THE PREVALENCE OF OVERWEIGHT AND ITS RISK FACTORS AMONG ADOLESCENTS IN AN URBAN CITY IN EDO STATE

*VO Omuemu, **CE Omuemu

Departments of *Community Health and **Medicine,College of Medicine,University of Benin, Benin-City, Edo State.Nigeria.

ABSTRACT

Introduction: The prevalence of overweight is rising even in countries with significant rates of under-nutrition. This is exacerbated by westernization of lifestyles and the image of prosperity associated with overweight. Children are not spared and the health consequences may become apparent in the near future. This study assessed the prevalence of overweight among adolescents in an urban city in a developing country.

Methodology: This cross-sectional study conducted from September to December 2005 involved 300 adolescents selected by cluster sampling in Benin-city, Nigeria. Overweight and risk of overweight were defined as Body mass index (BMI)-for-age $\geq$ 95th percentile and BMI-for-age 85th to < 95th percentile respectively.

Results: Of the participants, 5.7% were overweight while 52.7% were at risk of overweight. Risk factors of overweight identified were consumption of snacks (64.3%), soft drinks (85.7%) and physical inactivity (69.7%). Being overweight was significantly associated with consumption of snacks, soft drinks, physical inactivity and positive family history of obesity, (p<0.05).

Conclusion: The high prevalence of risk factors for overweight suggests that the already high prevalence of overweight will increase in the near future. Preventive measures are required to forestall this increase.

INTRODUCTION

The increasing prevalence of overweight and obesity is gaining worldwide attention. Countries with food security and under-nutrition problems are paradoxically not spared due to the fact that mal-distribution of resources and affluence co-exist with abject poverty.[1] This problem appears to be increasing rapidly in children as well. The prevalence of childhood obesity in the United States has risen dramatically in the past several decades with 25-30 percent of children being affected.[2] Studies carried out in Nigeria revealed prevalence of obesity to range from 5.2-18 percent[3,4] and that of "risk of overweight" to be between 3.7-13.7 percent.[3,5] In South Africa, prevalence rates among adolescents of 1.6-3.2% for boys and 4.9-13.4% for girls, have been documented.[6,7] It may soon rival hunger and infectious disease as the world's most pressing public-health problem.[8] Changes in lifestyle, dietary habits, physical activity and the social and cultural environment are associated with the occurrence of obesity.[9]

Obesity increases the risk of developing a number of health conditions including hypertension, Type II diabetes mellitus, coronary heart disease, ischaemic stroke, colon cancer, post menopausal breast cancer, gall bladder disease, osteoarthritis and obstructive sleep apnoea.[10,11] Adults who are obese are at a higher relative mortality risk compared to those who are normal.[12]

Overweight and obesity and their health consequences may have significant direct and indirect economic impact. The direct medical costs include preventive, diagnostic and treatment services related to obesity. Indirect costs include morbidity costs (value of income lost from decreased productivity, restrictive activity and absenteeism) or mortality costs (value of future income lost due to premature death).[13]

Obesity in childhood tends to track into adulthood and this is more likely to persist when its onset is in late childhood or adolescence.[14,15] Overweight adolescents have a 70 percent chance of becoming overweight or obese adults and this increases to 80 percent if one or both parents are overweight or obese.[16] Dyslipidaemia, hypertension and insulin resistance are frequently seen in obese children and these are all carried over into young adulthood. Freedman et al reported that approximately 60% of 5 to 10 year-old children who were overweight had at least one biochemical or clinical risk factor for cardiovascular disease such as hypertension, elevated insulin and hyperlipidaemia and 20% had two or

Correspondence: Dr V O Omuemu
E-Mail: cvomuemu@yahoo.com

more risk factors.[12] Adolescents eventually become the labour force of any society. Their life expectancy and productivity may be compromised by overweight and obesity with potentially grave consequences on the economic and social development of the society.

In Africa, the emphasis has been on under-nutrition and problems of food security rather than overweight and obesity. Trends in overweight and obesity have only been studied in a few countries or population sub-groups, therefore, this study was designed to determine the prevalence of overweight and its predisposing factors among adolescents in an urban city in a developing country. This will provide baseline data upon which intervention programmes can be designed.

SUBJECTS AND METHOD

This cross-sectional, descriptive study was carried out between September 2005 to December 2005 in Oredo Local Government Area (LGA) of Edo State, Nigeria. Oredo LGA is one of the three LGAs making up the Benin metropolis (capital of Edo state) and one of the eighteen LGAs in Edo state. The LGA is sub-divided into twelve political wards and has a total population of about 374,671. The indigenous people are *Binis* and speak the *Edo* language. However, being an urban community, it has a mixture of ethnic groups from various parts of the state and country.

The study population included all adolescents (10-19 years) resident within the LGA. Using a prevalence of obesity of 18%,[4] the minimum sample size was estimated to be 250. Participants were selected by cluster sampling method. Out of the 12 wards in the LGA, two were selected by simple random sampling method (balloting) and all the adolescents (10-19 years) resident in those wards were included in the study.

Data collection was by pre-tested, semi-structured and researcher-administered questionnaire. Information was collected on socio-demographic data (age at last birthday, date of birth, sex, parents' educational status and occupation), habits such as daily exercises, outdoor and indoor activities, consumption of snacks and sugar-sweetened carbonated drinks (soft drinks). The body weight was measured to the nearest 0.1kg with a bathroom scale placed on a firm horizontal surface and with light clothes and without shoes. The zero was checked each day and the scale standardized by reference to a 50kg standard weight just before calibration. The height was measured to the nearest 0.1m using a measuring tape fitted with a sliding head-piece to avoid parallax effect, the subject standing erect, barefoot and the back against a wall without head coverings. Physical activity was assessed using open-ended questions to inquire about average activity during work and leisure time. Those engaged mainly in activities such as television watching, playing video games and internet browsing were classified as physically inactive while those engaged mainly in activities such as playing football, hawking, household chores were classified as physically active.

Consumption of snacks (such as meat-pies, doughnut, cakes, buns, etc) and carbonated/sugar sweetened drinks (350mls of soft drink) on a daily basis were assessed. Interviewers had a common training programme conducted by the principal investigators. The training included standardization of methods of questionnaire administration and measurement of anthropometric indices. This was to ensure accuracy, reduce inter- and intra-observer errors and ensure comparability of study participant's responses and measurements.

Body mass index (BMI) was calculated by dividing the subject's weight by the square of the height (kg/m^2) and the Center for Disease Control (CDC) BMI-for-age growth chart was used because it takes into account normal differences in body fat between boys and girls and differences in body fat at various ages.[17] BMI- for- age is used to track body size throughout the lifecycle since the childhood index is consistent and a determinant of the adulthood index.[9]

The Centre for Disease Control and Prevention defines 'overweight' as being at or above the 95th percentile of BMI-for-age and 'at risk of overweight' as being between 85th and 95th percentile of BMI-for-age.[18] 'Overweight' rather than 'obesity' is the term preferred for describing children and adolescents with BMI-for-age equal to or greater than 95th percentile of BMI-for-age. Therefore, obesity and overweight was used interchangeably in this study. Parents' body mass index was also calculated and obesity was defined as BMI $\geq 30.00 \, Kg/m^2$)[11]

The adolescents were classified into three groups using the World Health Organization (WHO) definition: Early Adolescence (10-13 years), Mid-Adolescence (14-15 years) and Late Adolescence (16-19 years).[19]

A total of 300 adolescents participated in the study after excluding acutely-ill, hospitalized and pregnant adolescents. All the adolescents were interviewed in their homes after informed verbal consent was sought and obtained from parents/guardians.

Data was analyzed using the Statistical Package for Social Sciences (SPSS) software, version 11. Test of association using the chi-square test was done where appropriate and differences were considered significant at p less than 0.05.

RESULTS

Three hundred adolescents between the ages of 10 and 19 years were involved in the study. The study

population was made of 155 (51.7%) males and 145 (48.3%) females and their mean age was 15.3 ± 1.9 years. Table 1.

Table 2 shows the distribution of risk factors of overweight and obesity among the respondents. Two hundred and fifty-seven (85.7%) of them consumed soft drinks daily while 193 (64.3%) of them consumed snacks such as meat-pies, doughnut, cakes, buns, etc on a daily basis. The respondents consumed 2.1 bottles of soft drinks (350 mls per bottle) on the average. Only 91 (30.3%) of the adolescents were involved in physical exercises on a daily basis while the rest 209 (69.7%) were physically inactive. All the respondents were involved in one indoor activity or the other and 123 (41.0%) were involved in outdoor activities. The indoor and outdoor activities carried out by the respondents are shown on Table 3. The indoor activities engaged included watching television (90.7%), playing video games/internet browsing (60.3%), reading novels, books and newspapers (45.0%), conversing (43.0%) and listening to music (38.0%). Others are playing cards/ludo/monopoly games (30.0%), household chores (16.7%) and sleeping (4.3%). Outdoor activities included football games (70.0%), jogging (48.0%), basketball games (35.0%), press-ups (18.7%), swimming (15.4%), hawking (12.2%) and volley ball games (6.5%).

One hundred and fifty-eight (52.7%) of the respondents were at risk of over-weight (85th 95th percentile of BMI-for-age) while 17 (5.7%) were over-weight/obese (> 95th percentile of BMI-for-age). The female adolescents had a higher proportion of those at "risk of over-weight" and "over-weight" than the male adolescents, 55.2% against 50.3% for "risk of over-weight" and 6.9% and 4.5% for "over-weight" but these differences are not statistically significant, $X^2 = 7.24$, df = 3, p = 0.0646.

Table 4 shows the relationship between body mass index and the risk factors of overweight and obesity. A significantly higher proportion of 'risk of overweight' (61.5%) and 'obesity' (6.6%) were found among those who consumed soft drinks on a daily basis than those who do not (0.0%). $X^2 = 127.61$, df = 2, p < 0.0001. A significantly higher proportion of 'risk of overweight' (65.8%) and 'obesity' (7.8%) were found among those who consumed snacks on a daily basis than those who do not (29.0% and 1.9% for 'risk of overweight' and 'obesity', respectively), $X^2 = 52.54$, df = 3, p < 0.0001. There was a significantly higher proportion of 'risk of 'overweight' (58.9%) and 'obesity' (6.7%) found among those who were physically inactive than those who were not, (38.5% for 'risk of over-weight' and 3.3% for 'obesity', respectively), $X^2 = 15.675$, df = 3, p = 0.0013.

Majority of the respondents who were obese (82.4%)

and those 'at risk of overweight' (80.4%) had all three risk factors assessed (soft drinks, snacks and physical inactivity) present compared with only 58.9% of those with normal weight and 10.7% of those who were underweight, $X_c^2 = 85.925$, df = 6, p = 0.000.

Table 1: Demographic Characteristics of Respondents.

Characteristics	Frequency (N = 300)	Percent
Age group (years)		
10-13	53	17.7
14-15	151	50.3
16-19	96	32.0
Sex		
Male	155	51.7
Female	145	48.3
Social class		
I	64	21.3
II	48	16.0
III	90	30.0
IV	58	19.3
V	40	13.3
Religion		
Christianity	262	87.3
Islam	30	10.0
Others	8	2.7

Table 2: Distribution of Risk Factors of Overweight among Respondents.

Risk factors	Male (N=155) Freq %	Female (N=145) Freq %	Total (N=300) Freq %
Consumption of soft drinks daily			
Yes	131 (84.5)	126 (86.9)	257 (85.7)
No	24 (15.5)	19 (13.1)	43 (14.3)
$X^2 = 0.3457$, df = 1, p = 0.6223			
Consumption of snacks daily			
Yes	79 (51.0)	114 (78.6)	193 (64.3)
No	76 (49.0)	31 (21.4)	107 (35.7)
$X^2 = 24.967$, df = 1, p < 0.0001*			
Physical inactivity			
Yes	101 (65.2)	108 (74.5)	209 (69.7)
No	54 (34.8)	37 (25.5)	91 (30.3)
$X^2 = 3.08$, df = 1, p = 0.0792			

*Statistically significant

Table 3: Indoor and Outdoor Activities among Respondents.

Variable	Frequency	Percent
Indoor activities (N = 300)		
Watching television	272	90.7
Video games/ Internet browsing	181	60.3
Reading	135	45.0
Talking on the phone	129	43.0
Listening to music	114	38.0
Cards/Ludo/Monopoly	90	30.0
Household chores	50	16.7
Sleeping	13	4.3
Outdoor activities (N = 123)		
Football	86	70.0
Jogging	59	48.0
Basketball	43	35.0
Press-ups	23	18.7
Swimming	19	15.4
Hawking	15	12.2
Volley ball	8	6.5

Table 4: **Association between BMI-For-Age and Risk Factors of Over-Weight.**

Variables	BMI For	Age			
	Underweight Freq %	Healthy weight Freq %	Risk of Overweight Freq %	Overweight Freq %	p-value
Soft drinks					
Yes (n=257)	6 (2.3)	76 (29.6)	158 (61.5)	17 (6.6)	
No (n = 43)	22 (51.2)	21 (48.8)	0 (0.0)	0 (0.0)	<0.0001*
Snacks					
Yes (n =193)	10 (5.2)	41 (21.2)	127 (65.8)	15 (7.8)	
No (n = 107)	18 (16.8)	56 (52.3)	31 (29.0)	2 (1.9)	<0.0001*
Physical inactivity					
Yes (n = 209)	18 (8.6)	54 (25.8)	123 (58.9)	14 (6.7)	
No (n = 91)	10 (11.0)	43 (47.3)	35 (38.5)	3 (3.3)	0.0013*
Presence of risk factors					
All	3 (10.7)	58 (59.8)	127 (80.4)	14 (82.4)	
Some	15 (53.6)	14 (14.4)	31 (19.6)	3 (17.6)	
None	10 (35.7)	25 (25.8)	0 (0.0)	0 (0.0)	0.000*
Total(n= 300)	28 (9.3)	97 (32.3)	158 (52.7)	17 (5.7)	

*Statistically significant

(Table 4) Family history of obesity (that is, one or both parents were obese) was positive in 84.2% of obese adolescents compared with 2.2% of those who were not obese and the difference was statistically significant, $X^2 = 152.27$, df = 1, p = 0.000.

DISCUSSION

This study has shown very high levels of risk factors of overweight and obesity among these adolescents. We also found that more than two-thirds of them were physically inactive, consumed soft drinks (sugar-sweetened drinks) and snacks on a daily basis. The prevalence of obesity of 5.7 percent found in this study is comparable to what has been reported elsewhere in Nigeria (5.2%)[3] and in Tunisia (5.1%)[20]. A higher prevalence of obesity and risk of overweight found among females in this study is also in agreement with reports from several studies.[6,7, 21-23] It is noteworthy that more than half of the study population was at 'risk of over-weight' (85th - 95th percentile of BMI-for-age). This is a very serious problem as they are at increased risk of becoming obese as adults and consequently are at higher risk of subsequent health problems.[12]

As found in related studies,[9, 24] the consumption of snacks and soft drinks on a daily basis was significantly associated with over-weight among our study population. It has been shown that the body mass index of children increased for each serving of sugar-sweetened drink per day and the risk of becoming obese increased from 1-6 times for each additional can or glass of sugar-sweetened drink consumed every day.[25] Dietary factors, particularly the level of fat and energy intake are strongly associated with excess body weight[11] and this may play an important role in the rise of obesity. This is particularly true with large shift from traditional types of diet to more westernized diets which are characterized by high fat, high cholesterol and low fibre. Among the changes that affects children's energy intake are the increasing availability of high calorie foods and drinks at their schools. Changes in the family set-up particularly an increase in numbers of working mothers may also increase the demand for foods away from home.[14]

Physical activity patterns have an important influence on the physiological regulation of body weight especially total energy expenditure, fat balance and food intake. As was the case in our study, an inverse relationship between BMI and physical activity has been reported by several studies[11, 26] suggesting that decreased physical activity and increased sedentary lifestyles play a role in weight gain and development of obesity. A sedentary lifestyle involving physically passive activities such as television viewing, reading, working on the computer (including playing video games and browsing the internet) and talking with friends on the

telephone was high among our study population and has been reported to be associated with obesity among children and adolescents.[27-29] This is cause for concern and has been attributed to urbanization and advances in technology in which labour saving devices at home and at work have freed people from tasks involving a lot of effort and energy expenditure. The proliferation of cheap and easily available communication and gaming devices has contributed to leisure time being dominated by physically inactive pastimes.

A disturbing finding in this study was that the majority of those who were obese and 'at risk of overweight' had all three risk factors (soft drinks, snacks and physical inactivity) assessed present compared with those who were not. This further buttresses the fact that a combination of high energy intake and physical inactivity contribute to the development of overweight and obesity.

Our finding of a significant correlation between a family history of obesity and overweight in the respondents requires further attention. The prevention of overweight by eliminating its other modifiable risk factors in their offspring is therefore absolutely essential. This finding is not surprising since a significantly higher proportion of positive family history of obesity found among obese adolescents has been reported elsewhere.[20]

In conclusion, this study has demonstrated a high level of over-weight and its risk factors among adolescents in Benin-City, Edo State. It is to be expected from these findings that the prevalence of obesity will increase in the near future unless definite steps are taken to reverse this trend. Considering the known consequences of overweight it is therefore recommended that policy makers should be made aware of the extent of this problem as well as its health and socioeconomic implication on the individual, family and nation. It is essential that relevant strategies to combat it be put in place immediately. A national programme including nutrition education and promotion of physical activity would go far in addressing the issues raised by the findings of this study.

ACKNOWLEDGEMENT

REFERENCES

1. **Masaiger AO.** Overweight and obesity in the Eastern Mediterranean Region: Can we control it? Eastern Mediterranean Health Journal, 2004; 10 (6): 789-93.

2. **Moran R.** Evaluation and Treatment of Childhood Obesity. The American Academy of Family Physicians. 1999; 59(4): 60.

3. **Senbanjo IO, Adejuyigbe EA.** Prevalence of overweight and obesity in Nigerian pre-school children. Nutrition and Health, 2007; 18(4): 391-99.

4. **Owa JA, Adejuyigbe O.** Fat mass, fat mass percentage, body mass index and mid-upper arm circumference in a healthy population of Nigerian children. J Tropic. Paediatrics, 1997; 43: 13-19.

5. **Ben-Bassey UP, Oduwale AO, Ogundipe OO.** Prevalence of overweight and obesity in Eti-Osa LGA, Lagos, Nigeria. Obes rev. 2007; 8(6): 475-9.

6. **Mamabolo RL, Kruger HS, Lennox A, Monyeki MA, Pienaar AE, Underhay C, et al.** Habitual physical activity and body composition of black township adolescents residing in the North-West Province South Africa. Public Health Nutr. 2007; 10(10): 1047-56.

7. **Armstrong MEG, Lambert MI, Sharwood KA, Lambert EV.** Obesity and overweight in South African Primary school children: the health of the nation study. South African Medical Journal, 2006; 96(5): 439-44.

8. **Wangnoo SK.** Adolescent obesity is like an epidemic. Awake, 2004 Nov;3.

9. **Whitaker RC, Wright JA, Pepe MS, Seidel KO, Dietz WH.** Predicting Obesity in Young Adulthood from Childhood and Parental Obesity. N. Engl Journal Med 1997; 37(13): 869-73.

10. **Dietz WH.** Childhood weight affects adult morbidity and mortality. Journal of Nutrition, 1998; 128(Suppl.2): 411s-4s.

11. WHO - Obesity: Preventing and Managing the Global Epidemic. Geneva, World Health Organization, 1998. (WHO Technical Report Series, No. 894).

12. **Freedman DS, Dietz WH, Srinivasan SR, Berenson GS.** The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. Paediatrics, 1999; 103: 1175-82.

13. **Wolf AM, Colditz GA.** Current estimates of the economic cost of obesity in the United States. Obesity Research, 1998; 6(2): 97-106.

14. **Anderson PM, Butcher KE** - Childhood Obesity: Trends and Potential Causes. Future Child, 2006; 16(1): 19-45.

15. **Power C, Lake JK, Cole TJ.** Measurement and Long-term Health Risks of Children and Adolescent Fatness. Int. J. Obesity Related Metabolic Disorder 1997;

16. United States Department of Health and Human Services The Surgeon General's call to Action to prevent and Decrease Overweight and Obesity: Overweight in Children and Adolescents
.   www.surgeongeneral.gov/topic/obesity/call to action. January 11, 2007.

17. **Pietrobelli A, Faith MS, Allison DB, Gallagher D, Chiumello G, Heymsfield SB.** Body mass index as a measure of adiposity in children and adolescents: a validation study. Journal of Paediatrics 1998; 132: 204-10.

18. **Barlow SE, Dietz WH.** Obesity evaluation and treatment: Expert Committee Recommendations. Journal of Paediatrics, 1998; 102(3): e29.

19. WHO. Adolescent Friendly Health Service. An agenda for change; who are adolescents? Geneva, WHO, 2003; 5.

20. **Blouza-Chabehoub S, Rached-Amrouche C, Jamoussi-Kammoun H, Bouchaa N.** Frequency and risk factors of obesity in Tunisian adolescents. Tunis Med. 2006; 84(11): 714-6.

21. **Adeleke E.** The prevalence of childhood obesity in Ekiti State of Nigeria. Obesity Report, 2005; 1.

22. **Afaine F.** Body composition in urban children aged 6-13 years. Biol. Sci J Warri, 2001; 2: 62-7.

23. **Jinabhai CC, Reddy P, Taylor M, Monyeki D, Kambaran N, Omardien R et al.** Sex differences in under and over-nutrition among school going black teenagers in South Africa: an uneven nutrition trajectory. Trop. Med. Int. Health, 2007; 12(8): 944-52.

24. **Dehghan M, Aktar-Danesh N, Merchant AT.** Childhood obesity, prevalence and prevention. Nutrition, 2005; 4: 24.

25. **Ludwig DS, Peterson KE, Gortmaker SL.** Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. Lancet, 2001; Http://www.coloradohealthsite.org/CHNReports/sodas_childobesity.html

26. **Al-Rafaee SA, Al-Hazzaa HM.** Physical activity profile of adult males in Riyadh City. Saudi Medical Journal, 2001; 22(9): 78-9.

27. **Musaiger AO.** Socio-cultural factors affecting obesity in Arab countries. Bahrain Centre for studies and Research, 2003; (Technical Report).

28. **Swinburn B, Egger G.** Preventive strategies against weight gain and obesity. Obes. Rev, 2002; 3: 289-301.

29. **McVeigh JA, Norris SA, DeWet T.** The relationship between socio-economic status and physical activity patterns in South African children. Acta paediatr. 2004; 93: 982-88.