence of underweight were higher among the male participants compared with their female counterparts. Esimai and Ojofeitimi were of the opinion that the higher prevalence of thinness in boys compared with girls could be explained by the engagement of the boys in more physical demanding activities than girls including walking to school irrespective of the distance and also partaking in rigorous activities.

On the other hand, it is not surprising but expected that high proportion of female adolescents were more overweight compare to the male folk. This could be due to differences in growth rate. According to Santrock (2005), the onsets of puberty and growth spurts occur two years earlier in girls who are generally less happy with their bodies than the boys. This finding was in line with Adesina, Peterside, Anochie and Akani (2012) who reported that females were more overweight than their male counterparts and in all stages of adolescence. The finding is also in line with that of United Nations Population Fund-UNFPA (2013) who reported that in India, large numbers of adolescents are undernourished and the problem was more prevalent among girls (45%) than boys (20%). Underweight among male and female in-school adolescents implies undernourishment which initiates vicious cycle of malnutrition which is transmitted to future generation.

This finding is not surprising and therefore expected because of the differences in physiological make up and nutritional requirements of male and female. This finding coincides with the results of Omobuwa, Alebiosub, Olajide and Adebimpe (2014) and Esimai and Ojofeitimi (2015) which revealed that there was a significant difference in the mean BMI of males and females by the period of adolescence and that the mean BMI of females was significantly higher than the males during the early and mid-adolescents. However, the findings are in sharp contrast to that of Srivastav, Mahajan and Grover (2013) that the difference of thinness among the boys and girls was not found to be statistically significant.

Conclusion

Low proportion of in-school adolescents was underweight, overweight and obese. However, younger female in-school adolescents were more underweight in relation to those who are overweight or obese. Low proportion of underweight, overweight and obesity among in-school adolescents in Enugu State suggests proper growth and development among them. However, underweight especially at early adolescents can degenerate to malnutrition, anaemia, osteoporosis, and poor growth development of the adolescents. In addition, underweight, among female in-school adolescents can lead to amenorrhoea and other menstrual cycle dysfunctions which may cause infertility later in life. Hence, the need for improved and continuing sensitization campaign on the nutritional requirement of adolescents especially in early adolescents.

Recommendations

The researchers recommend among others that health educators should intensify awareness campaign on the menace of poor nutritional status especially among adolescents. Also, the State Government in conjunction with the Federal Ministry of Health, Federal Ministry of Education, school authorities, Non-governmental Organizations (NGOs) and churches should embark on sensitization workshop and public enlightenment campaigns in the area of Nutrition Education both in schools and the general public.

Reference

- Adesina, F. A., Peterside, O., Anochie, I., & Akani, N. A. (2012). Weight status of adolescents in secondary school in Port Harcourt using Body Mass Index (BMI). *Italian Journal of Pediatrics*, 38, 31.
- Akhter, N., & Sondhya, F. Y. (2013). Nutritional status of adolescents in Bangladesh: Comparison of severe thinness status of a low-income family's adolescents between urban and rural Bangladesh. *Journal of Education and Health Promotion*, 2, 27-37.

- Akingbade, A. K., & Sanusi, R. A. (2016). Nutritional status of in-school adolescents in Ekiti State Nigeria. *Global Journal of Medicine and Public Health*, 5(4), 1-11.
- Ani, A. N., Uvere, P. O., & Ene-Obong, H. N. (2014). Prevalence of weight, obesity and thinness among adolescents in rural and urban areas of Enugu State, Nigeria. *International Journal of Basic and Applied Sciences*, 3 (1), 1-7.
- Cogill, B. (2003). *Anthropometric Indicators Measurement Guide* (internet). Retrieved on 29/05/2017: <http://www.fantaproject.org.accessed>.
- Cohen, L. Mannion, L. & Morrison, K. (2011). *Research Method in Education (7th Ed.)*. New York: Routledge Taylor and Francis Group.
- Dambhare, D. G., Bharambe, M. S., Mehendale, A. M. & Garg, B. S. (2010). Nutritional status and morbidity among school going adolescents in wardha, a peri-urban area. *Online Journal Health Allied Sciences*, 9, 3.
- Esimai, O. A., & Ojofeitimi, E. O. (2015). Nutritional and health status of adolescents in a private secondary school in Port Harcourt. *Health Science Journal*, 9 5, 4.
- Gaiki, V., & Wagh, V. (2014). Nutritional status of adolescent girls from selected rural area of a district from Central India. *Innovative Journal of Medical and Health Science*, 4(2), 90-92.
- Gibson, R.S. (2005). *Principles of nutritional assessment (2nd Ed.)*. New York: Oxford University press.
- Haddad, L. (2017). The state of nutrition in Nigeria: from security threat to economic imperative. Global Alliance for Improved Nutrition (GAIN), access from <https://www.gainhealth.org/knowledge-centre/state-nutrition-nigeria-security-threat-economic-imperative/> on 5/09/2019.
- Heltbery, R. (2009). Malnutrition, poverty and economic growth. In *Health Economic* 39(1), 77-88.
- Johanna, C. (2010). Factors contributing to malnutrition in children 0-60 months admitted to hospital in the Northern Cape University of free State, Bloemfontein.
- Manyang, T., El-Sayed, H., Doku, D. T. & Randall, J. R. (2014). The prevalence of underweight, overweight, obesity and associated risk factors among school-going adolescents in seven African countries. *BioMed Central Public health*, 14, 1-11.
- Omobuwa, O., Alebiosu, C. O., Olajide, F. O., & Adebimpe, W.O. (2014). Assessment of nutritional status of in-school adolescents in Ibadan, Nigeria. *South African Family Practice*, 56 (4), 246-250.
- Post Primary Schools Management Board – PPSMB, Enugu & Science Technical and Vocational School Management Board-STVSMB (2017).
- Rhode, S. (2015). A study of prevalence and household socio-economic determinants of malnutrition among school children in Mumbai Metropolitan. *Global Journal of Human Social Science: Economics*, 15, 7.
- Samuel, E. S. (2012). *Our Food: Friend and Foe*. Enugu: Snaap Press Nigeria Ltd.
- Santrock, J. W. (2005). *Children* (8th ed.) New York: McGraw-Hills companies.
- Sarka, M., Manna, N., Sinha, S., Sarka, S., & Pradha, U. (2015). Eating habits and nutritional status among adolescent school girls: An experience from rural area of West Bengal. *Journal of Dental and Medical Sciences*, 14, (12), 06-12.
- SECA gmbh Hamburg Germany (2018).803 Digital Bodyweight scale for measuring weight. <http://www.scalesgalore.com/Seca803.htm>. Accessed on 08/05/18.
- Srivastav, S. Mahajan, H., & Grover, V.L. (2013). Nutritional status of the government school children of adolescent age group in urban areas of District Gautambudhnagar, Uttar Pradesh. *National Journal of Community Medicine*, 4(1), 100-310.
- Thomas, S. (2015). What “does nutritional status” mean? *Livestrong*. Thomas S.(2017). <https://www.livestrong.com/article/444750-what-does-nutritional-status-mean/>. Assessed on 29/7/17
- United Nations’ Children’s Emergency Fund-(UNICEF) (2011). *The State of the World’s Children: Adolescence an Age of Opportunity*. New York, USA: UNICEF
- United Nation Population Fund (2013). Adolescents in India: A Profile UNFPA for UN System in India. UNFPA Annual Report. Accessed from <https://www.unfpa.org/publications/unfpa-annual-report-2013> on 02/09 /17.
- Well, J. C. (2012). Obesity as malnutrition: the role of capitalism in the obesity global epidemic. *American Journal of Human Biology*, 24 (3) 261-276.
- Winstead, E. R. (2008). National Cancer Institute. *Journal of institute of Health*, 5, 3.
- World Health Organization (1995). Physical status: the use and interpretation of anthropometry. Report of a WHO expert committee. *Geneva, WHO Technical Series*, 854 (1), 452.