Feeding Habits associated with overweight and obesity amongst secondary School students in Private and Public schools in Langata Nairobi Kenya

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Abstract- **Background**; Obesity continues to pose major public health challenges globally. This study was conducted to determine the prevalence of overweight /obesity amongst secondary school students in private and public schools in Langata Nairobi and identify the feeding habits associated with it.

Methods: A cross-sectional descriptive survey was carried out on 292 boys and girls from both public and private secondary schools in Langata sub county Nairobi. Multistage random sampling was used to select the study participants. Data was collected using a self administered questionnaire and direct anthropometric measurements of height and weight which was used to calculate Body mass index. The World Health Organization (WHO) Age and gender specific BMI- for –age Z-scores (BAZ) was used to classify nutrition status. Data was analyzed using SPSS version 20 and WHO AnthroPlus software. Descriptive statistics were used to analyze quantitative variables. The Chi square tests were used to determine any association between selected variables such as age, gender, type of school (private or public), boarding or day, parent/guardian car(s) ownership, feeding habits such as fruit and vegetable consumption, missing breakfast, snacking, caring about portion size and overweight and obesity using 0.05 as the level of significance. For the variables that were significant at bivariate, analysis proceeded to logistic regression. **Results:** The prevalence of overweight and obesity was 17.8 %(16.96% among males and 20.59% among females). It was significantly higher in private (23.45%) than public schools (12.24%) with a computed p=0.047Additionally, being a boarder p=0.004, parents' ownership of car(s) p=0.004 and not caring about the portion size of food eaten p=0.008 were also significantly associated with overweight and obesity. **Conclusion**: The prevalence of overweight and obesity in this study is high especially among girls and should be of public health concern to policy planners .**Recommendation**: The government should consider increasing time for physical education in schools and introducing some levy on junk food in addition to a school health and fitness programme involving parents.

Index Terms- Adolescents, Body Mass Index, Kenya, Obesity, Overweight

I. INTRODUCTION

Worldwide, obesity prevalence has nearly doubled between 1980-2014. According to the World Health Organization (WHO 2016), more than 1.9 billion adults 18 years and older were overweight. Out of these 600 million were obese. In 2014, approximately 35% of adults 18yrs and above were overweight (WHO,2016) WHO defines overweight and obesity (OWO) as abnormal or excessive fat accumulation that may impair health. Overweight and obesity in adults are classified using Body mass Index (BMI) which is a simple index of weight for height. It is defined as a person's weight in Kilograms divided by the square of his height in meters (kg/m^2). A BMI greater than or equal to 25 but less than 30 is considered overweight while a BMI greater than or equal to 30is said to be obesity (WHO, 2011). With research strongly associating parental obesity as a risk factor for childhood obesity, this may be a pointer to increasing rates in school going children. In a study amongst 9-14 year olds, 29% children in private and 11.5% of those in public schools were found to be OWO (Kyallo *et al.,* 2013). Adamo *et al.,* (2010) found that 16.7% of the girls and 6.8% of the boys in urban areas in Kenya were obese/ overweight. Though the process of overweight and obesity (OWO) development is not well understood, it is believed to have manifold causes. It is believed to be caused due to an imbalance between energy intake and expenditure where the intake supersedes expenditure (Kyallo *et al*., 203). Several studies have associated socio economic status with OWO (Sztainer *et al.,* 2002; Adesina *et al.,* 2012; Kyallo *et al.,* 2013). Although OWO has been shown to be more prevalent in subpopulations with low SES in the developed countries the reverse is true in the developing countries (Kyallo et *al.,* 2013). KDHS 2008/2009 reported a higher prevalence among women of high SES (KNBS *et al.,* 2010). Overweight and obesity are the fifth leading risk for global deaths (WHO, 2011). WHO estimates that at least 2.8 million adults die each year as a result of being overweight /obese. In addition, 44% of the diabetes burden, 23% of the ischemic heart disease burden and between 7% and 41% of certain cancer burdens are attributable to overweight and obesity (WHO, 2011). A recent study by Katz *et al.*, 2013 found that obese adolescents were at greater risk of sensori neural hearing loss.

The feeding habits that one acquires during adolescence greatly contribute to obesity (Sztainer *et al.,* 2002). Hanley *et al.,*

(2000) found that it is not only the amount of food intake but also its dietary composition and quality are factors that determine the prevalence of overweight/obesity. This is because dietary patterns, particularly among children and adolescents, which have been marked by low consumption of fruits and vegetables and an increased consumption of sandwich biscuits, snacks, sweets, and sodas, have often been associated with the overweight/obesity in this range. Another study by Corder *et al*., (2011) also revealed that frequent breakfast consumers had a higher total intake of energy but had lesser chances of being overweight than their counterparts who skip breakfast. Studies have found an association between teenage overweight and adulthood obesity (Domingo *et al.,* 2007) especially among girls (Murage, 2013) a risk factor for early deaths, cardiovascular diseases, hypertension, some types of cancers asthma, and obstetric problems in adulthood. Most linked to schooling are stigmatization (Pearce *et al.,* 2002; Bray, 2004) and hearing loss which may affect learning (Katz *et al.,* 2013).

Hence, this study sought to determine the prevalence of overweight and obesity amongst high school students in public and private schools and to identify the feeding factors associated with it as a follow up on other studies (kyallo *et al.,* 2013). Most importantly it sought to generate evidence that will be brought to the attention of the concerned parties i.e. parents, schools, policy makers such as the Ministry of Education (MoEST), Ministry of Health (MOH) so as to take action towards preventing it.

II. MATERIALS AND METHODS

Study design, setting, population

This cross sectional descriptive survey was carried out over a period of two weeks   on 14-18 year old secondary school boys and girls in Langata sub county, Nairobi Kenya. Langata is a residential area in Nairobi which comprises of areas such as Karen inhabited by people of high socioeconomic class and Kibra, a slum. In essence, opulence and poverty thrive within Langata. Like most of Nairobi city Langata is well served with hotels, restaurants such as Ken chic, java and a good road network, modern congested housing hence a sedentary lifestyle is unavoidable

Sample size, Ethical approval, inclusion/exclusion criteria.

Ethical approval was sought from Institutional Research and Ethics Committee (IREC) of Moi University, and study approval from National Commission for Science, Technology and Innovation (NACOSTI). Based on a previous study by Kyallo *et al.,* 2013, Varkessier's. *et al,* 2003 formulae n=p1(1-p1)+p2(1-p2)e^2 was used to select 292 boys and girls to participate in the study using Multistage sampling technique since this was a comparative study. Students suffering from any known illnesses such as heart disease, asthma, sickle cell were also excluded from the study (Adesina *et al.,* 2012). The school Principals and parents signed consent forms whereas students signed assent forms having been told that participation was purely on voluntary basis.

Data Collection procedure

Data was collected using a piloted self administered questionnaire in which the students were asked to fill in their socio demographics such as age, gender (Mesas *et al*., 2012) type of school (private/public. boarding/day) (Kyallo *et al.,* 2013), type of residence, mothers level of education,, car ownership by parents/guardians, amount of pocket money given per month, qualification for Constituency development fund for school fees subsidy. They also self reported on their feeding habits such as frequency of snacking (Goldfield *et al.*, 2011), fruits and vegetable consumption (Mello *et al*., 2010), frequency of skipping breakfast (Corder *et al.,* 2011) mindful eating, (Mesas *et al*., 2012) consumption of soda and other sweetened drinks (Malik *et al.,* 2006

Anthropometric measurements of weight and height were also taken by two trained research assistants (Male and Female) and used to calculate BMI. The students were lightly dressed in a private room (Kyallo *et al.,* 2013)   They used a Ramtons scale Model RM 285, Serial no 0341410255 for measuring weight and a stadiometer for measuring height. Weight was taken without shoes, lightly dressed and recorded to the nearest 0.1kg. Height was taken without shoes feet together and arms by the sides looking straight ahead and the head rest pressed firmly on the head. Both measurements were taken twice and the average recorded. For avoidance of inter observer bias, one research assistant took the measurements while the other recorded them. (Adesina *et al.,* 2012).

Nutrition Status reference Standard:

Body Mass Index was then calculated as Weight in kg/ divided by height in meters squared. BMI for age Z scores were then computed using WHO. AnthroPlus software. Classification of overweight and obesity was then determined using WHO gender specific BMI-for-age- Z scores (BAZ) for children 5-19 yrs as follows. Underweight= BAZ $\leq$-2SD, Normal=-2SD<BAZ$\leq$1SD, Overweight= +1SD<BAZ$\leq$+2SD, Obese=BAZ > +2SD, Overweight/obese= BAZ>+1SD (Kyallo *et al.,* 2013).

Data Analysis:
Data was analyzed using SPSS version 20 and WHO AnthroPlus software. Descriptive statistics were used to analyze quantitative variables such as age, BMI, Weight, height. The chi-square tests were used to determine any association between selected variables such as age, gender, type of School (private or public), boarding or day, feeding habits such as snacking, fruit and vegetable consumption, missing breakfast and overweight and//obesity using 0.05 as the level of significance. For the variables that were significant at bivariate, analysis proceeded to Logistic regression.

III. RESULTS

Demographic Characteristics of the respondents

A total of 292 participants took part in the study. The response rate was 100%. There were 224 boys and 68 girls aged 14-18yrs from both public and private, boarding and day schools across all classes from form 1-4. The majority of female students (45) were from public schools whereas only 23 were from private schools. Most of the boarding students (145) were from private schools and only 73 were from public schools. Their mean age of all the students was 16.08yrs. (Table 1)

Anthropometric characteristics by gender and school type

On average the girls had a higher BMI (22.30 SD 4.69) than the boys (21.61 SD4.31). Comparatively the average BMI for

students in private schools (22.73) was higher than in public (21.36). (Table 2)

Nutrition status of students by school type and gender

According to table 3 overweight and obesity was higher in private (23.45%) than public (12.24%) schools. Overweight and obesity among boys in private schools (23%), was 2.3 times higher than among boys in public schools (9.8%). Girls in private schools were 1.5 times likely to be overweight or obese (26.1%) than their counterparts in public schools (17.8%

Table 1: Demographic characteristics of the students by type of school (n=292)

Demographic characteristics of the students	n (N = 292)	Percentage	Public n (%)	Private n (%)
Gender:				
Male	224	76.7	102 (45.5)	122 (54.5)
Female	68	23.3	45 (66.2)	23 (33.8)
Type of School:				
Private	145	49.7		
Public	147	50.3		
Age:				
14	46	15.8	15 (32.6)	31 (67.4)
15	51	17.5	22 (43.1)	29 (56.7)
16	71	24.3	33 (46.5)	38 (53.5)
17	82	28.1	48 (58.5)	34 (41.5)
18	42	14.4	29 (69.0)	13 (31.0)
Known Health Conditions:				
Yes	0	0	0 (0)	0 (0)
No	292	100	147 (50.3)	145 (49.7)
Class:				
Form 1	80	27.4	41 (51.2)	39 (48.8)
Form 2	78	26.7	36(46.2)	42(53.8)
Form 3	73	25	41 (56.2)	32 (43.8)
Form 4	61	20.9	29 (47.5)	32 (52.5)
Boarder/ Day Scholar				
Boarder	218	74.7	73 (33.5)	145 (66.5)
Day Scholar	74	25.3	74 (100)	0 (0)

Table 2 Anthropometric characteristics by gender and school type

	All (Mean, SD)		Private Schools(Mean, SD)		Public Schools(Mean, SD)	
	Male n=224	Female n =68	Male n=122	Female n=23	Male n=102	Female n=45
Weight (Kg)	60.49 (11.60)	57.24 (9.18)	61.82 (12.39)	55.55 (8.44)	58.89 (10.43)	58.10 (9.51)
Height (m)	1.68 (0.1)	1.61 (0.10)	1.67 (0.10)	1.57 (0.14)	1.68 (0.09)	1.63 (0.07)
Mean BMI	21.61 (4.31)	22.30 (4.69)	22.20 (4.68)	23.26 (6.35)	20.90 (3.72)	21.82 (3.55)

Table 3: Nutrition status of students by school type and gender

	All		Private Schools		Public Schools	
	Private n=145 %	Public n=147 %	Male n=122 %	Female n=23 %	Male n=102 %	Female n=45 %
Underweight	2.8	4.8	3.3	0.0	5.9	2.2
Normal	73.8	83.0	73.8	73.9	84.3	80
Overweight	10.3	7.5	10.7	8.7	5.9	11.1
Obese	13.1	4.8	12.3	17.4	3.9	6.7
Overweight & Obese	23.4	12.3	23.0	26.1	9.8	17.8
PREVALENCE OF OVERWEGHT/OBESITY	17.8		23.45		12.24	

Socio demographic characteristics of OWO students and the normal weight students

There was a significant difference in OWO rates based on the type of school (p=0.047), being a boarder or a day-scholar (p=0.0020) and ownership of car(s) by parents (p=0.028). However within the schools there was no significant difference in overweight and obesity rates between boys and girls (p=>0.05) (Table 3). The average monthly Pocket money for the OWO students was higher (Ksh.1, 586.4) than the average monthly pocket money for the normal weight students (Ksh.1, 111.5) across all ages. 16yrs had the highest proportion of the normal weight students (92.96%) and only (7.04% were overweight and obese. Prevalence of OWO had a positive association with class, gradually increasing from form 1-4 (f1:15%, f2: 17.95%, f3: 19.18%, and f4: 19.67%). (Table 4)

Table 4: Comparison of demographic characteristics of the normal weight and OWO students

Socio-Demographic Factors	Normal weight (%)	Overweight & Obese (%)	p-value
Type of School:			0.047 *
Private	76.55	23.45	
Public	87.76	12.24	
Boarder/Day Scholar:			0.020*
Boarder	78.44	21.56	
Day Scholars	93.24	6.76	
Mother's Level of Education:			0.288
Did not finish high school	85.29	14.71	
Diploma	90.00	10.00	
Degree	77.27	22.73	
Age:			0.065
14	78.26	21.74	
15	75.55	27.45	
16	92.96	7.04	
17	81.70	18.29	
18	80.95	19.05	
Gender:			0.653

Male	83.04	16.96	
Female	79.41	20.59	
Class:			
F1	85.00	15.00	0.782
F2	82.05	17.95	
F3	80.82	19.18	
F4	80.33	19.67	
Parent car ownership			
Yes	77.02	22.98	0.028*
No	88.55	11.45	

* p<0.05, statistically significant

Feeding habits associated with overweight and obesity.

Genetics predisposes one to OWO, however environmental factors such as poor feeding habits greatly influence overweight and obesity.

Three-day feeding was used as the yardstick in this study and information on the weekly feeding habits was collected whereas 2 meals was the yardstick for the daily feeding habits. The study revealed that 41.2% of the students who cared about the portion size of food they ate were overweight /obese compared to 58.8% of those who did not care about the portion size of food they ate. This habit together with how often a student ate snacks after or between meals per week as well as how often they drank water before meals in a day had p- values of less than 0.05, (Table 5.) and their analysis proceeded to the logistic regression level.

Table 5: Feeding habits of the normal weight vs. OWO students

Feeding Habit	Normal weight (%)	Overweight & Obese (%)	p-value
Missed breakfast in a week			0.974
Less than 3 days	81.51	18.49	
3 or more days	88.89	11.11	
Snacks consumption in a week			0.019 *
Less than 3 days	78.91	21.09	
3 or more days	84.76	15.24	
Daily 3 servings of fruits in a week			0.203
Less than 3 days	89.02	10.98	
3 or more days	79.52	20.48	
Daily 2 servings of vegetables in a week			0.124
Less than 3 days	88.95	11.05	
3 or more days	71.17	28.83	
Sweetened juices consumption in a week			0.074
Less than 3 days	74.34	25.66	
3 or more days	87.15	12.85	
Control of amount of food eaten in day			0.169
Less than 3 times	90.48	9.52	
3 or more times	79.91	20.09	

Consumption of water before meals in a day			
Less than 3 times	76.60	23.40	0.049*
3 or more times	84.85	15.15	
Adding blue band or margarine to cooked food in a day			
Less than 3 times	72.73	27.27	0.2000
3 or more times	82.56	17.44	
Caring about portion size			
			0.002*
Yes	61.8	41.2	
No	38.2	58.5	

*=p<0.05, statistically significant

Predictors of overweight and obesity

The Chi-square Tests were used to determine if there was any significance between the variables and OWO status. The 7 variables that were found to have an association with OWO status at bivariate level were included in the logistic regression analysis. Logistic regression analysis was employed to determine which variables could best predict OWO status.

The only demographic predictor that made a significant difference in rates of OWO was being a' boarder or a day scholar.' p= 0.004. This shows that chances of a student being OWO were affected by whether he/she was a boarder or a day scholar. Boarders were 2.34 times more likely to be OWO compared to day scholars (OR 2.34, C.I: 0.88-

.623). The type of school the student attended did not make any significant difference in OWO rates (sig. 0.809 > 0.05).Parents' car(s) ownership was the only socio-economic predictor that made a significant difference in OWO rates (sig. 0.004). The chances of being OWO were 2.36 times higher among students whose parents owned car(s) compared to those whose parents did not own a car (OR 2.358, C.I.: 1.35- 4.226). The analysis further revealed that caring about portion size of food eaten was the only feeding habit predictor that made a significant difference in OWO rates (sig. 0.008). The chances of being OWO were 2.31 times higher amongst those who did not care about the portion size of food they ate compared to those who cared (OR 2.308, C.I.: 1.247-4.272).

IV. DISCUSSION

Prevalence of OWO among secondary school students.

The prevalence of OWO in this study was found to be 17.8% and was significantly higher   in private than public schools suggesting a positive association with socio economic status. This study assumed that private schools serve those from high socio economic status whereas public schools serve those from low socio economic status since the school fees is low at Ksh 53000 (MoEST, 2014) due to government subsidy This finding is similar to many studies (Adesina *et al.,* 2012, Kyallo *et al*., 2013, H. T. Le *et al.,* 2013, Ene-obong *et al.,* 2012). A higher SES increases a household's purchasing power particularly of high calories food such as sweets, chocolates, junk. This together with decreased physical activity greatly contributes to fat accumulation in most population groups (Adamo *et al*., 2011, Adesina *et al*., 2012, H.T. Le *et al*., 2013, Kyallo *et al*., 2013).

However these findings are different from (Dehghan *et al*., 2005) where the prevalence of OWO among children in the US was almost twice the prevalence in this study at 36% (25% overweight and 11% obese). This is not surprising because comparatively US is a stronger economy than Kenya given that studies have found a positive association between OWO and high SES. After finding a higher prevalence among girls, Adesina *et al*., (2012) concluded that   this could be because adolescent girls usually have an increase in fat mass as opposed to boys whose fat mass stabilizes and instead increase their fat free mass. Car(s) ownership was a significant factor (p=0.028) to OWO. The odds of being OWO were2.3 times higher amongst students whose parents own car(s) compared to those students whose parents didn't own car(s). For the students whose parents owned cars, 22.98% were OWO compared to just 11.45% of those whose parents did not own cars. In Kenya currently, owning a car(s) is a symbol of high SES. The fact that it had a positive association with OWO in this study is a pointer to the positive association between OWO and SES. Being in boarding or day schooling made a significant difference in OWO rates (p=0.020) as the odds of being OWO was 2.3 times higher amongst boarders compared to day scholars. Therefore it is conclusive that being a day scholar had a protective effect on the students. This is not surprising because there were no private day schools in the study as all private schools were boarding schools whereas in the public schools category there were day scholars. This again supports the association between OWO and SES. The day scholars may also be accessing healthier foods prepared at home (Adesina *et al*., 2012). Additionally they could be walking to school which helps in shedding off some weight).   Food insecurity has also been found to have an association with overweight among low income families especially among women. A possible explanation for this could be that high calorific foods are cheaper than fruits, vegetables, lean meats and fiber rich foods (Mello *et al., 2010*).

Feeding habits associated with overweight and obesity

The frequency of snacking between meals made a significant difference in OWO rates in this study (p=0.019) similar to (Marin-Guerrero *et al*., 2008) and contrary to other studies (Adesina *et al*., 2012, Field *et al*., (2004), Phillips *et al*., 2004). However the study by Field *et al*., (2004) had limitations as the sample size was not a random representative of all the adolescents of the US. Snacks may cause overweight threefold. First and foremost most snacks are fatty and therefore laden with

calories, secondly they are eaten together with but not replacing meals and lastly sweet snacks may promote hunger and appetite and thus promote eating.   Caring about portion size of food to eat had a significant association with OWO similar to (Mesas *et al.*, 2012). When OWO students were compared to their normal weight counterparts, only 41.2% p=0.002 reported caring about the amount of food they ate and a majority (58.8%) reported not caring at all in comparison to the normal weight students who 61.8% cared about how much they ate and only 38.2% did not care. However the author could not get similar studies on this, but given that majority of the students ate a lot of snacks across all ages as discussed earlier, If they ate them in large quantities then OWO was inevitable since snacking may cause OWO as stated earlier by Field *et al.,* (2004). It is evident that being careful about portion size of food to eat can be a useful weight control measure. Small reductions in amount of food eaten can be a useful strategy to reduce energy intake. (Lewis *et al.,* 2015). Corder *et al.*, (2011) also found that frequent breakfast consumers had lesser chances of becoming overweight. He therefore concluded that possibly skipping breakfast may lead to apathy and lethargy which may in turn lead to a reduction in Physical activity and hence enhance weight gain .However the teenagers' poor feeding could be fueled by the school and home environments because when all students were asked why they didn't eat 3 servings of fruits and 2 servings of vegetables per day, a majority (74.1%) reported that the fruits were not available at school/home daily whereas again 52.8% reported that the vegetables were not available at home/school daily.

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COMPETING INTERESTS

The authors declare that they have no competing interests

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