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Effect of Parental Socio-economic Status and Lifestyle Habits on Risk of Childhood Obesity in a Developing Nation: A Cross-Sectional Study

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: The prevalence of childhood obesity (COB) in the developing world is currently high and is rising rapidly. Unlike developed countries, studies evaluating the association between parental socio-economic status (SES) and risk of COB in developing countries are limited. Besides, the association varies across country and race/ethnicity and changes overtime. The aim of this study was to assess the association between parental SES and life style habits (LSHs) and risk of COB in Uyo, Southern Nigeria.
Methods: Five hundred pupils and the corresponding number of parents were examined between April and September 2018 using socio-demographic/LSHs assessment questionnaire and body mass index (BMI) evaluation. Data analysis was performed and frequencies and percentages were computed. Associations between SES and LSHs of parents and risk of COW/COB were evaluated using multiple logistic regression analysis. Odds ratios and corresponding 95% confidence intervals were estimated.
Results: The prevalence of COW and COB was 3.4% and 16% respectively. The risk of COW/COB was higher among children whose parents had high level of education (OR=1.81, C.I=1.985-3.327,P=0.046), high level of income(OR=16.07, C.I=3.773-68.455,P=0.0001), employed(OR=1.138,C.I=0.157-12.057) and poor dietary habits. High level of physical activity of fathers and high income level of mothers decreased the risk of COW/COB.

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Conclusion: High SES and poor LSHs of parents are associated with increased risk of COW/COB. Interventions necessary to reduce high prevalence of COW/COB in our cities and other developing countries should include among other risk factors parental SES and LSHs.

Keywords: Obesity; children; parents; socioeconomic position; lifestyle; developing nation; Nigeria.

1. INTRODUCTION

The prevalence of childhood obesity (COB) is steadily increasing in many countries and population groups with rates greater than 4 folds in the last four decades [1] in developed and developing countries. COB presents a major public health challenge worldwide due to the associated short and long term complications including psychosocial problems (low self-esteem, poor self-image, depression, anxiety and stigmatization) and cardio-metabolic disorders (hypertension, coronary heart disease, diabetes mellitus, stroke and certain cancers) [2,3,4]. Furthermore, COB is associated with greater than 3 folds risk of adult obesity and increased morbidity and mortality through adult life. Accordingly, about 70-80% of obese children are likely to become obese adults [5].

The worldwide increased prevalence and burden of childhood overweight (COW) and COB is huge and varies across regions, countries and states, and even within states, the variations exist across population groups and between urban and rural dwellers. The variation also exists across age groups, gender, race/ethnicity and changes over time [6]. Between 1990 and 2010 the global prevalence of COW/COB increased from 4.2% to 6.7% and was projected to reach 9.1% or approximately 60million children in 2020 [7]. In 2010, the combined prevalence of COW and COB in developing countries was 6.1%, with the projection that it may reach 8.6% in 2020. In 2010, 43 million children suffered from COW and COB of which 35 million were from developing countries [8]. In Nigeria, similar trend has been reported by previous investigators in different parts of the country. For instance, reported prevalence of COW and COB in Kano, Plateau, Edo, Sokoto and Benue states were 8.9% and 3.3%, 10.3% and 1.7%, 1.4% and 4.9% respectively [9,10,11,12,13]. These rates have increased over the years. The differences in the prevalence observed across states could partly be due to variation in distribution of risk factors including dietary, genetic, social, cultural and environmental factors. Recent studies [14] in some developed countries have observed a causal relationship between parental SES and COW and COB. In almost all the studies, the authors observed inverse relationship between parental SES and COB, however, such studies in developing countries including Nigeria are limited [7] despite the marked dissimilarities in socio-economic characteristics and lifestyle habits (LSHs) of parents in developed and developing countries. The aim of the present study was to investigate the relationship between SES and LSHs of parents and childhood obesity in Akwa Ibom State, Southern Nigeria, which hitherto has not been documented.

2. METHODS

This was a cross-sectional study conducted from April to September 2018 on five hundred nursery/primary and secondary school pupils aged between 4 and 17 years. Equal numbers of parents (mothers and fathers) were also included in the survey.

The survey took place in ten selected nursery/primary and secondary schools (6 private and 4 public) within Uyo Metropolis, Akwa Ibom State, Nigeria.

Exclusion criteria included obvious health problem, deformity, age outside the study age (<4 >17 years), inappropriate completion of questionnaire, missing data, decline participation, parents whose child was not included in the survey and single parenthood.

Written informed consent was obtained from all parents /guardians and ascent from children of 8 years and above. The study protocol was approved by the Institutional Research Ethics Committee. The study protocols followed Helsinki Declaration guidelines governing the conduct of human research.

Two instruments were used in this survey including a socio-demographic/LSHs assessment questionnaire and measurement of anthropometric indices.

2.1 Assessment of Measures

A Two-sectioned semi-structured validated and pretested questionnaire was used for data

collection. Section one of the questionnaire contained information on the demographic/lifestyle characteristics of the pupils including age, gender, physical activity status, dietary habits, mode of transportation to school, frequency of television watch, use of computer games, family history of overweight/obesity.

Section 2 of the questionnaire contained information on the parents/guardians demographic data and socio-economic variables including age, occupation, educational attainment, monthly income and LSHs.

2.2 Anthropometric Assessment

The anthropometric indices of pupils and parents (weight in (kg) and height in meters) were measured by specially trained paramedical staff, using standard methods as recommended by WHO [15]. Body weight and height were measured with subjects standing erect and wearing light clothes using weighing scale and with 100 g accuracy (Seca model) with mounted height rod (to the nearest mm).

Body mass index (BMI) was calculated as weight in kg divided by the square of the height in meters (Weight kg/Height^{2}m^2).

Anthropometric variables in adults were classified as follows;

BMI = < 18.5 kn/m^2 was considered underweight

BMI = 18.5-24.9 kg/m^2 normal weight, BMI=25.0-29.9 kgm^2 overweight and BMI ≥ 30 kg/m^2 was regarded as obese

BMI categories of children were classified as follows;

Underweight (BMI < 5th percentile)

Normal weight (BMI 5th to 85th percentile)

Overweight (BMI 85th to 95th percentile)

Obese (BMI ≥ 95th percentile)

2.3 Assessment of Socio-economic Status

The socio-economic status of parents was assessed based on per capita monthly income, educational attainment and occupation. Per capita monthly income was stratified into seven groups namely < 10,000, 10,000-29,000, 30,000-49,000, 50,000-74,000, 75,000-99,000, 100,000-199,000 and ≥ 200,000.

Those who earned ≤ 99,000 were classified as low income earners, 100,000-199,000 were grouped as middle income earners while ≥ 200,000 were grouped as high income earners.

Educational attainment was classified as professional degree, graduate/post graduate, Higher National Diploma /Ordinal National Diploma, secondary and primary school. Professional degree, graduate/post graduate and high national diploma were regarded as high educational attainment. Others were low educational attainment.

Employment status was grouped into professional, semi-professional, clerk, skilled and unemployed. Professional and semi professional were regarded as high paid jobs while clerk and unemployed were in low paid/income class.

The high income earners, high educational attainment and high paid job parents were grouped as high SES class while the rest were in low SES class.

2.4 Statistical Analysis

Data obtained were subjected to both descriptive and inferential analyses. Frequencies and percentages were computed for categorical variables.

Multiple logistic regressions were performed to test the association between the SES and LSH of parents and COB.

Odds ratio (OR) and the corresponding 95% Confidence intervals (CI) were estimated.

Statistical analysis was carried out using the Statistical Package for Social Science (SPSS) version 22.0.

3. RESULTS

Of 500 pupils who participated in this survey, 52.4% (262) were underweight and 28.2% (141) had normal weight. Three point four percent (17) were overweight while 16% (80) were obese. Demographic characteristics of the pupils which showed significant association with their obesity status were age (P < 0.00001), dietary habits (P = 0.002), physical activity level (P < 0.0001), mode of transportation to school (P = 0.001),

family history of obesity (P = 0.001), television watch (P < 0.0001) and sleep duration (P = 0.003) (Table 1).

The socio-demographic characteristics of fathers with demonstrable significant association with obesity status of children were age (P < 0.0001), dietary habit (P = 0.006), occupation (P < 0.0001), physical activity level (P < 0.0001), smoking habit (P < 0.008), level of education (P < 0.0001), monthly income (P < 0.0001), religion (P < 0.0001) and ethnicity (P < 0.0001) (Table 2).

Table 3 shows the socio-demographic characteristics of mothers that showed significant association with COB to include age (P<0.0001), BMI (P = 0.0001), occupation (P < 0.0001), physical activity level (P = 0.0001), dietary habit (P = 0.0006), smoking habit (P=0.0001), educational attainment (P = 0.011), income level (P < 0.0001), religion (P < 0.0001) and ethnicity (P < 0.0001).

Furthermore, the odds of being obese were higher among children whose fathers had high level of education (Odds ratio (OR) = 1.81, confidence interval (C.I) = 1.985-3.327, P = 0.046), high income level (OR = 16.07, C.I = 3.773-68.455, P=0.0001) and those who were employed (OR=1.138, C.I=0.157-12.057).

Increased risk of COB was also higher in children whose mothers were employed (OR=2.39, C.I = 1.292-19.540, P = 0.0416) and with high educational attainment (OR = 2.74, C.I = 1.889-8.460, P=0.008) (Table 4).

The risk of COB was low among children whose fathers had high physical activity level (OR=0.29, C.I=0.09-0.941, P=0.039) whereas increased odds of COB were found among children whose fathers indulged in poor dietary habit (OR=1.53, C.I=1.349-6.674, P=0.025). Also, mothers' poor dietary habit increased the risk of COB in children (OR=2.35, C.I=1.092-4.314, P=.002, P<0.05). Other lifestyle habits of mothers which were not significantly associated with COB were smoking habits and alcohol consumption (Table 5).

Table 1. Distribution of the socio-demographic characteristics of children

Socio-demographic variables	Underweight (n=262)	Normal (n=141)	Overweight (n=17)	Obese (n=80)	Total	P-value
Age						
4-6	88(33.6)	103(73.0)	17(100.0)	20(25.0)	228(45.6)	<0.0001**
7-12	164 (62.6)	38(27.0)	0(0.0)	60(75.0)	262(52.4)	
13-17	10 (3.8)	0(0.0)	0(0.0)	0(0.0)	10(2.0)	
Gender						
Male	48(18.3)	19(13.5)	1(5.9)	21(26.2)	89(17.8)	0.060
Female	214(81.7)	122(86.5)	16(94.1)	59(73.8)	411(82.2)	
Physical activity Status						
Mild	176(69.3)	105(74.5)	9(52.9)	47(58.8)	337(68.5)	<0.0001**
Moderate	56(22.0)	35(24.8)	8(47.1)	23(28.8)	122(24.8)	
Severe	4(1.6)	1(0.7)	0(0.0)	9(11.2)	14(2.8)	
Not physically active	18(7.1)	0(0.0)	0(0.0)	1(1.2)	19(3.9)	
Dietary habit						
Good	17(6.7)	0(0.0)	1(5.9)	0(0.0)	18(3.7)	0.002**
Poor	237(93.3)	141(100.0)	16(94.1)	80(100.0)	474(96.3)	
Mode of transportation to school						
Car	161(63.4)	71(50.4)	8(47.1)	57(71.2)	297(60.4)	0.007**
Tricycle	93(36.6)	70(49.6)	9(52.9)	23(28.8)	195(39.6)	
Television watch						
Often	93(36.6)	75(53.2)	0(0.0)	46(57.5)	214(43.5)	<0.0001**
Very often	161(63.4)	66(46.8)	17(100.0)	34(42.5)	278(56.5)	
Computer gaming						
Yes	116(45.7)	72(51.1)	9(52.9)	37(46.2)	234(47.6)	0.727
No	138(54.3)	69(48.9)	8(47.1)	43(53.8)	258(52.4)	
Family history of obesity						
Yes	164(64.6)	112(79.4)	8(47.1)	63(78.8)	347(70.5)	0.001**
No	90(35.4)	29(20.6)	9(52.9)	17(21.2)	145(29.5)	

**Significant at 5% (P<0.05)*
***Significant at 1% (P<0.01)*

Table 2. Distribution of the socio-demographic variables of fathers in relation to the obesity status of their children

Variables	Underweight (n=262)	Normal (n=141)	Overweight (n=17)	Obese (n=80)	Total	P-value
Age (years)						
18-35	54(20.6)	4(2.8)	8(47.1)	12(15.0)	78(15.6)	<0.0001
36-45	72(27.5)	25(17.7)	2(11.8)	28(35.0)	127(25.4)	
46-55	80(30.5)	45(31.9)	7(41.2)	16(20.0)	148(29.6)	
>55	56(21.4)	67(47.5)	0(0.0)	24(30.0)	147(29.4)	
BMI(Kg/m^2)						
Underweight	30(11.5)	12(9.0)	1(5.9)	17(21.5)	60(12.2)	<0.0001
Normal	145(55.8)	104(77.6)	8(47.1)	50(63.3)	307(62.7)	
Overweight	75(28.8)	0(0.0)	8(47.1)	10(12.7)	93(19.0)	
Obese	10(3.8)	18(13.4)	0(0.0)	2(2.5)	30(6.1)	
Occupation						
Professional	107(40.8)	61(43.3)	8(47.1)	34(42.5)	210(42.0)	<0.0001
Semi-Professional	73(27.9)	36(25.5)	1(5.9)	29(36.2)	139(27.8)	
Clerk	67(25.6)	25(17.7)	0(0.0)	9(11.2)	101(20.2)	
Skilled	5(1.9)	19(13.5)	8(47.1)	8(10.8)	40(8.0)	
Unemployed	10(3.8)	0(0.0)	0(0.0)	0(0.0)	10(2.0)	
Physical active						
Mild	164(62.6)	72(51.1)	8(47.1)	58(72.5)	302(60.4)	<0.0001
Moderate	54(20.6)	43(30.5)	1(5.9)	6(7.5)	104(20.8)	
Severe	44(6.8)	26(18.4)	8(47.1)	16(20.0)	94(18.8)	
Dietary habit						
Good	240(91.6)	125(88.7)	17(100.0)	63(78.8)	445(89.0)	0.006
Poor	22(8.4)	16(11.3)	0(0.0)	17(21.2)	55(11.0)	
Alcohol Intake						
Yes	60(22.9)	31(22.0)	8(47.1)	17(21.2)	116(23.2)	0.125
No	202(77.1)	110(78.0)	9(52.9)	63(78.8)	384(76.8)	
Smoking habit						
Yes	144(55.0)	80(56.7)	16(94.1)	39(48.8)	279(55.8)	0.008
No	118(45.0)	61(43.3)	1(5.9)	41(51.2)	221(44.2)	
Educational level						
Professional degrees	132(50.4)	64(45.4)	8(47.1)	47(58.8)	251(50.2)	
Graduate /Post-graduate	49(18.7)	36(25.5)	7(41.2)	19(23.8)	111(22.2)	<0.0001
OND/HND	78(29.8)	32(22.7)	1(5.9)	12(15.0)	123(24.6)	
Secondary	1(0.4)	8(5.7)	0(0.0)	1(1.2)	10(2.0)	
Primary school	2(0.8)	1(0.7)	1(5.9)	1(1.2)	5(1.0)	
Monthly Income						
>10,000	1(0.4)	17(12.1)	0(0.0)	0(0.0)	18(3.6)	<0.0001
10,000-29,000	17(6.5)	8(5.7)	0(0.0)	1(1.2)	26(5.2)	
30,000-49,000	54(20.6)	7(5.0)	1(5.9)	1(1.2)	63(12.6)	
50,000-74,000	44(16.8)	28(19.9)	8(47.1)	31(38.8)	111(22.2)	
75,000-99,000	67(25.6)	12(8.5)	8(47.1)	26(32.5)	113(22.6)	
100,000-199,000	69(26.3)	51(36.2)	0(0.0)	12(15.0)	132(26.4)	
>200,000	10(3.8)	18(12.8)	0(0.0)	9(11.2)	37(7.4)	
Religion						
Christianity	260(99.2)	117(83.0)	17(100.0)	80(100.0)	474(94.8)	<0.0001
Islam	2(0.8)	24(17.0)	0(0.0)	0(0.0)	26(5.2)	
Ethnic group						
Ibibio	146(55.7)	87(61.7)	16(94.1)	51(63.8)	300(60.0)	0.019
Igbo	54(20.6)	32(22.7)	0(0.0)	20(25.0)	106(21.2)	
Yoruba	46(17.6)	14(9.9)	1(5.9)	9(11.2)	70(14.0)	
Hausa	16(6.1)	8(5.7)	0(0.0)	0(0.0)	24(4.8)	

**Significant at 5% (P<0.05), **Significant at 1% (P<0.01)*

4. DISCUSSION

The prevalence of COW and COB in the present study was 3.4% and 16% respectively. The odds for COB were higher among children whose parents had high level of education and were employed. Interestingly, the risk was highest in children whose fathers belonged to the high

Table 3. Distribution of the socio-demographic variables of the mothers in relation to the obesity status of their children

Variables	Underweight (n=262)	Normal (n=141)	Overweight (n=17)	Obese (n=80)	Total	P-value
Age						
18-35	120(45.8)	14(9.9)	8(47.1)	28(35.0)	170(34.0)	<0.0001
36-45	69(26.3)	36(25.5)	9(52.9)	21(26.2)	135(27.0)	
46-55	61(23.3)	50(35.5)	0(0.0)	13(16.2)	124(24.8)	
>55	12(4.6)	41(29.1)	0(0.0)	18(22.5)	71(14.2)	
Obesity Status						
Underweight	12(4.6)	9(6.4)	1(5.9)	10(12.5)	32(6.4)	0.0001
Normal	89(34.0)	32(22.7)	8(47.1)	29(36.2)	158(31.6)	
Overweight	69(26.3)	23(16.3)	8(47.1)	6(7.5)	106(21.2)	
Obese	92(35.1)	77(54.6)	0(0.0)	35(43.8)	204(40.8)	
Occupation						
Professional	114(43.5)	45(31.9)	0(0.0)	17(21.2)	176(35.2)	<0.0001
Semi-Professional	36(13.7)	22(15.6)	0(0.0)	25(31.2)	83(16.6)	
Clerk	54(20.6)	10(7.1)	0(0.0)	18(1.22)	82(16.4)	
Skilled	20(7.6)	48(34.0)	17(100.0)	1(1.2)	86(17.2)	
Semi-skilled worker	37(14.1)	9(6.4)	0(0.0)	9(11.2)	55(11.0)	
Physical active						
Mild	148(56.5)	65(46.1)	8(47.1)	57(71.2)	278(55.6)	0.001
Moderate	88(33.6)	68(48.2)	9(52.9)	22(27.5)	187(37.4)	
Severe	26(9.9)	8(5.7)	0(0.0)	1(1.2)	35(7.0)	
Dietary habit						
Good	213(81.3)	100(70.9)	17(100.0)	53(66.2)	383(76.6)	0.0001
Poor	49(18.7)	41(29.1)	0(0.0)	27(33.8)	177(23.4)	
Alcohol Intake						
Yes	74(28.2)	33(23.4)	16(94.1)	20(25.0)	143(28.6)	<0.0001
No	188(71.8)	108(76.6)	1(5.9)	60(75.0)	357(71.4)	
Smoking habit						
Yes	44(16.8)	45(31.9)	8(47.1)	19(23.8)	116(23.2)	0.001
No	218(83.2)	96(68.1)	9(52.9)	61(76.2)	384(76.8)	
Educational level						
Professional degrees	73(27.9)	36(25.5)	0(0.0)	18(22.5)	127(25.4)	
Graduate /Post-graduate	99(37.8)	62(44.0)	17(100.0)	44(55.0)	222(44.4)	0.011
OND/HND	61(23.3)	20(14.2)	0(0.0)	14(17.5)	95(19.0)	
Secondary	27(10.3)	16(11.3)	0(0.0)	2(2.5)	45(9.0)	
Primary school	2(0.8)	7(5.0)	0(0.0)	2(2.5)	11(2.2)	
Monthly Income						
Less than 10,000	28(10.7)	17(12.1)	0(0.0)	1(1.2)	46(9.2)	<0.0001
10,000-29,000	17(6.5)	28(19.9)	0(0.0)	20(25.0)	65(13.0)	
30,000-49,000	60(22.9)	23(16.3)	0(0.0)	3(3.8)	86(17.2)	
50,000-74,000	44(16.8)	25(17.7)	9(52.9)	12(15.0)	90(18.0)	
75,000-99,000	51(19.5)	10(7.1)	8(47.1)	33(41.2)	102(20.4)	
100,000-199,000	62(23.7)	38(27.0)	0(0.0)	10(12.5)	110(22.0)	
>200,000	0(0.0)	0(0.0)	0(0.0)	1(1.2)	1(0.2)	
Religion						
Christianity	259(98.9)	132(93.6)	17(100.0)	79(98.8)	487(97.4)	0.011
Islam	3(1.1)	9(6.4)	0(0.0)	1(1.2)	13(2.6)	
Ethnic group						
Ibibio	110(42.1)	93(66.0)	9(52.9)	49(61.2)	361(52.3)	<0.0001
Igbo	88(33.7)	39(27.7)	0(0.0)	14(17.5)	141(28.3)	
Yoruba	47(18.0)	9(6.4)	8(47.1)	17(21.1)	81(16.2)	
Hausa	16(6.1)	0(0.0)	0(0.0)	0(0.0)	16(3.2)	

**Significant at 5% (P<0.05), **Significant at 1% (P<0.01)*

income class and mothers were of high educational class. However, the risk of COB decreased in children from mothers of high income class, although the decrease did not reach level of statistical significance. Taken together, these observations suggest that upper level of parental SES is associated with a higher risk of COB.

These findings are consistent with results of previous studies in other parts of Nigeria [10] and in other developing countries where high parental SES variables (high income, educational and

Table 4. Logistic regression showing association between the socio-economic status of parents and risk of childhood obesity (odd ratios and 95% C.I)

Socio-economic status	OR(95% C.I)	P-value
Fathers' Socio-economic status		
Employment Status		
Employed	1.00	
Unemployed	1.38[0.157-12.057]	0.773
Educational level		
Low	1.00	
High	1.81[1.985-3.327]	0.046*
Income Level		
Low	1.00 (reference)	
High	16.07[3.773-68.455]	<0.0001**
Mothers' Socio-economic status		
Employment Status		
Employed	1.00 (reference)	
Unemployed	2.39[1.292-19.54]	0.0416
Educational level		
Low	1.00 (reference)	
High	2.74[1.889-8.460]	0.008**
Income		
Low	1.00 (reference)	
High	0.782[0.422-1.449]	0.435

**Significant at 5% (P<0.05), **Significant at 1% (P<0.01)*

Table 5. Logistic regression analysis showing the association between parental lifestyle habits and risk of childhood obesity (odd ratios and 95% C.I)

Fathers' lifestyle variable	OR(95% C.I)	P-value
Physical activity Status		
Mild	1.00(reference)	
Moderate	0.749[0.168-3.33]	0.705
Severe	0.29[0.09-0.941]	0.039*
Dietary habit		
Good	1.00(reference)	
Poor	1.53 [1.349-6.674]	0.047*
Alcohol Consumption		
Yes	1.00(reference)	
No	1.94[0.751-5.024]	0.171
Smoking habit		
Yes	1.00(reference)	
No	1.38 [0.106-1.372]	0.140
Mothers' life style variables		
Physical activity Status		
Mild	1.00(reference)	
Moderate	0.60[0.158-2.278]	0.454
Severe	0.09[0.011-0.741]	0.025*
Dietary habit		
Good	1.00(reference)	
Poor	2.35[1.092-4.314]	0.002**
Alcohol Consumption		
Yes	1.00	
No	1.52[0.632-3.694]	0.347
Smoking habit		
Yes	1.00	
No	1.23[0.472-3.183]	0.677

**Significant at 5% (P<0.05), **Significant at 1% (P<0.01)*

employment levels) showed consistent positive relationship to COB [16]. The demographic characteristics of children with higher prevalence of obesity including age between 7 and 12years, positive family history of obesity, indulgence in poor dietary habits, mild physical activity level, computer gaming, regular television watch, transportation to school by car and resident in urban area suggest association with higher parental SES, environmental factors and genetic predisposition. This is consistent with numerous epidemiological studies that demonstrated that obesity-SES association is complex and varies by several demographic (e.g., age and sex) and geographic/environmental factors (countries, SES), [7]. For instance, Serra-Majem et al. [17] reported highest prevalence of COB in children aged between 6 and 13 years, similar to findings of the present study. They further showed that gender, age group, region, size of locality, residence, mother's level of education and family SES level were significant predictors of COB similar to findings of the the present study.

Also, studies in most developing countries have shown that the prevalence of COW/COB is higher in urban areas and in families in upper SES level [18]. A growing number of multiple level studies have found an association between high SES and lifestyle habits known to be associated with overweight and obesity including increased consumption of unhealthy diets such as high energy foods, saturated fats, sugars, processed foods and eating out at fast foods. One Spainish study [17] reported higher odds for COB among children who indulged in the consumption of buns, cakes, snacks and sugared drinks in a national random sample of children and young people. There are also availability and use of electronic gadgets such as televisions, video games and social networks and leading to exposure to long hours of television watch/computer gaming and less sleep. Availability of paid labor and labor serving devices at homes and household lifters also encourages sedentary lifestyle among children. These findings are at variance with results of studies carried in developed countries where inverse relationship between SES and incidence of COW and COB has been reported [19].

A plethora of research shows that changes in SES could lead to profound changes in lifestyle by causing a concomitant changes in disposable incomes available for lifestyle modification that can affect living environment and the behavioral pattern of individuals including dietary habits and physical activity status [20].

Parental poor lifestyle and dietary habits were also found to increase the risk of COW/ COB in the present study. For instance, mild physical activity level of parents was associated with high prevalence of obesity among them similar to the observation in children. Likewise moderate to severe physical activity level of parents was associated with decreased odds for COB. The risk was lower in children whose parents usually perform severe physical activity. In a similar manner, poor dietary habit of parents was associated with increased risk of excess weight gain in children.

The significant correlation between parental physical activity levels and dietary habits and risk of COB further confirms the role of family environment in the development of COB as previously reported. For instance, lack of family meals at home has been associated with increased risk of COB [21]. Healthy lifestyle education including good physical activity and dietary habits can be obtained primarily at home from parents especially from mothers. Food preference formed at childhood may be influenced by the food choices of parents. Children may be exposed to inappropriate foods and eating patterns if parents indulge in having regular family visits to the restaurant where they are exposed to weight promoting diets such as white bread, savory snacks, cookies, biscuits, and chocolates instead of a lot of traditional foods made up of plenty vegetables and fruits. According to Noh et al. [22], strong and direct correlations exist between parental body shapes and the overweight and obesity status of children which could partly be related to the family's lifestyle. Accordingly, there is a high likelihood of slim parents producing underweight children, while obese mothers may produce overweight children [22]. This explains the result of the present study which shows a higher prevalence of low physical activity level and childhood obesity among obese mothers than obese fathers and a corresponding higher prevalence low physical activity level in children. This also confirms previous assertion that weight is a heritable trait [23], therefore COW/COB is a consequence of the interplay between genetic, environmental influences and developmental processes [24].

Another interesting finding of the present study was the higher prevalence of underweight children among the study participants. This is consistent with results of other studies that showed that obesity and underweight coexist in developing countries and in the under-privileged

populations including children [14] and may depict the impact of different socio-economic levels of parents on weight status of children. Accordingly, Monteiro and colleagues [25] observed higher prevalence of underweight and overweight in low-income Brazilian women than high-income Brazilian women. Underweight indicates malnutrition, and may suggest a high proportion of socioeconomic disadvantaged parents in developing countries. Therefore the problem of weight disorders in developing countries affects both the low and high SES individuals and poses an important concern in developing countries [20]. Some limitations of the present study should be considered in the interpretation of the results especially those associated with the cross-sectional nature of the study design.

Furthermore, self-reported personal characteristics, body weight and height are prone to over and underestimation.

5. CONCLUSION

This study showed that high SES and poor LSHs of parents conferred a higher risk of COW/COB on our study participants. Interventions necessary to reduce high prevalence of COB in our cities and other developing countries should include among other risk factors parental SES and LSHs. The positive correlation between parental SES and LSHs and COB can help us to understand the population specific distribution and risk factors for COB, as well as assist in the development of effective population specific preventive programmes.

CONSENT AND ETHICAL APPROVAL

All participants signed written informed consent and the study protocol was approved by the Institutional Research Ethics Committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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