PDF version

Mohamed El Kabbaoui [1], Alae Chda [1], Amal Bousfiha [1], Lotfi Aarab [1], Rachid Bencheikh [1] and Abdelali Tazi
[1]

[1]Laboratory of Bioactive Molecules, Faculty of Sciences and Techniques of Fez, Université Sidi Mohamed Ben Abdellah, Fez, Morocco (Correspondence to: A. Tazi: abdelalitazi@yahoo.fr).

Abstract

Background: Overweight and obesity among children and adolescents is a major public health concern and their prevalence is increasing worldwide at an alarming rate in both developing and developed countries.

Aims: The objective of this study was to assess the prevalence of overweight and obesity in a representative sample of 12–18-year-old schooled adolescents in Fez, Morocco, and to investigate the possible risk factors associated with adolescent obesity.

Methods: A cross-sectional study was conducted between September 2014 and March 2015 in public secondary schools. Data were collected from a questionnaire. Weight and height were measured, and body mass index was calculated. Weight was classified according to the reference curves of WHO (2007). Data on 1818 adolescents aged 12–18 years were used.

Results: The prevalence of overweight was 7.69% and that of obesity was 3.41%. Overweight and obesity in adolescents were positively correlated to having a father (odds ratio (OR) = 1.58, P = 0.008) or a mother with higher education (OR = 1.56, P = 0.009). High family income (OR = 2.115, P = 0.028), motorized transport to school (adjusted OR = 1.77, P = 0.017), using a computer for > 4 h/day (OR: 2.56, P = 0.004) and frequent consumption of soda and soft drinks (OR = 1.42, P = 0.04) were also correlated with an increased risk for overweight and obesity.

Conclusions: This study provides useful findings that could be elaborated on and expanded in studies on overweight and obesity among adolescents in Morocco.

Keywords: Obesity, adolescents, nutrition, diet, Morocco.

Citation: El Kabbaoui M; Chda A; Bousfiha A; Aarab L; Bencheikh R; Tazi A. Prevalence of and risk factors for overweight and obesity among adolescents in Morocco. East Mediterr Health J. 2018;24(6):512–521. https://doi.org/10.26719/2018.24.6.512

Received: 29/09/15; accepted: 05/06/16

Introduction

Obesity and overweight constitute a major public health problem, and their prevalence is increasing worldwide at an alarming rate in both developing and developed countries (1). WHO has described obesity as the worst non-infectious epidemic in history (1). During the past two decades, the prevalence of overweight and obesity in many developed and developing countries has also increased rapidly in children, largely due to growing urbanization and nutrition transitions (2). The nutrition transition is generally associated with increased consumption of energy-dense foods that are low in fibre and high in sugar and of sweetened drinks as well as a decrease in physical activity and a more sedentary lifestyle (3).

Obesity is potentially serious because of its impact on the physical and psychological health of children and adolescents. It is strongly associated with numerous deleterious health issues (4). Metabolic complications associated with obesity in childhood greatly increase the risks for type 2 diabetes, hypertension, chronic inflammation and cardiovascular diseases (5). Many risk factors contribute to overweight and obesity, but they include genetic, biological, social and environmental factors, which affect weight gain through the mediators of energy intake and energy expenditure (6).

As in many other developing countries, Morocco is now facing the phenomenon of epidemiological transition (7). This has led to new health problems in the country, such as childhood overweight and obesity. The high burden of childhood obesity calls for rigorous investigations of its determinants, context-specific patterns and associated factors. The objective of this study was to assess the prevalence of overweight and obesity in a representative sample of 12–18-year-old schooled adolescents in the city of Fez, Morocco, and to investigate the possible associations with sociodemographic and lifestyle factors.

Methods

Study design and sample

Data from the Regional Academy for Education in Fez indicated that 151 974 adolescents were enrolled in secondary schools, 92% (139 812 students) of whom attended public schools and 8% (12 162 students) attended private schools. A cross-sectional study was conducted between September 2014 and March 2015.

The sample size was calculated from a sample proportion of overweight or obesity of 50%, with 95% confidence intervals (CIs) and a margin error of 0.03. The sample proportion was assumed to be 0.50, which gave the maximum possible sample size required. The sample size was calculated from the formula:

$$n = N*X / (X + N - 1),$$

where $X = Z_{\alpha/22} *p*(1-p) / MOE^2$, $Z_{\alpha/2}$ is the critical value of the normal distribution at $\alpha/2$ (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion, and N is the population size (139 812 students). This method indicated that the required minimal sample size was 1060 adolescents. Additional students were included to account for missing data, and the final sample comprised 1818 adolescents randomly recruited from public secondary schools in Fez (909 boys and 909 girls aged 12–18 years) , who completed the questionnaire.

The secondary schools were selected to ensure representation of all the city districts. The city is divided into 12 districts and has a total of 95 secondary schools, and one secondary school was randomly selected from each district. Classes were then selected at each grade by a simple random method. In this way, one class was selected in each of the six grades (grades 1, 2, 3 for

junior level and grades 4,5, 6 for senior level) in each secondary school. All classes were mixed (males and females), and all participants were healthy, with no physical disabilities.

Ethical permission to carry out the study was obtained from the Regional Academy for Education in Fez. Directors, teachers and students at the selected secondary schools were informed about the procedures and the purpose of the study. The field survey included anthropometric measurements and a questionnaire survey, which was administered to all participants. The questionnaires were completed anonymously to respect confidentiality.

Anthropometric measurements

Weight (kg) and height (cm) were measured, and body mass index (BMI) was calculated as weight in kilograms divided by height in metres squared (kg/m2) for each adolescent. Corpulence was classified from the WHO reference curves (2007) for children aged 5–19 years (8).

Socioeconomic and lifestyle variables

The questionnaire used in this study was adapted from that of a previous study conducted in Morocco (9). Its validity was examined in a pilot study of 50 adolescents, which showed that it was acceptable and understandable. The questionnaire elicited information on demographic and socioeconomic variables, meal pattern, eating habits, physical activity and sedentary time.

Parents' education level was categorized into three groups. Parents who had never attended school or only primary school were considered to have a low educational level; medium level of education corresponded to secondary education (junior to senior high-school), and a high educational level corresponded to higher education and university. The monthly income of the family was used as a class variable in the following categories: low socioeconomic level, a salary 10 000 MAD per month.

The survey included questions about the frequency of practising sports and other physical activity during a typical week. Sedentary time was assessed as time spent watching television (hours per day), use of a computer (hours per day) and the mode of transport to school (walking or motoring). The questionnaire also addressed sleep duration (h/day) and dietary behaviour, such as the number and regularity of daily meals, the frequency of eating between meals and

the frequency of consumption of certain types of foods per week.

Statistical analysis

The data were analysed with Epi Info, version 7.1.3.3 software. Means and percentages were used for descriptive analyses. Unpaired comparisons were performed by Student's t test (mean values). For the purpose of the analysis, the adolescents were divided into those of normal weight and those who were overweight or obese. Differences in proportions between groups were investigated with the chi-squared test. P

Results

We included 1818 adolescents (909 girls and 909 boys) with mean ages of 16.03 ± 1.67 years for boys and 15.58 ± 1.68 years for girls. Table 1 shows the main anthropometric characteristics of the sample. No significant differences were found between boys and girls in age, weight, height or BMI. The distribution of corpulence according to BMI is shown in Table 2. Overall, the prevalence of underweight was 3.05%, that of overweight was 7.69%, and that of obesity was 3.41%. More boys were underweight (3.96%) than girls (2.1%), and the difference was statistically significant (P = 0.028). The prevalence of overweight was 8.25% for girls and 7.15% for boys, but the difference was not statistically significant (P = 0.37). The prevalence of obesity was higher among girls (3.96%) than boys (2.86%), but, again, the difference was not significant (P = 0.19).

Table 3 shows the distribution of normal, overweight and obese adolescents in relation to socioeconomic and lifestyle variables. We found a statistically significant relation between family income, reported by 1763 adolescents (55 missing values), and the weight of adolescents (P = 0.004), the prevalence of overweight and obesity increasing with increasing family income. The prevalence of overweight and obesity also increased significantly with the level of education of the father (14.69% for high and 8.91% for low education; P = 0.004) and the mother (18.42% for high and 9.33% for low; P = 0.001).

The frequency of overweight and obesity further increased with the number of hours per day spent watching television, although the relation was not significant (P = 0.32). Time spent using a computer was, however, statistically significantly related to the prevalence of overweight and obesity, the prevalence being higher in adolescents who spent more than 4 h/day using a computer than in those who spent

We found no statistically significant relation between the prevalence of overweight and obesity and practice of sport at school (P = 0.56), although the prevalence of overweight was lower among adolescents who practised physical activity outside school every week (P = 0.02). The prevalence of overweight and obesity was higher among adolescents who went to school in

motor vehicles than among those who walked to school (P = 0.001).

The eating habits of normal and overweight adolescents are shown in Table 4 . No statistically significant associations were found between adolescents who were overweight and and those of normal weight who ate breakfast regularly (P = 0.87), ate lunch regularly (P = 0.46), ate dinner regularly (P = 0.14) or ate between meals (P = 0.88). A statistically significant relation was seen between the prevalence of overweight and the frequency of consumption of soda and soft drinks (P = 0.03).

Similarly, in the multivariate logistic regression analysis (Table 5), overweight and obesity in adolescents were significantly associated with higher education of both the father (adjusted OR = 1.58; 95% CI, 1.13–2.21; P = 0.008) and the mother (adjusted OR = 1.56; 95% CI, 1.11–2.18; P = 0.009); family income (2.12, 1.08–4.14; P = 0.028); transport to school in a motor vehicle (1.77, 1.10–2.82; P = 0.017); use of a computer for > 4 h/day (2.56, 95% CI, 1.33–4.93; P = 0.004); and drinking soda and soft drinks three or more times a week (1.42, 1.01–1.98; P = 0.04).

Discussion

In this study, the prevalence of overweight was 7.29% and that of obesity was 3.41%. This result is consistent with those of surveys in other Moroccan cities (10,11). The prevalence of overweight and obesity among schoolchildren aged 7–14 years in Rabat were 5.1% and 3.7%, respectively (10), and Kaoutar et al. (2013) in Marrakech reported a prevalence of overweight and obesity of 9.1% in a sample of 1407 schooled adolescents aged 12–18 years (11). Studies in other countries of the Maghreb found similar or higher rates. In Tunisia, the prevalence of overweight and obesity among adolescents aged 15–19 years was estimated to be 15% and 2.6%, respectively (12). In Algeria, the prevalence was higher, one study showing a prevalence of 5.26% for overweight and 18.64% for obesity among children aged 6–12 years (13). The differences between countries of the Maghreb might be due to differences in period, gender, the targeted age groups and methods (14, 15).

Elsewhere, the prevalence of overweight and obesity also varies considerably. In studies conducted in Middle East countries, the rates of overweight were higher than in our study. For instance, the prevalence of overweight and obesity among Kuwaiti elementary schoolchildren was 20.2% and 16.8%, respectively (16). The prevalence of overweight is much higher in developed countries. In the United Kingdom, for example, the prevalence was 23.6% among boys and 27.9% among girls (17), and, in the USA, the prevalence was estimated to be 35.3% for boys and 34.1% for girls (18). These results are difficult to compare because of the differences in the reference values used to classify weight, sample size, age group and

sociodemographic and genetic factors.

We found a significant relation between family income and overweight in adolescents, the prevalence of overweight and obesity increasing with higher family income. A similar finding was reported in a study of Moroccan adults, in which family income, used as a determinant of socioeconomic status, was strongly associated with overweight and obesity (19), and the study in Tunisia indicated a link between living in household of a high socioeconomic level and overweight among adolescents (12). The literature is, however, contradictory, with some studies reporting that obesity is more prevalent among people of low socioeconomic status (20) and others showing the opposite (21,22). Studies in developed countries in particular indicate excess weight among children in families of lower socioeconomic status (23), while in studies in developing countries excess weight is found predominantly among children and adolescents in families of higher socioeconomic status (24). Several explanations have been proposed. The low prevalence of obesity in groups of low socioeconomic status in developing countries is related to food scarcity, patterns of high energy expenditure and the greater capacity of the elite to obtain adequate food supplies (25). The inverse correlations reported in some studies may be due to the benefits of economic growth, notably better access to food and high energy expenditure by poorer social groups, difficulty in acquiring more expensive, less energy-dense foods and a trend towards less leisure time and fewer opportunities for exercise (26).

Another important risk factor of adolescents for overweight and obesity was having parents with a high educational level, in accordance with other studies (22, 27–29); however, studies in developed countries found that obesity was more strongly related to lower parental education (30,31). Our finding is related to the association between high parental educational level and occupation and consequently to higher socioeconomic status; therefore, their children have access to high-energy foods, such as fast foods, increasing their risk for obesity.

Watching television daily for ≥ 4 h was not associated with overweight or obesity in our study, although a previous study found a significant positive correlation with the risk of adolescents for overweight (32). We did find a statistically significant correlation between the prevalence of overweight and obesity and the number of hours spent using a computer, consistent with the findings of studies in Brazil and Portugal (33,34). Media use may reduce energy expenditure by replacing physical activity and also increase snacking, which is further encouraged by advertisements for energy-dense foods (35).

Practising sports at school was not significantly associated with overweight and obesity; however, the majority of the participants participated in school sports, so the association would be difficult to identify. In our sample, practising sports outside schools was also not significantly

associated with overweight and obesity. Other studies have shown the opposite. For instance, a study in Saudi Arabia showed that intense physical activity was inversely associated with adolescent obesity (36), and a strong negative association was reported between vigorous physical activity and total and central body fat in Spanish adolescents (37). Inadequate physical activity has been hypothesized to be an important contributing factor to the development of childhood obesity. A review of the influence of physical activity on adiposity among 5–18-year-olds showed that adiposity was reduced and aerobic capacity increased with more time spent in intense physical activity (38). Our finding that the mode of transport to school was associated with overweight and obesity is similar to those of other studies (33,39). Walking has been shown to be beneficial to health and weight control, while motorized vehicle use is associated with overweight and other disorders (40).

Overweight and obesity were significantly associated with a high frequency of drinking soda and soft drinks, in line with previous studies. For instance, the consumption of carbonated soft drinks was associated with obesity in Mexican–American children (41), and BMI was positively correlated with consumption of sugar-sweetened carbonated beverages in boys in Saudi Arabia (42).

Our findings should be interpreted in the light of the potential limitations of the study. The risk factors for overweight and obesity were identified from self-reported data, which could be biased by socially desirable reporting, even though students were encouraged to be honest by assuring them that their responses were anonymous and confidential. Furthermore, the results reflect only the situation of adolescents attending public high schools in a city. It would be important also to study private high schools, in which most of the students belong to upper socioeconomic classes.

Conclusion

This study provides useful findings that could be elaborated and expanded in future studies on overweight and obesity among adolescents in Morocco. Primary prevention of obesity should be a national public health priority in our country. Initiatives to combat overweight and obesity among children and adolescents must include monitoring of nutritional status at both the individual and the collective level, and strategies for the prevention, diagnosis and early treatment of overweight and obesity should be introduced before the problem spreads more widely.

Acknowledgements

The authors thank the Regional Academy for Education in Fez for permission to conduct this

study. They also thank the school principals, teachers and students for their cooperation and assistance in data collection.

Funding: None.

Competing interests: None declared.

Prévalence et facteurs de risque du surpoids et de l’obésité parmi les adolescents au Maroc

Résumé

Contexte : Le surpoids et l’obésité chez l’enfant et l’adolescent représentent une préoccupation de santé publique majeure et leur prévalence est en augmentation de manière alarmante dans les pays industrialisés et les pays en développement.

Objectif : La présente étude avait pour objectif d’évaluer la prévalence du surpoids et de l’obésité dans un échantillon représentatif d’adolescents scolarisés âgés de 12 à 18 ans à Fès, au Maroc, et d’examiner les facteurs de risque potentiels associés à l’obésité des adolescents.

Méthodes : Une étude transversale a été menée entre septembre 2014 et mars 2015 dans des établissements

d’enseignement secondaire publics. Des données ont été collectées au moyen d’un questionnaire. Le poids et la taille ont

été mesurés, et l’indice de masse corporelle a été calculé. Le poids a été classé selon les courbes de référence de

l’OMS (2007). Les données relatives à 1818 adolescents âgés de 12 à 18 ans ont été utilisées.

Résultats : La prévalence du surpoids était de 7,69 % et celle de l'obésité de 3,41 %. Le surpoids et l'obésité chez les adolescents avaient une corrélation positive avec le niveau d'éducation supérieur du père (odds ratio (OR) = 1,58, p = 0,008) ou de la mère (OR = 1,56, p = 0,009). Un revenu familial élevé (OR = 2,115, p = 0,028), un transport scolaire motorisé (OR ajusté = 1,77, p = 0,017), l'utilisation d'un ordinateur plus de quatre heures par jour (OR = 2,56, p = 0,004) et la consommation régulière de sodas et de boissons gazeuses (OR = 1,42, p = 0,04) étaient également corrélés à une augmentation du risque de surpoids et d'obésité.

Conclusion : La présente étude a fourni des résultats utiles qui pourront être approfondis et étendus à d'autres études sur le surpoids et l'obésité parmi les adolescents au Maroc.

[illegible]

[illegible]

[illegible]

[illegible] :
[illegible]
.[illegible]

[illegible] :
[illegible] 18 12 [illegible]
.[illegible]

[illegible] 2015 [illegible]/[illegible] 2014 [illegible]/[illegible] :
[illegible]
.(2007) [illegible]
.[illegible] 18 12 [illegible] 1818 [illegible]

ج[illegible] .3.41% [illegible] 7.69% [illegible] :
[illegible]) [illegible]

□1.56 = □□□□□□□□□ □□□□□) □□□□□□□ □□□□□□□□ □□□□□□□ □□ □□ (0.008 =P □1.58 = □□□□□□□□□ P=0.009). □□□□□□□ □□□□□□ □□□□□□□ □□□□ □□□□□□□□ □□□□□ □□□□□□ □□□□□□□□ □□ □□ □□□□ □□□□□□□ □□□□□) □□□□□□□□ □□□□ □□□□□□□□□□ □□□□□□□□ □(0.028 =P □2.115 = □□□□□□□□□ □□□□□) □□□□□□□□ □□□□□□□ □□□□□□ 4 □□ □□□□□□ □□□□□□□□□□ □□□□ □□□□□□□□ □(0.017=P □1.77 = □□□□□□□□ □□□□□□□□□ □□□□□) □□□□□□□□ □□□□□□□□□□□ □□□□□□□ □□□□□□□□ □□□□□□ □(0.004=P □2.56 =□□□□□□□□□ □□□□□) .(0.04=P □1.42 =□□□□□□□□□

□□□□□□□□□□□□□□□ □□□□□□□ □□□□□□□ □□□□□ □□□□□□□ □□□□□ □□□□□□ □□□□□□ □□□□□□□□ □□□□ □□□□□ : .□□□□□□□ □□ □□□□□□□□□□ □□□□ □□□□□□□□ □□□□□□ □□□□□ □□□□□□□□□ □□□□□□□□□

References

1. World health statistics: a wealth of information on global public health. Geneva: World Health Organization; 2013 (http://www.who.int/gho/publications/world_health_statistics/2013/en/, accessed 24 September 2015).
2. Popkin BM, Gordon-Larsen P. The nutrition transition: worldwide obesity dynamics and their determinants. Int J Obes Relat Metab Disord. 2004 Nov;28(S3) Suppl 3:S2–9. https://doi.org/10.1038/sj.ijo.0802804 PMID:15543214
3. Popkin BM. The shift in stages of the nutrition transition in the developing world differs from past experiences! Public Health Nutr. 2002 Feb;5 1A:205–14. PMID:12027286
4. Barlow SE; Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. Pediatrics. 2007 Dec;120 Suppl 4:S164–92. https://doi.org/10.1542/peds.2007-2329C PMID:18055651
5. Nathan BM, Moran A. Metabolic complications of obesity in childhood and adolescence: more than just diabetes. Curr Opin Endocrinol Diabetes Obes. 2008 Feb;15(1):21–9. https://doi.org/10.1097/MED.0b013e3282f43d19 PMID:18185059
6. Jasik CB, Lustig RH. Adolescent obesity and puberty: the “perfect storm”. Ann N Y Acad Sci. 2008;1135(1):265–79. https://doi.org/10.1196/annals.1429.009 PMID:18574233
7. Benjelloun S. Nutrition transition in Morocco. Public Health Nutr. 2002 Feb;5(1a) 1A:135–40. https://doi.org/10.1079/PHN2001285 PMID:12027276
8. Child growth standards. Geneva: World Health Organization; 2007 (www.who.int/childgrowth/en/index.html, accessed 24 September 2015).
9. El Rhazi K. Transition nutritionnelle, facteurs associés et émergence des maladies chroniques au Maroc : étude transversale en population générale adulte. [Nutrition transition, associated factors and the emergence of chronic diseases in Morocco: cross-sectional study in the general adult population.] Fes: Sidi Mohamed Ben Abdellah University; 2010.
10. Cherkaoui Dekkaki I, Mouane N, Ettair S, Meskini T, Bouklouze A, Barkat A. Prevalence of obesity and overweight in children: a study in government primary schools in Rabat, Morocco. Arch Med Res. 2011 Nov;42(8):703–8. https://doi.org/10.1016/j.arcmed.2011.12.004 PMID:22227044
11. Kaoutar K, Hilali MK, Loukid M. Comportement alimentaire et indice de masse corporelle des adolescents de la Wilaya de Marrakech (Maroc). [Dietary behaviour and body mass index

of adolescents in the Wilaya of Marrakesh (Morocco)]. Antropo. 2013;30:79–87.

12. Aounallah-Skhiri H, Romdhane HB, Traissac P, Eymard-Duvernay S, Delpeuch F, Achour N, et al. Nutritional status of Tunisian adolescents: associated gender, environmental and socio-economic factors. Public Health Nutr. 2008 Dec;11(12):1306–17. https://doi.org/10.1017/S1368980008002693 PMID:18561866

13. Taleb S, Agli AN. Obesity of the child: role of the socio-economic factors, parental obesity, food behavior and physical activity in schoolchildren in a city of east Algeria. Cah Nutr Diét. 2009;44:198–206. https://doi.org/10.1016/j.cnd.2009.04.003

14. Atek M, Traissac P, El Ati J, Laid Y, Aounallah-Skhiri H, Eymard-Duvernay S, et al. Obesity and association with area of residence, gender and socio-economic factors in Algerian and Tunisian adults. PLoS One. 2013 10 08;8(10):e75640. PMID:24116063

15. Wells JC. The thrifty phenotype: An adaptation in growth or metabolism? Am J Hum Biol. 2011 Jan-Feb;23(1):65–75. https://doi.org/10.1002/ajhb.21100 PMID:21082685

16. Al-Isa AN, Campbell J, Desapriya E. Factors associated with overweight and obesity among Kuwaiti elementary male school children aged 6–10 years. Int J Pediatr. 2010;2010:459261. https://doi.org/10.1155/2010/459261 PMID:20886010

17. Stamatakis E, Wardle J, Cole TJ. Childhood obesity and overweight prevalence trends in England: evidence for growing socioeconomic disparities. Int J Obes. 2010 Jan;34(1):41–7. https://doi.org/10.1038/ijo.2009.217 PMID:19884892

18. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. JAMA. 2010 Jan 20;303(3):242–9. https://doi.org/10.1001/jama.2009.2012 PMID:20071470

19. El Rhazi K, Nejjari C, Zidouh A, Bakkali R, Berraho M, Barberger Gateau P. Prevalence of obesity and associated sociodemographic and lifestyle factors in Morocco. Public Health Nutr. 2011 Jan;14(1):160–7. https://doi.org/10.1017/S1368980010001825 PMID:20602865

20. O'Dea JA. Differences in overweight and obesity among Australian schoolchildren of low and middle/high socioeconomic status. Med J Aust. 2003 Jul 7;179(1):63. PMID:12831394

21. Abalkhail BA, Shawky S, Soliman NK. Validity of self-reported weight and height among Saudi school children and adolescents. Saudi Med J. 2002 Jul;23(7):831–7. PMID:12174236

22. Núñez-Rivas HP, Monge-Rojas R, León H, Roselló M. Prevalence of overweight and obesity among Costa Rican elementary school children. Rev Panam Salud Publica. 2003 Jan;13(1):24–32. https://doi.org/10.1590/S1020-49892003000100004 PMID:12744799

23. Langnäse K, Mast M, Müller MJ. Social class differences in overweight of prepubertal children in northwest Germany. Int J Obes Relat Metab Disord. 2002 Apr;26(4):566–72. https://doi.org/10.1038/sj.ijo.0801956 PMID:12075585

24. Lobstein T, Frelut ML. Prevalence of overweight among children in Europe. Obes Rev. 2003 Nov;4(4):195–200. https://doi.org/10.1046/j.1467-789X.2003.00116.x PMID:14649370

25. Monteiro CA, Moura EC, Conde WL, Popkin BM. Socioeconomic status and obesity in adult populations of developing countries: a review. Bull World Health Organ. 2004 Dec;82(12):940–6. PMID:15654409

26. Sobal J, Stunkard AJ. Socioeconomic status and obesity: a review of the literature. Psychol Bull. 1989 Mar;105(2):260–75. https://doi.org/10.1037/0033-2909.105.2.260

PMID:2648443

27. Guedes DP, Rocha GD, Silva AJRM, Carvalhal IM, Coelho EM. Effects of social and environmental determinants on overweight and obesity among Brazilian schoolchildren from a developing region. Rev Panam Salud Publica. 2011 Oct;30(4):295–302. PMID:22124687

28. Al-Saeed WY, Al-Dawood KM, Bukhari IA, Bahnassy A. Prevalence and socioeconomic risk factors of obesity among urban female students in Al-Khobar city, Eastern Saudi Arabia, 2003. Obes Rev. 2007 Mar;8(2):93–9. https://doi.org/10.1111/j.1467-789X.2006.00287.x PMID:17300275

29. Musaiger AO, Al-Roomi K, Bader Z. Social, dietary and lifestyle factors associated with obesity among Bahraini adolescents. Appetite. 2014 Feb;73:197–204. https://doi.org/10.1016/j.appet.2013.11.002 PMID:24231426

30. Júlíusson PB, Eide GE, Roelants M, Waaler PE, Hauspie R, Bjerknes R. Overweight and obesity in Norwegian children: prevalence and socio-demographic risk factors. Acta Paediatr. 2010 Jun;99(6):900–5. https://doi.org/10.1111/j.1651-2227.2010.01730.x PMID:20175763

31. Lamerz A, Kuepper-Nybelen J, Wehle C, Bruning N, Trost-Brinkhues G, Brenner H, et al. Social class, parental education, and obesity prevalence in a study of six-year-old children in Germany. Int J Obes. 2005 Apr;29(4):373–80. https://doi.org/10.1038/sj.ijo.0802914 PMID:15768043

32. Mota J, Ribeiro J, Santos MP, Gomes H. Obesity, physical activity, computer use, and TV viewing in Portuguese adolescents. Pediatr Exerc Sci. 2006;18(1):113–21. https://doi.org/10.1123/pes.18.1.113

33. Duncan S, Duncan EK, Fernandes RA, Buonani C, Bastos KD, Segatto AF, et al. Modifiable risk factors for overweight and obesity in children and adolescents from São Paulo, Brazil. BMC Public Health. 2011 07 22;11:585. PMID:21781313

34. Padez C, Mourão I, Moreira P, Rosado V. Prevalence and risk factors for overweight and obesity in Portuguese children. Acta Paediatr. 2005 Nov;94(11):1550–7. https://doi.org/10.1080/08035250510042924 PMID:16303693

35. Lowry R, Wechsler H, Galuska DA, Fulton JE, Kann L. Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity, and gender. J Sch Health. 2002 Dec;72(10):413–21. https://doi.org/10.1111/j.1746-1561.2002.tb03551.x PMID:12617028

36. Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI, Qahwaji DM, Musaiger AO. Lifestyle factors associated with overweight and obesity among Saudi adolescents. BMC Public Health. 2012 05 16;12:354. PMID:22591544

37. Moliner-Urdiales D, Ruiz JR, Ortega FB, Rey-Lopez JP, Vicente-Rodriguez G, España-Romero V, et al.; HELENA Study Group. Association of objectively assessed physical activity with total and central body fat in Spanish adolescents; the HELENA Study. Int J Obes. 2009 Oct;33(10):1126–35. https://doi.org/10.1038/ijo.2009.139 PMID:19597518

38. Parikh T, Stratton G. Influence of intensity of physical activity on adiposity and cardiorespiratory fitness in 5-18 year olds. Sports Med. 2011 Jun 1;41(6):477–88. https://doi.org/10.2165/11588750-000000000-00000 PMID:21615189

39. Andegiorgish AK, Wang J, Zhang X, Liu X, Zhu H. Prevalence of overweight, obesity, and associated risk factors among school children and adolescents in Tianjin, China. Eur J

Pediatr. 2012 Apr;171(4):697–703. https://doi.org/10.1007/s00431-011-1636-x PMID:22160003

40. Gordon-Larsen P, Nelson MC, Beam K. Associations among active transportation, physical activity, and weight status in young adults. Obes Res. 2005 May;13(5):868–75. https://doi.org/10.1038/oby.2005.100 PMID:15919840

41. Beck AL, Tschann J, Butte NF, Penilla C, Greenspan LC. Association of beverage consumption with obesity in Mexican American children. Public Health Nutr. 2014 Feb;17(2):338–44. https://doi.org/10.1017/S1368980012005514 PMID:23308395

42. Collison KS, Zaidi MZ, Subhani SN, Al-Rubeaan K, Shoukri M, Al-Mohanna FA. Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference, and poor dietary choices in school children. BMC Public Health. 2010 05 09;10:234. PMID:20459689

Thursday 11th of July 2024 05:43:28 AM