

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Prevalence and determinants of overweight/obesity among school-aged adolescents in the United Arab Emirates: A cross-sectional study of private and public schools
AUTHORS	Baniissa, Wegdan; Radwan, Hadia; Rossiter, Rachel; Fakhry, Randa; Al-Yateem, Nabeel; Al shujairi, Arwa; Enayah, Sana; Macridis, sultana; Farghaly, Abeer; Naing, Lin; Awad, M. A.

VERSION 1 – REVIEW

REVIEWER	Bing Zhang National Institute for Nutrition and Health, China CDC
REVIEW RETURNED	06-May-2020

GENERAL COMMENTS	<p>It is good study to reflect situation of adolescents' overweight or obesity in UAE. However there is still some questions below.</p> <p>1. Abstract results. "In total, 34.7% of participants were overweight/obese; 20.2% in public and 14.5% in private schools." It is wrong. As a rate, could not be showed 20.2% in public and 14.5% in private schools directly. It should be 37.8% in public and 31.1% in private schools.</p> <p>2. Strengths and limitations of this study: "The study included multiple variables related to obesity," it is true, but not enough since lack of some variables such as genetic, family, dietary pattern, stress factors and so on.</p> <p>3. Introduction: the final paragraph "In this study, we explored the epidemiology of overweight and obesity and identify determinants of factors contributing to obesity in adolescents in the UAE using a representative sample of adolescents from private and public schools." I want to know whether private and public schools are similar proportion in UAE.</p> <p>4. Methods Participants "Based on an overweight/obesity prevalence of 40% among UAE adolescents," It is overestimated on adolescents' overweight/obesity. "An additional 100 participants were included to allow for non-response, meaning we aimed to recruit 1224 participants for this study." It is underestimated on non-response, real number is 192. Another critical issue is that male participants is only one-third and female two-third. In the population of UAE, male is two-third. So sample is not balance in related to their population. Why is there low response for male participants?</p>
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	<p>5. Methods Data Collection “Data collected over 10 months from 2018-2019.” Is there no season’s difference in anthropometric measurement?</p> <p>6. Is the cut-off value of hypertension for all of age adolescent same as 120/80 mmHg?</p> <p>7. Methods Data analysis “We then analyzed variables to find determinants of overweight/obesity using logistic regression analysis.” It is not enough to make confounding factors control since the present study did not collect dietary data such as energy intake, fat intake and so on.</p> <p>8. Results Sample characteristics and anthropometric results “311 (33.4%) were male and 621 (66.6%) were female.” Same comments as 4. The number of male participants is too less to represent real situation of UAE adolescents.</p> <p>9. Results Table 2 should be recalculated. For examples, denominator of Public schools is 498, is not 932, so male 169(33.9), female 329(66.1). Same as private schools.</p> <p>10. Discussion Obesity in Public versus Private Schools “We also noted that private school participants had higher SBP and DBP compared with public school participants”. It is opposite point of view in compared to Table 2 results.</p>
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REVIEWER	Frederick Murunga Wekesah African Population and Health Research Center (APHRC), Kenya
REVIEW RETURNED	08-Jun-2020

GENERAL COMMENTS	<p>bmjopen-2020-038667 Prevalence and determinants of overweight/obesity among school-aged adolescents in the United Arab Emirates: A comparative study of private and public schools</p> <p>Childhood obesity is an important public health issue, globally. Developed countries have reported alarming rates among children of school-going age, and have identified diet and physical activity as the driving factors for what they equate to an epidemic waiting to happen. Developing countries, most of them in low- and middle-income brackets, are beginning to see an emergence of this problem. Assessing the drivers to childhood obesity, their patterns of distribution in the population and determining what can be done to stop the epidemic is therefore a crucial mission. By so doing, we can prevent early onset of diabetes, obesity in adulthood and a growth in morbidity and mortality from cardiovascular diseases.</p> <p>See some comments below, mostly on the approach for analysis</p> <ol style="list-style-type: none"> 1. In the abstract (line 13-design), the authors have indicated that cluster sampling was used. However, the computation of sample size has not taken into account this approach. Cluster sampling is not mentioned anywhere in the methods.
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	<ul style="list-style-type: none"> - Could it have been used to select the institutions that participated in the survey? - If so what was the cluster size? - Was this considered in arriving at the sample size? - Was the clustering adjusted for in the analysis? <ol style="list-style-type: none"> 2. In lines 26-29 the authors have indicated that convenience sampling was used to select students from the identified classrooms until the required sample size was reached. What informed the choice of convenience sampling approach? Was a list of students that could have constituted a sample frame for randomization unavailable? 3. The use of convenience sampling in this study may have amounted to a high sampling error. Do the authors have a justification for this? 4. What are the potential predictor/explanatory variables in this study and how were they constructed and measured? 5. How was the logistic regression modeling of factors associated with obesity performed? Was there a univariate model from which a multivariate model was developed? Or was this informed by a theoretical framework? If the latter, 6. How was the adjustment for known risk factors of obesity done? 7. The authors used multiple approaches such as (BMI, Abdominal obesity, WC, WHR) to measure the outcome (obesity). Given that these approaches resulted in a huge variation in the outcome, how did the authors finally classify the respondent as being obese or normal to model the potential predictors? Was sensitivity and/or specificity considered in this respect? 8. Could the authors confirm whether the results reported in line 13-20 constitute to a description of the epidemiology of obesity? What one sees is a description of the anthropometric results. The epidemiology of obesity seems to be a wider concept not articulated well in this section. 9. In lines 19-24 the authors indicate that the students with chronic illnesses were excluded from the study. What informed this decision? Furthermore, blood pressure and blood sugar have been used as potential explanatory variables (what was the idea behind this? if having a chronic illness had been previously set as the exclusion criteria, don't the authors find this conflicting. 10. What are the p-values in table 2 for, is it the t-test or Pearson's chi-squared test? 11. Where was the independent sample t-test mentioned in the methodology (line 8-13) used? 12. There is a huge mix-up in the results. The authors indicate that..... overweight/obese participants were significantly less likely to consume fruits and vegetables or engage in physical activity compared with their peers who were underweight (OR 0.79, 95% CI: 0.72–0.86) or normal weight (OR 0.54, 95% CI: 0.38–0.78). In addition, overweight/obese participants had significantly higher odds of having high SBP and DBP compared with participants that were underweight (OR 1.03, 95% CI: 1.02–1.04) and of normal weight (OR 1.02 95% CI: 1.00–1.03). Finally, participants that were overweight/obese had higher odds of having larger anthropometric indices (WC, WHR, WHtR, and %BF).
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	- If the outcome for this study is the “likelihood of being obese” then these findings may be totally untrue given that a logistic regression is known to predict the likelihood of the occurrence of an outcome and not the potential predictor.
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REVIEWER	Hongyan Xu Augusta University, USA
REVIEW RETURNED	14-Jul-2020

GENERAL COMMENTS	<p>This study aims to look at the epidemiology of obesity. It is an interesting topic. However, I have some concerns of the analysis methods.</p> <ol style="list-style-type: none"> 1. The children are clustered within schools, so a clustered analysis approach should be used to account for the school effect. This could be achieved with a mixed model regression. 2. The main result presented in Table 3 is from simple logistic regression. A multiple regression is more appropriate to remove potential confounding effects. 3. The first 3 lines of Participants section on page 8, the sample size calculation should be clarified. Is it for detecting 40% prevalence, or for detecting some differences between groups?
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VERSION 1 – AUTHOR RESPONSE

Reviewers' Comments to Author:

Reviewer: 1

Reviewer Name: Bing Zhang

Institution and Country: National Institute for Nutrition and Health, China CDC

Please state any competing interests or state 'None declared': None declared

Response: Thank you for noting this. We have included a “None declared” statement (page. 22).

It is good study to reflect situation of adolescents' overweight or obesity in UAE.

However there is still some questions below.

1. Abstract results. “In total, 34.7% of participants were overweight/obese; 20.2% in public and 14.5% in private schools.” It is wrong. As a rate, could not be showed 20.2% in public and 14.5% in private schools directly. It should be 37.8% in public and 31.1% in private schools.

Response: Acknowledged. The numbers in the abstract have been corrected. We have also added detail regarding other obesity-related indices in the abstract, as requested by another reviewer (see the revised abstract, pages 2).

2. Strengths and limitations of this study: “The study included multiple variables related to obesity,” it is true, but not enough since lack of some variables such as genetic, family, dietary pattern, stress factors and so on.

Response: Acknowledged. That statement was deleted as these factors did not influence outcomes in this paper. Instead, we included a recommendation that further studies consider genetic, family, dietary patterns, and stress factors (page 21 in the strengths and limitations, in red color).

3. Introduction: the final paragraph “In this study, we explored the epidemiology of overweight and obesity and identify determinants of factors contributing to obesity in adolescents in the UAE using a representative sample of adolescents from private and public schools.”

I want to know whether private and public schools are similar proportion in UAE.

Response: Thank you for this excellent suggestion. We have added information on the proportion of private and public schools in the UAE

(page 7, under study design and setting, in red color).

4. Methods

Participants “Based on an overweight/obesity prevalence of 40% among UAE adolescents,” It is overestimated on adolescents’ overweight/obesity.

Response: Acknowledged. We have added sufficient justification for our sample size calculation. A 40% obesity rate was realistic considering recent evidence from similar studies that reported increased prevalence rates of overweight/obesity in adolescents in the UAE. We have also reported existing evidence for obesity prevalence rates in the UAE (page 8, last paragraph of participants and sampling-in red).

Comment: “An additional 100 participants were included to allow for non-response, meaning we aimed to recruit 1224 participants for this study.” It is underestimated on non-response, real number is 192.

Response: Thank you for bringing this to our attention. We have corrected the response rate (page 11, Participants’ characteristics and obesity-related indices, in red).

Another critical issue is that male participants is only one-third and female two-third. In the population of UAE, male is two-third. So sample is not balance in related to their population. Why is there low response for male participants?

Response: Acknowledged. We are aware that there were more female than male adolescents in our study. A recent report from the World FACTBOOK indicated that in the category aged 15–24 years, the ratio of males to females is 59.4% vs. 41.6% (The World Factbook, 2020). We considered that our population of secondary-school adolescents was consistent with this category (the mean age of our participants was 15 years). However, as the reviewer noted, we acknowledge that there were more females in our study than males. We have included a possible explanation for this and also added this point as a limitation of our study (page 20-21, strengths and limitations, paragraph 2, in red).

Reference: "The World Factbook — Central Intelligence Agency."

<https://www.cia.gov/library/publications/the-world-factbook/geos/ae.html>

5. Methods

Data Collection "Data collected over 10 months from 2018-2019." Is there no season's difference in anthropometric measurement?

Response: Acknowledged. We agree with the reviewer's concern regarding seasonal effects, and have clarified the exact months of data collection and provided more information related to seasonal differences (page 8, under data collection section, in red).

6. Is the cut-off value of hypertension for all of age adolescent same as 120/80 mmHg?

Response. Noted. As BP was not relevant to the aim of this study, we deleted that variable as a potential predictor of obesity. We may include BP in a future study involving the same population (All measurements used in the current study were included on pages 9-10).

7. Methods

Data analysis "We then analyzed variables to find determinants of overweight/obesity using logistic regression analysis." It is not enough to make confounding factors control since the present study did not collect dietary data such as energy intake, fat intake and so on.

Response: Acknowledged. We only collected information on fruits/vegetables intake. We plan to include additional dietary data such as energy and fat intake in future studies. In addition, we acknowledge the impact of confounding variables and repeated the analyses using simple logistic regression followed by **multiple logistic regression** to control for confounding variables. Only variables significantly associated with BMI ($p \geq 0.20$) were entered into the multiple logistic regression models (page 11 on statistical analysis, page 15, predictors of overweight/obesity, and page 17 - Table 3 multiple regression analysis, in red).

8. Results

Sample characteristics and anthropometric results “311 (33.4%) were male and 621 (66.6%) were female.” Same comments as 4. The number of male participants is too less to represent real situation of UAE adolescents.

Response: Acknowledged. We have added this as a limitation and included an explanation, as stated above. (page 21, second paragraph, in red)

9. Results

Table 2 should be recalculated. For examples, denominator of Public schools is 498, is not 932, so male 169(33.9), female 329(66.1). Same as private schools.

Response: Acknowledged. The table was recalculated so that the dominators were 498 for public schools and 329 for private schools.

(page 14-14, revised Table 2).

10. Discussion

Obesity in Public versus Private Schools “We also noted that private school participants had higher SBP and DBP compared with public school participants”. It is opposite point of view in compared to Table 2 results.

Response: Acknowledged. This statement was deleted as we deleted the BP variable, as described above.

Reviewer: 2

Reviewer Name: Frederick Murunga Wekesah

Institution and Country: African Population and Health Research Center (APHRC), Kenya

Please state any competing interests or state 'None declared': None declared

Response: A "None declared" statement was added. (page 22).

The analysis approach requires a better description/elaboration. It is difficult to know how the variables were selected, how the independent assessment of the association between the variables and outcome was done, and how the multivariable model was built.

Response: The authors would like to thank the reviewer for the important suggestions regarding the data analysis. We made important additions based on the reviewer's feedback to provide a more realistic and valid picture of obesity in our population. As requested, we elaborated on the analyses and added multiple logistic regression models for each obesity indicator with the rationale for the selection of variables

We justified the use of BMI to classify participants' obesity levels, and agree with the reviewer on the limitation of using BMI as a gold standard to classify participants into overweight/obese vs. underweight/normal groups. Therefore, we elaborated on the other obesity indices used in this study, including abdominal obesity and body fat percentage.

We are responding on individual comments raised in the attached PDF file by the reviewer

bmjopen-2020-038667

Prevalence and determinants of overweight/obesity among school-aged adolescents in the United

Arab Emirates: A comparative study of private and public schools

Childhood obesity is an important public health issue, globally. Developed countries have reported alarming rates among children of school-going age, and have identified diet and physical activity as the driving factors for what they equate to an epidemic waiting to happen. Developing countries, most of them in low- and middle-income brackets, are beginning to see an emergence of this problem. Assessing the drivers to childhood obesity, their patterns of distribution in the population and determining what can be done to stop the epidemic is therefore a crucial mission. By so doing, we can prevent early onset of diabetes, obesity in adulthood and a growth in morbidity and mortality from cardiovascular diseases.

Response: We would like to thank you for emphasizing the importance of tackling childhood obesity, especially in the Middle East. We hope that you find our responses below to your valuable comments satisfactory.

1. In the abstract (line 13-design), the authors have indicated that cluster sampling was used. However, the computation of sample size has not taken into account this approach. Cluster sampling is not mentioned anywhere in the methods.

- Could it have been used to select the institutions that participated in the survey?

- If so what was the cluster size?
- Was this considered in arriving at the sample size?
- Was the clustering adjusted for in the analysis?

Response: Acknowledged. We recognize there was a lack of information on cluster sampling in the Methods section of our manuscript. We have added detailed information on cluster sampling to address the above concerns (size of cluster, criteria for sample size estimation, and how we controlled for cluster sampling effect) (see Participants and Sample section, page 7, in red).

2. In lines 26-29 the authors have indicated that convenience sampling was used to select students from the identified classrooms until the required sample size was reached. What informed the choice of convenience sampling approach? Was a list of students that could have constituted a sample frame for randomization unavailable?

Response: Acknowledged. We have added clear justification for our use of convenience sampling (page 7 and top of page 8, in red).

3. The use of convenience sampling in this study may have amounted to a high sampling error.

Do the authors have a justification for this?

Response: Highly acknowledged. We have added justification for our use of convenience sampling and how we accounted for sampling errors (page 7 and top of page 8, in red).

4. What are the potential predictor/explanatory variables in this study and how were they constructed and measured?

Response: Acknowledged. Thank you for this important question.

We conducted simple logistic regression followed by multiple logistic regression analyses to determine the association between potential explanatory variables and the outcome variables. Only variables that had significant associations with the outcome variables were included in the multiple regression models. Please see the Data Analysis section for details on the variables and their selection. (page 11-data analysis and new table 3).

5. How was the logistic regression modeling of factors associated with obesity performed? Was there a univariate model from which a multivariate model was developed? Or was this informed by a theoretical framework? If the latter,

Response: Acknowledged. This was a major change made to this paper as requested by the reviewer. As noted above, we conducted simple logistic regression analyses to determine the associations between potential explanatory variables and obesity-related outcomes. We then ran multiple logistic regression models for each obesity indicator significant in the simple analyses ($p \leq 0.20$) to identify the independent determinants/predictors of obesity. (page 11, Data Analysis section, and new Table 3).

6. How was the adjustment for known risk factors of obesity done?

Response: Acknowledged. As stated above, we conducted multiple regression models to clarify the independent determinants of obesity-related outcomes. Only variables significant in the simple regression analyses were included in the multiple logistic regression models. Adding multiple logistic regression analyses answered most of the questions related to the variables selected.

(page 11- Data Analysis section, and new Table 3).

7. The authors used multiple approaches such as (BMI, Abdominal obesity, WC, WHR) to measure the outcome (obesity). Given that these approaches resulted in a huge variation in the outcome, how did the authors finally classify the respondent as being obese or normal to model the potential predictors? Was sensitivity and/or specificity considered in this respect?

Response: Acknowledged. We agree that there is lack of consensus on a gold standard to classify adolescents as obese or normal based on BMI. To respond to the reviewer's comments, we elaborated on the following points:

1) We provided adequate justification for the use of BMI, including international standards and previous epidemiological studies.

(see Obesity related anthropometric measurements and indices, page 10, in red).

2) We emphasized and considered obesity indices in addition to BMI, including abdominal obesity indicators (waist circumference, waist to height ratio, waist to hip ratio) and total body fat percentage. We believe that the inclusion of these measures added validity to our results for obesity given the limitations of BMI.

(see Obesity related anthropometric measurements and indices, page 10, in red)

3) We ran separate multiple logistic regression models for each of the obesity indices (BMI, abdominal obesity, and body fat percentage) to determine predictors of obesity (see new **Table 3** and Results section).

Note. We intend to produce a separate paper to examine the gold standard and cutoff values for each of the obesity indices in our adolescent population (ROC curve, specificity, and sensitivity analyses).

8. Could the authors confirm whether the results reported in line 13-20 constitute to a description of the epidemiology of obesity? What one sees is a description of the anthropometric results. The epidemiology of obesity seems to be a wider concept not articulated well in this section.

Response: Acknowledged. As noted above, we considered measures of abdominal obesity and body fat percentage as important indices of obesity. Therefore, we revised this section by connecting anthropometric measures used to estimate our main outcome (obesity); that is, calculating WHR and WHtR (see Results section, starting page 11).

9. In lines 19-24 the authors indicate that the students with chronic illnesses were excluded from the study. What informed this decision? Furthermore, blood pressure and blood sugar have been used as potential explanatory variables (what was the idea behind this? if having a chronic illness had been previously set as the exclusion criteria, don't the authors find this conflicting).

Response: We agree with this comment. We removed the BP and blood sugar variables as they were not relevant to the aim of this study. We may include them in a future study.

10. What are the p-values in table 2 for, is it the t-test or Pearson's chi-squared test?

Response: All comparative analyses between private and public schools were performed using Pearson's chi-square tests; the corresponding p-values were related to Pearson's chi-square tests (see Table 2).

11. Where was the independent sample t-test mentioned in the methodology (line 8-13) used?

Response: All comparative analyses between private and public schools were performed using Pearson's chi-square tests. All the corresponding p-values were related to Pearson's chi-square tests, and no independent samples t-tests were used.

12. There is a huge mix-up in the results. The authors indicate that..... overweight/obese participants were significantly less likely to consume fruits and vegetables or engage in physical activity compared with their peers who were underweight (OR 0.79, 95% CI: 0.72–0.86) or normal weight (OR 0.54, 95% CI: 0.38–0.78). In addition, overweight/obese participants had significantly higher odds of having high SBP and DBP compared with participants that were underweight (OR 1.03, 95% CI: 1.02–1.04) and of normal weight (OR 1.02 95% CI: 1.00–1.03). Finally, participants that were overweight/obese had higher odds of having larger anthropometric indices (WC, WHR, WHtR, and %BF).

- If the outcome for this study is the "likelihood of being obese" then these findings may be totally untrue given that a logistic regression is known to predict the likelihood of the occurrence of an outcome and not the potential predictor.

Response: Acknowledged. This is a valid point. As discussed above, we conducted multiple regression models with obesity-related indices as outcomes. We revised the Results section as necessary so that obesity was the outcome (DV) not the potential (IVs). (see results page 15, New table 3, page 16)

Reviewer: 3

Reviewer Name: Hongyan Xu

Institution and Country: Augusta University, USA

Please state any competing interests or state 'None declared': None declared.

Response: Acknowledged and stated on the last page before the references.

This study aims to look at the epidemiology of obesity. It is an interesting topic. However, I have some concerns of the analysis methods.

1. The children are clustered within schools, so a clustered analysis approach should be used to account for the school effect. This could be achieved with a mixed model regression.

Response: Well received. We used one-stage cluster sampling to account for the school effect through randomized selection of schools within each cluster. We also repeated the analysis with multiple logistic regression models to identify independent determinants for each of the obesity indices (see page 7, participant and design and new Table 3).

2. The main result presented in Table 3 is from simple logistic regression. A multiple regression is more appropriate to remove potential confounding effects.

Response: Thank you for this suggestion. It aligned well with comments from Reviewer 2. We repeated the analysis with the addition of separate multiple logistic regression models for each obesity indicator used (BMI, abdominal obesity, and body fat percentage) as DVs.

(See results section page 16 and table 3)

3. The first 3 lines of Participants section on page 8, the sample size calculation should be clarified. Is it for detecting 40% prevalence, or for detecting some differences between groups?

Response: The sample size calculation assumed a 40% prevalence of obesity in the UAE adolescent population. We elaborated on our description of the prevalence of obese/overweight adolescents to clarify any confusion (see Participants and Sampling section, page 8, last paragraph).

VERSION 2 – REVIEW

REVIEWER	Hongyan Xu Augusta University, United States
REVIEW RETURNED	01-Sep-2020

GENERAL COMMENTS	This is a revision. My major concern is the analysis method, which I raised in the previous review. Basically, the samples are clustered within schools and the analysis should account for the clustering. The authors' response is to use multiple regression, and claimed the schools are random samples. However, multiple regression is not the solution to this problem and the results could be biased due to the random effect from the schools. A mixed effect regression analysis should be performed.
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VERSION 2 – AUTHOR RESPONSE

Reviewer's Comments to Author:

Reviewer: 3

Reviewer Name: Hongyan Xu

Institution and Country: Augusta University, United States

Please state any competing interests or state 'None declared': None declared

This is a revision. My major concern is the analysis method, which I raised in the previous review. Basically, the samples are clustered within schools and the analysis should account for the clustering. The authors' response is to use multiple regression, and claimed the schools are random samples. However, multiple regression is not the solution to this problem and the results could be biased due to the random effect from the schools. A mixed effect regression analysis should be performed.

Response: Thank you for these excellent recommendations. We repeated the analysis using mixed effect regression as suggested. This provided a true estimation of predictors of obesity because we controlled for the random effect of schools.

Please see Table 3 and the associated narrative in the results concerning predictors of overweight/obesity (BMI, AO, and %BF).

VERSION 3 – REVIEW

REVIEWER	Hongyan Xu Augusta University
REVIEW RETURNED	27-Oct-2020
GENERAL COMMENTS	This is a revision. The authors have addressed my previous concerns sufficiently.