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Keywords:	Obesity, children, the Gulf Cooperation Council (GCC) countries, systematic review

Epidemiology of overweight and obesity in early childhood in the Gulf Cooperation Council countries: a systematic review and meta-analysis protocol

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Keywords

Obesity, children, early years, epidemiology, risk factors, the Gulf Cooperation Council (GCC) countries, systematic review

ABSTRACT

Introduction: There has been a notable increase in the prevalence of overweight and obesity in school-aged children in many industrialised regions. The worldwide prevalence of childhood overweight and obesity increased from 4.2% in 1990 to 6.7% in 2010. Although many studies have been published, the epidemiological burden of overweight and obesity in the Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) is unclear. There is a need to bring together and appraise relevant studies in order to estimate the epidemiological burden (including incidence, prevalence, risk factors, trend over time) of overweight and obesity in this region and thus help to inform national and regional policies.

Methods and analysis: We will conduct a systematic review and meta-analysis on the epidemiology of overweight and obesity in early childhood in the GCC countries. We will search international electronic databases for published, unpublished and in-progress epidemiological studies of interest published from inception to 2017. In addition, we will contact an international panel of experts on the topic. There will be no restriction on the language of publication of studies. We will use the Effective Public Health Practice Project (EPHPP) to appraise the methodological quality of included studies. Meta-analysis will be undertaken using random effects models.

Ethics and dissemination: Ethical approval is not required. The outcome of the review will be disseminated through conference presentations and peer-reviewed journal publication.

Protocol registration number: International Prospective Register for Systematic Reviews **(**PROSPERO) number CRD42017073189

Strengths and limitations of this study:

- This systematic review will for the first time provide estimates of the epidemiological burden of overweight and obesity in early childhood across the GCC region and within each nation
- Understanding the burden of overweight and obesity during the early years will help to formulate and strengthen national family and school policies for children in this age group in the GCC region.
- Whilst this study will provide a comprehensive overview of the burden of overweight and obesity in the GCC region, we anticipate disparities across available studies, and this will be taken into account in our interpretation of the underlying evidence

INTRODUCTION

Childhood overweight and obesity is a global health problem, impacting the physical and psychological health of individuals for the duration of their life.[1-5] Childhood overweight and obesity strongly correlate with adult obesity, which is linked to an increased risk of morbidity and mortality.[6,7] Overweight or obese children have an increased risk of heart disease, diabetes and other health problems in adulthood.[2] The impact is not limited to the individual but carries a significant economic burden.[8] This is partially due to increased spending on healthcare with a German study estimating the excess lifetime cost of childhood overweight and obesity in the German population at €145 billion.[9]

According to the World Health Organisation (WHO), 43 million children (35 million from developing countries) were estimated to be overweight and obese in 2010, while 92 million worldwide were at risk of being overweight.[10] In the same report, the worldwide prevalence of childhood overweight and obesity combined increased from 4.2% (95% CI: 3.2% to 5.2%) in 1990 to 6.7% (95% CI: 5.6% to 7.7%) in 2010. This trend is expected to reach 9.1% (95% CI: 7.3%, 10.9%) or affect 60 million children by 2020.[10]

The prevalence of childhood obesity is high among Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), with the prevalence of obesity among pre-school children estimated to be between 8% to 9%.[11] In Kuwait, for instance, 40-49% of adolescents are obese.[11] Kuwait ranks among the top 7% of countries worldwide in reference to adult obesity prevalence,[1,12] and is among the top 3% of countries with the highest prevalence of diabetes.[13]The recognition of childhood overweight and obesity and the long-term consequences, has made it a high priority for health authorities in the GCC countries[14,15] and globally.[1,16]

Currently there is paucity of robust epidemiological data on childhood overweight and obesity in the GCC countries. A number of studies suggest that trends in childhood overweight and obesity in GCC countries may be increasing.[17-21] However, despite several studies that have been published the epidemiological burden of overweight or obesity in the GCC is currently unclear. There is a need to bring together the relevant available evidence and synthesise them in order to derive relevant epidemiological parameters (including incidence, prevalence, risk factors, trend over time) that will help to describe current burden

of overweight and obesity in the GCC region. This will help to formulate or strengthen existing regional and national policies around obesity, particularly in relation to school and early years nutrition and lifestyle.

We plan to undertake a systematic review to identify, appraise and synthesise all available evidence on the epidemiology of overweight and obesity in children during the early years of life in the GCC region. Specifically, by bringing together all relevant published evidence, this systematic review aims to provide reliable and contemporaneous estimates of the incidence, prevalence, time trends, risk factors for childhood overweight and obesity in GCC countries in children during the early life years. The focus on the early years of childhood is to identify early dominant factors that may in the long-term help in formulating evidence-based policies for early interventions.

METHODS AND ANALYSES

Types of studies

We will include all interventional (randomised controlled trials, controlled before and after studies, and interrupted time series studies) and observational (cohort, case control, and cross-sectional studies) studies. Reviews, case studies and case series, and animal studies will be excluded.

Participants

The participants will include all children in their early years (up to 8 years).

Outcome measures

Primary outcomes: Our primary outcomes will include objectively defined measures of the incidence and prevalence of obesity in children aged up to 8 years old in GCC countries.

Secondary outcomes: Secondary outcomes will include time trends and risk factors of obesity in children aged up to 8 years old in GCC countries.

Search methods

We will employ a highly sensitive search strategy to retrieve articles meeting the review criteria. Appendix 1 contains the search strategies developed for MEDLINE database

interface, which we will adapt to search other databases. Databases to search will include MEDLINE, EMBASE, Cochrane Library, ISI Web of Science, CINAHL, Google Scholar, AMED, Psych INFO, CAB International, and WHO Global Health Library. Additional references will be located through searching the references cited in identified papers, as well as searching databases of the proceedings of international conferences, such as ISI Conference Proceedings Citation Index and ZETOC (British Library). For unpublished and ongoing studies, we will contact international experts in the field of research. There will be no language restrictions, and where possible we will translate literature in languages other than English and report any literature we are unable to translate.

Study selection

Two reviewers will independently check titles and abstracts of the retrieved articles according to the review criteria; any discrepancies will be resolved by consensus and a third reviewer will arbitrate disagreements. Full text copies of potentially relevant studies will be obtained and their eligibility for inclusion independently assessed by two reviewers; discrepancies will be resolved by consensus and disagreements will be arbitrated by a third reviewer.

Quality assessment and analysis

Two reviewers will independently appraise the quality of eligible studies and assess the potential for risk of bias; any discrepancies will be resolved by discussion or arbitration by a third reviewer in the event of any disagreement. We will assess the methodological quality of observational studies by using the Effective Public Health Practice Project (EPHPP).[22] Will also derive component-specific (i.e. suitability of the study design for the research question; risk of selection bias; exposure measurement; outcome assessment; and generalizability of findings) and overall grading for each observational study.

Data extraction and reporting

Two reviewers will independently extract relevant information and study data onto a customized data extraction sheet. Any discrepancies in data extraction will be resolved by discussion or arbitration by a third reviewer if agreement cannot be reached. Descriptive tables will be used to summarize the literature and characteristics of studies contributing to the overall evidence. We will employ the PRISMA checklist to guide the reporting of the review.[23]

Data analysis

We will undertake a narrative synthesis of the data. In addition, for studies deemed to be reasonably clinically, methodologically, and statistically homogeneous, we will perform meta-analyses using random-effects models. We will quantify the heterogeneity between studies using the I^2 statistic. Where possible, we will perform subgroup analyses according to background characteristics, such as age, body mass index, country, and other potential characteristics. We will perform sensitivity analyses based on risk of bias in the studies. We will assess evidence of publication bias using Funnel plots and statistically using Begg and Egger tests.[24,25] The meta-analyses will be performed using Comprehensive Meta-analysis, version 3.

Protocol registration

A detailed protocol for the review has been registered with the International Prospective Register of Systematic Reviews (PROSPERO CRD42017073189): http://www.crd.york.ac.uk/prospero/ prior to commencing the review.

DISCUSSION

The current review will present the most comprehensive and unbiased synthesis of the evidence relating the incidence, prevalence, time trends, and risk of obesity in children in the early years up to 8 years old in GCC countries. Our preliminary searches could not find any systematic reviews on this topic.

CONCLUSION

Evidence generation and synthesis on up to date estimates of the incidence, prevalence, time trends, and risk factors of obesity/overweight in children in GCC countries will help to develop interventions for overweight or obese children. Furthermore, a comprehensive synthesis of the evidence base will provide the opportunity to create evidence-informed policies in these GCC countries in the prevention of obesity and overweight among children in the early years.

Acknowledgements: We thank the Ministry of Health of Saudi Arabia for retrieving unobtainable papers.

Contributors: UBN and MN conceived the idea for this study. UBN, BIN and FA developed the methods and together with SM and MN drafted this protocol.

Competing of interests: The authors declare no competing interest related to this work.

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Appendix 1: MEDLINE Search Strategy

1. pediatric obesity.mp. or exp Pediatric Obesity/
2. obesity in children.mp.
3. obesity.mp. or exp Obesity/ or exp Obesity, Morbid/
4. overweight.mp. or exp Overweight/
5. weight gain.mp. or exp Weight Gain/
6. (overweight or over weight or overeat* or over eat* or overfeed* or over feed*).ti,ab.
7. (weight adj1 gain*).ti,ab.
8. obes*.ti,ab.
9. exp Body Mass Index/ or body mass.mp.
10. (BMI or body mass index).ti,ab.
11. or/1-10
12. incidence.mp. or exp Incidence/
13. prevalence.mp. or exp Prevalence/
14. risk factors.mp. or exp Risk Factors/
15. (incidence or prevalence or epidemiol$).ti.
16. epidemiologic methods.mp.
17. exp Epidemiologic Methods/
18. *cohort studies/ or cohort.ti,ab.
19. (longitudinal or prospective).ti,ab.
20. *case-control studies/
21. Control groups/ or control group*.ti,ab.
22. Matched-pair analysis/
23. (case* adj5 control*).ti,ab.
24. (case* adj3 comparison*).ti,ab.
25. (case* adj3 referen*).mp.
26. (case* adj1 base).mp.
27. (case* adj1 cohort).mp.
28. exp cross-sectional studies/ or cross-sectional.ti,ab.
29. Controlled clinical trial.pt.
30. Randomized controlled trial.pt.
31. (random$ or placebo$ or single blind$ or double blind$ or triple blind$).ti.ab.
32. Quasi-randomized Controlled Trial.mp.
33. (Controlled before and after).mp.
34. (Controlled before and after studies).mp.
35. Interrupted time series.mp.
36. Interrupted time series studies.mp.
37. or/12-36
38. Arab states of the Persian Gulf.mp.
39. Gulf Cooperation Council.mp.
40. Gulf countries.mp.
41. exp Saudi Arabia/ or Eastern Arabia.mp.
42. Kuwait.mp. or exp Kuwait/
43. Bahrain.mp. or exp Bahrain/
44. Oman.mp. or exp Oman/
45. Qatar.mp. or exp Qatar/
46. United Arab Emirates.mp. or exp United Arab Emirates/
47. or/38-46
48. 11 and 37 and 47

49. advertisements/ or animation/ or architectural drawings/ or bibliography/ or biography/ or book illustrations/ or bookplates/ or charts/ or comment/ or letter/ or editorial/ or news/ or patient education handout/ or published erratum/ or "retraction of publication"/
50. 48 not 49

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol

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Section/topic	*#*	*Checklist item*	*Reported on page #*
ADMINISTRATIVE INFORMATION			
Title Identification Update	 1a 1b	 Identify the report as a protocol of a systematic review If the protocol is for an update of a previous systematic review, identify as such	 1
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	PROSPERO CRD42017073189
Authors: Contact Contributions	 3a 3b	 Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author Describe contributions of protocol authors and identify the guarantor of the review	 1 1, 7
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	NA
Support: Sources Sponsor Role of sponsor or funder	 5a 5b 5c	 Indicate sources of financial or other support for the review Provide name for the review funder and/or sponsor Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	 NA NA NA
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	2
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4
METHODS			

Section/topic	*#*	*Checklist item*	*Reported on page #*
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	4,5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	4-6
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	9,10
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	6
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	5
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	5
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	4-6
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	4
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	5
Data synthesis	15a 15b 15c 15d	Describe criteria under which study data will be quantitatively synthesised If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ) Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression) If quantitative synthesis is not appropriate, describe the type of summary planned	5,6 6 6 6
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	6
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	4-6

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ABSTRACT

Introduction: There has been a notable increase in the prevalence of overweight and obesity in school-aged children in many industrialised regions. The worldwide prevalence of childhood overweight and obesity increased from 4.2% in 1990 to 6.7% in 2010. Although many studies have been published, the epidemiological burden of overweight and obesity in the Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) is unclear. There is a need to bring together and appraise relevant studies in order to estimate the epidemiological burden (including incidence, prevalence, risk factors, trend over time) of overweight and obesity in this region and thus help to inform national and regional policies.

Methods and analysis: We will conduct a systematic review and meta-analysis on the epidemiology of overweight and obesity in early childhood including incidence, prevalence, risk factors and trends over time in the GCC countries. We will search international electronic databases for published, unpublished and in-progress epidemiological studies of interest published from inception to 2017. In addition, we will contact an international panel of experts on the topic. There will be no restriction on the language of publication of studies. We will use the Effective Public Health Practice Project (EPHPP) to appraise the methodological quality of included studies. Meta-analysis will be undertaken using random effects models.

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Strengths and limitations of this study:

- This systematic review will for the first time provide estimates of the epidemiological burden of overweight and obesity in early childhood across the GCC region and within each nation
- Understanding the burden of overweight and obesity during the early years will help to formulate and strengthen national family and school policies for children in this age group in the GCC region.
- Whilst this study will provide a comprehensive overview of the burden of overweight and obesity in the GCC region, we anticipate disparities across available studies, and this will be taken into account in our interpretation of the underlying evidence.

INTRODUCTION

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According to the World Health Organisation (WHO), 43 million children (35 million from developing countries) were estimated to be overweight and obese in 2010, while 92 million worldwide were at risk of being overweight.[10] In the same report, the worldwide prevalence of childhood overweight and obesity combined increased from 4.2% (95% CI: 3.2% to 5.2%) in 1990 to 6.7% (95% CI: 5.6% to 7.7%) in 2010. This trend is expected to reach 9.1% (95% CI: 7.3%, 10.9%) or affect 60 million children by 2020.[10]

The prevalence of childhood obesity is high among Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), with the prevalence of obesity among pre-school children estimated to be between 8% to 9%.[11] In Kuwait, for instance, 40-49% of adolescents are obese.[11] Kuwait ranks among the top 7% of countries worldwide in reference to adult obesity prevalence,[1,12] and is among the top 3% of countries with the highest prevalence of diabetes.[13]The recognition of childhood overweight and obesity and the long-term consequences, has made it a high priority for health authorities in the GCC countries[14,15] and globally.[1,16]

Currently there is paucity of robust epidemiological data on childhood overweight and obesity in the GCC countries. A number of studies suggest that trends in childhood overweight and obesity in GCC countries may be increasing.[17-21] However, despite several studies that have been published the epidemiological burden of overweight or obesity in the GCC is currently unclear. Given differences in population structure, culture and lifestyle habits, education, occupation, the risk factors for obesity may vary from population to

population, hence risk factors may differ between the GCC countries and western countries.[22] There is a need to bring together the relevant available evidence and synthesise them in order to derive relevant epidemiological parameters (including incidence, prevalence, risk factors, trend over time) that will help to describe current burden of overweight and obesity in the GCC region. This will help to formulate or strengthen existing regional and national policies around obesity, particularly in relation to school and early years nutrition and lifestyle.

The early childhood concept model and framework has been developed in several countries. [23,24.] Obesity can occur early in life with the prenatal and early childhood periods crucial for child growth and development. [25,26] In addition, important and powerful obesity risk factors can be identified within the first 1000 days of early life, from conception to 24 months.[3] Preventing the causes and consequences of childhood obesity, avoiding transition of obesity from early childhood to adulthood and altering early life systems promise the interruption of the continuing vicious cycle of the childhood obesity epidemic worldwide.[27]

We plan to undertake a systematic review to identify, appraise and synthesise all available evidence on the epidemiology of overweight and obesity in children during the early years of life in the GCC region. Specifically, by bringing together all relevant published evidence, this systematic review aims to provide reliable and contemporaneous estimates of the incidence, prevalence, time trends, risk factors for childhood overweight and obesity in GCC countries in children during the early life years. The focus on the early years of childhood is to identify early dominant factors that may in the long-term help in formulating evidence-based policies for early interventions.

METHODS AND ANALYSES

Types of studies

We will include all interventional (randomised controlled trials, controlled before and after studies, and interrupted time series studies) and observational (cohort, case control, and cross-sectional studies) studies. The main source of data on the incidence and prevalence of obesity will come from cohort and cross-sectional studies, respectively. We will include interventional and case-control studies, as these will additionally provide data on risk factors for obesity. Reviews, case studies and case series, and animal studies will be excluded.

Participants

The participants will include all children in their early years (up to the child's 8th birthday). We will include and extract data only for children aged under 8 years old. If there are aggregated data and no sub-group analysis for children aged up to 8 years old we will exclude those papers.

Outcome measures

Primary outcomes: Our primary outcomes will include objectively defined measures of the incidence and prevalence of overweight and obesity, time trends in children aged up to 8 years old in GCC countries. For consistency, we will use the standard, validated WHO definition of overweight and obesity in children based on body mass index (BMI) measurements.

Secondary outcomes: Secondary outcomes will include risk factors of overweight and obesity in children aged up to 8 years old in GCC countries.

Search methods

We will employ a highly sensitive search strategy to retrieve articles meeting the review criteria. We will include studies from 2000 onwards to capture current and strong evidence in this SR. Appendix 1 contains the search strategies developed for MEDLINE database interface, which we will adapt to search other databases. Databases to search will include MEDLINE, EMBASE, Cochrane Library, ISI Web of Science, CINAHL, Google Scholar, AMED, Psych INFO, CAB International, and WHO Global Health Library. Additional references will be located through searching the references cited in identified papers, as well as searching databases of the proceedings of international conferences, such as ISI Conference Proceedings Citation Index and ZETOC (British Library). For unpublished and ongoing studies, we will contact international experts in the field of research. There will be no language restrictions, and where possible we will translate literature in languages other than English and report any literature we are unable to translate.

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DISCUSSION

The current review will present the first comprehensive synthesis of the evidence relating the incidence, prevalence, time trends, and risk of obesity in children in the early years up to 8 years old in GCC countries. Our preliminary searches could not find any systematic reviews on this topic.

CONCLUSION

Evidence generation and synthesis on up to date estimates of the incidence, prevalence, time trends, and risk factors of obesity/overweight in children in GCC countries will help to develop interventions for overweight or obese children. Furthermore, a comprehensive synthesis of the evidence base will provide the opportunity to create evidence-informed policies in these GCC countries in the prevention of obesity and overweight among children in the early years.

Acknowledgements: We thank the Ministry of Health of Saudi Arabia for retrieving unobtainable papers.

Contributors: UBN and MN conceived the idea for this study. UBN, BIN and FA developed the methods and together with SM and MN drafted this protocol. MN, UN, FA, SM will extract data, appraisal of papers, UN will conduct meta-analyses, draft a manuscript and all authors will contribute to the final synthesis of evidence.

Competing of interests: The authors declare no competing interest related to this work.

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Appendix 1: MEDLINE Search Strategy

1. pediatric obesity.mp. or exp Pediatric Obesity/
2. obesity in children.mp.
3. obesity.mp. or exp Obesity/ or exp Obesity, Morbid/
4. overweight.mp. or exp Overweight/
5. weight gain.mp. or exp Weight Gain/
6. (overweight or over weight or overeat* or over eat* or overfeed* or over feed*).ti,ab.
7. (weight adj1 gain*).ti,ab.
8. obes*.ti,ab.
9. exp Body Mass Index/ or body mass.mp.
10. (BMI or body mass index).ti,ab.
11. or/1-10
12. incidence.mp. or exp Incidence/
13. prevalence.mp. or exp Prevalence/
14. risk factors.mp. or exp Risk Factors/
15. (incidence or prevalence or epidemiol$).ti.
16. epidemiologic methods.mp.
17. exp Epidemiologic Methods/
18. *cohort studies/ or cohort.ti,ab.
19. (longitudinal or prospective).ti,ab.
20. *case-control studies/
21. Control groups/ or control group*.ti,ab.
22. Matched-pair analysis/
23. (case* adj5 control*).ti,ab.
24. (case* adj3 comparison*).ti,ab.
25. (case* adj3 referen*).mp.
26. (case* adj1 base).mp.
27. (case* adj1 cohort).mp.
28. exp cross-sectional studies/ or cross-sectional.ti,ab.
29. Controlled clinical trial.pt.
30. Randomized controlled trial.pt.
31. (random$ or placebo$ or single blind$ or double blind$ or triple blind$).ti.ab.
32. Quasi-randomized Controlled Trial.mp.
33. (Controlled before and after).mp.
34. (Controlled before and after studies).mp.
35. Interrupted time series.mp.
36. Interrupted time series studies.mp.
37. or/12-36
38. Arab states of the Persian Gulf.mp.
39. Gulf Cooperation Council.mp.
40. Gulf countries.mp.
41. exp Saudi Arabia/ or Eastern Arabia.mp.
42. Kuwait.mp. or exp Kuwait/
43. Bahrain.mp. or exp Bahrain/
44. Oman.mp. or exp Oman/
45. Qatar.mp. or exp Qatar/
46. United Arab Emirates.mp. or exp United Arab Emirates/

47. or/38-46
48. 11 and 37 and 47
49. advertisements/ or animation/ or architectural drawings/ or bibliography/ or biography/ or book illustrations/ or bookplates/ or charts/ or comment/ or letter/ or editorial/ or news/ or patient education handout/ or published erratum/ or "retraction of publication"/
50. 48 not 49

Appendix 2

Table 1 Summary of evidence on the prevalence/incidence, risk/prognostic factors for obesity in GCC countries

Author, year, country	Age range	Prevalence/incidence		Outcomes	Factors studied		Statistical analysis method	Results and comments
		Overweight	Obesity		Risk factors	Prognostic factors		

Table E1: The main features, main results of incidence and prevalence of obesity, and overall risk of bias assessment on the studies included in the systematic review on the epidemiology of obesity in GCC countries

Author, year, country	Study design	Inclusion/ exclusion criteria	Study population N, source of study population		Outcome assessment and definition		Occurrence measure(s)	Main results of the incidence or prevalence of obesity Percentage (95% CI)	Overall risk of bias assessment
			Number approached	Number participated	Outcome assessment	Outcome definition			

Table E2: Critical appraisal of included observational studies assessed by the Effective Public Health Practice Project (EPHPP)

Study, year	Design	Selection Bias			Study Design			Confounders			Blinding			Data Collection Method			Withdrawals and Dropouts			Global Rating		
		S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W

Abbreviations:

S	Strong
M	Moderate
W	Weak
NA	Not applicable

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol

Epidemiology of overweight and obesity in early childhood in the Gulf Cooperation Council countries: a systematic review and meta-analysis protocol

Section/topic	*#*	*Checklist item*	*Reported on page #*
ADMINISTRATIVE INFORMATION			
Title Identification Update	 1a 1b	 Identify the report as a protocol of a systematic review If the protocol is for an update of a previous systematic review, identify as such	 1
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	PROSPERO CRD42017073189
Authors: Contact Contributions	 3a 3b	 Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author Describe contributions of protocol authors and identify the guarantor of the review	 1 1, 7
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	NA
Support: Sources Sponsor Role of sponsor or funder	 5a 5b 5c	 Indicate sources of financial or other support for the review Provide name for the review funder and/or sponsor Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	 NA NA NA
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	2
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4
METHODS			

Section/topic	*#*	*Checklist item*	*Reported on page #*
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	4,5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	4-6
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	9,10
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	6
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	5
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	5
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	4-6
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	4
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	5
Data synthesis	15a 15b 15c 15d	Describe criteria under which study data will be quantitatively synthesised If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ) Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression) If quantitative synthesis is not appropriate, describe the type of summary planned	5,6 6 6 6
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	6
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	4-6

BMJ Open

Epidemiology of overweight and obesity in early childhood in the Gulf Cooperation Council countries: a systematic review and meta-analysis protocol

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Complete List of Authors:	Nahhas, Mahmoud; Ministry of Health, Kingdom of Saudi Arabia, School Health Asamoah, Felix ; Queen Mary, University of London; NHSI England, UK Mullen, Stephen ; Paediatric Emergency Department, University Hospitals of Wales Nwaru, Bright; Krefting Research Centre, Institute of Medicine, University of Gothenburg, Sweden; Usher Institute of Population Health Sciences and Informatics, The University of Edinburgh Nurmatov, Ulugbek; Division of Population Medicine, School of Medicine, Cardiff University
Primary Subject Heading:	Public health
Secondary Subject Heading:	Epidemiology, Evidence based practice, Public health
Keywords:	EPIDEMIOLOGY, systematic review, Obesity

Epidemiology of overweight and obesity in early childhood in the Gulf Cooperation Council countries: a systematic review and meta-analysis protocol

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Keywords
Obesity, children, early years, epidemiology, risk factors, the Gulf Cooperation Council (GCC) countries, systematic review

ABSTRACT

Introduction: There has been a notable increase in the prevalence of overweight and obesity in school-aged children in many industrialised regions. The worldwide prevalence of childhood overweight and obesity increased from 4.2% in 1990 to 6.7% in 2010. Although many studies have been published, the epidemiological burden of overweight and obesity in the Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) is unclear. There is a need to bring together and appraise relevant studies in order to estimate the epidemiological burden (including incidence, prevalence, risk factors, trend over time) of overweight and obesity in this region and thus help to inform national and regional policies.

Methods and analysis: We will conduct a systematic review and meta-analysis on the epidemiology of overweight and obesity in early childhood including incidence, prevalence, risk factors and trends over time in the GCC countries. We will search international electronic databases including MEDLINE, EMBASE, Cochrane Library, ISI Web of Science, CINAHL, Google Scholar, AMED, Psych INFO, CAB International, and WHO Global Health Library for published, unpublished and in-progress epidemiological studies of interest published from inception to 2017. In addition, we will contact an international panel of experts on the topic. There will be no restriction on the language of publication of studies. We will use the Effective Public Health Practice Project (EPHPP) to appraise the methodological quality of included studies. Meta-analysis will be undertaken using random effects models.

Protocol registration number: International Prospective Register for Systematic Reviews (PROSPERO) number CRD42017073189

Ethics and dissemination: Ethical approval is not required. The outcome of the review will be disseminated through conference presentations and peer-reviewed journal publication.

Strengths and limitations of this study:

- This systematic review will for the first time provide estimates of the epidemiological burden of overweight and obesity in early childhood across the GCC region and within each nation
- Understanding the burden of overweight and obesity during the early years will help to formulate and strengthen national family and school policies for children in this age group in the GCC region.
- Whilst this study will provide a comprehensive overview of the burden of overweight and obesity in the GCC region, we anticipate disparities across available

studies, and this will be taken into account in our interpretation of the underlying evidence.

INTRODUCTION

Childhood overweight and obesity is a global health problem, impacting the physical and psychological health of individuals for the duration of their life.[1-5] Childhood overweight and obesity strongly correlate with adult obesity, which is linked to an increased risk of morbidity and mortality.[6,7] Overweight or obese children have an increased risk of heart disease, diabetes and other health problems in adulthood.[2] The impact is not limited to the individual but carries a significant economic burden.[8] This is partially due to increased spending on healthcare with a German study estimating the excess lifetime cost of childhood overweight and obesity in the German population at €145 billion.[9]

According to the World Health Organisation (WHO), 43 million children (35 million from developing countries) were estimated to be overweight and obese in 2010, while 92 million worldwide were at risk of being overweight.[10] In the same report, the worldwide prevalence of childhood overweight and obesity combined increased from 4.2% (95% CI: 3.2% to 5.2%) in 1990 to 6.7% (95% CI: 5.6% to 7.7%) in 2010. This trend is expected to reach 9.1% (95% CI: 7.3%, 10.9%) or affect 60 million children by 2020.[10]

The prevalence of childhood obesity is high among Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), with the prevalence of obesity among pre-school children estimated to be between 8% to 9%.[11] In Kuwait, for instance, 40-49% of adolescents are obese.[11] Kuwait ranks among the top 7% of countries worldwide in reference to adult obesity prevalence,[1,12] and is among the top 3% of countries with the highest prevalence of diabetes.[13]The recognition of childhood overweight and obesity and the long-term consequences, has made it a high priority for health authorities in the GCC countries[14,15] and globally.[1,16]

Currently there is paucity of robust epidemiological data on childhood overweight and obesity in the GCC countries. A number of studies suggest that trends in childhood overweight and obesity in GCC countries may be increasing.[17-21] However, despite several studies that have been published the epidemiological burden of overweight or obesity in the GCC is currently unclear. Given differences in population structure, culture and lifestyle

habits, education, occupation, the risk factors for obesity may vary from population to population, hence risk factors may differ between the GCC countries and western countries.[22] There is a need to bring together the relevant available evidence and synthesise them in order to derive relevant epidemiological parameters (including incidence, prevalence, risk factors, trend over time) that will help to describe current burden of overweight and obesity in the GCC region. This will help to formulate or strengthen existing regional and national policies around obesity, particularly in relation to school and early years nutrition and lifestyle.

The early childhood concept model and framework has been developed in several countries. [23,24.] Obesity can occur early in life with the prenatal and early childhood periods crucial for child growth and development. [25,26] In addition, important and powerful obesity risk factors can be identified within the first 1000 days of early life, from conception to 24 months.[3] Preventing the causes and consequences of childhood obesity, avoiding transition of obesity from early childhood to adulthood and altering early life systems promise the interruption of the continuing vicious cycle of the childhood obesity epidemic worldwide.[27]

We plan to undertake a systematic review to identify, appraise and synthesise all available evidence on the epidemiology of overweight and obesity in children during the early years of life in the GCC region. Specifically, by bringing together all relevant published evidence, this systematic review aims to provide reliable and contemporaneous estimates of the incidence, prevalence, time trends, risk factors for childhood overweight and obesity in GCC countries in children during the early life years. The focus on the early years of childhood is to identify early dominant factors that may in the long-term help in formulating evidence-based policies for early interventions.

METHODS AND ANALYSES

Types of studies

We will include all interventional (randomised controlled trials, controlled before and after studies, and interrupted time series studies) and observational (cohort, case control, and cross-sectional studies) studies. The main source of data on the incidence and prevalence of obesity will come from cohort and cross-sectional studies, respectively. We will include

interventional and case-control studies, as these will additionally provide data on risk factors for obesity. Reviews, case studies and case series, and animal studies will be excluded.

Participants

The participants will include all children in their early years (up to the child's 8th birthday). We will include and extract data only for children aged under 8 years old. If there are aggregated data and no sub-group analysis for children aged up to 8 years old we will exclude those papers.

Outcome measures

Primary outcomes: Our primary outcomes will include objectively defined measures of the incidence and prevalence of overweight and obesity, time trends in children aged up to 8 years old in GCC countries. For consistency, we will use the standard, validated WHO definition of overweight and obesity in children based on body mass index (BMI) measurements.

Secondary outcomes: Secondary outcomes will include risk factors of overweight and obesity in children aged up to 8 years old in GCC countries.

Search methods

We will employ a highly sensitive search strategy to retrieve articles meeting the review criteria. We will include studies from 2000 onwards to capture current and strong evidence in this SR. Appendix 1 contains the search strategies developed for MEDLINE database interface, which we will adapt to search other databases. Databases to search will include MEDLINE, EMBASE, Cochrane Library, ISI Web of Science, CINAHL, Google Scholar, AMED, Psych INFO, CAB International, and WHO Global Health Library. Additional references will be located through searching the references cited in identified papers, as well as searching databases of the proceedings of international conferences, such as ISI Conference Proceedings Citation Index and ZETOC (British Library). For unpublished and ongoing studies, we will contact international experts in the field of research. There will be no language restrictions, and where possible we will translate literature in languages other than English and report any literature we are unable to translate.

Study selection

Duplicate papers will be removed first before undertaking the screening. If there are multiple publications from the same population, we will use the main comprehensive paper that incorporates all relevant outcomes that meet our inclusion criteria. Two reviewers will independently check titles and abstracts of the retrieved articles according to the review criteria; any discrepancies will be resolved by consensus and a third reviewer will arbitrate disagreements. Full text copies of potentially relevant studies will be obtained and their eligibility for inclusion independently assessed by two reviewers; discrepancies will be resolved by consensus and disagreements will be arbitrated by a third reviewer.

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Competing of interests: The authors declare no competing interest related to this work.

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Appendix 1: MEDLINE Search Strategy

1. pediatric obesity.mp. or exp Pediatric Obesity/
2. obesity in children.mp.
3. obesity.mp. or exp Obesity/ or exp Obesity, Morbid/
4. overweight.mp. or exp Overweight/
5. weight gain.mp. or exp Weight Gain/
6. (overweight or over weight or overeat* or over eat* or overfeed* or over feed*).ti,ab.
7. (weight adj1 gain*).ti,ab.
8. obes*.ti,ab.
9. exp Body Mass Index/ or body mass.mp.
10. (BMI or body mass index).ti,ab.
11. or/1-10
12. incidence.mp. or exp Incidence/
13. prevalence.mp. or exp Prevalence/
14. risk factors.mp. or exp Risk Factors/
15. (incidence or prevalence or epidemiol$).ti.
16. epidemiologic methods.mp.
17. exp Epidemiologic Methods/
18. *cohort studies/ or cohort.ti,ab.
19. (longitudinal or prospective).ti,ab.
20. *case-control studies/
21. Control groups/ or control group*.ti,ab.
22. Matched-pair analysis/
23. (case* adj5 control*).ti,ab.
24. (case* adj3 comparison*).ti,ab.
25. (case* adj3 referen*).mp.
26. (case* adj1 base).mp.
27. (case* adj1 cohort).mp.
28. exp cross-sectional studies/ or cross-sectional.ti,ab.
29. Controlled clinical trial.pt.
30. Randomized controlled trial.pt.
31. (random$ or placebo$ or single blind$ or double blind$ or triple blind$).ti.ab.
32. Quasi-randomized Controlled Trial.mp.
33. (Controlled before and after).mp.
34. (Controlled before and after studies).mp.
35. Interrupted time series.mp.
36. Interrupted time series studies.mp.
37. or/12-36
38. Arab states of the Persian Gulf.mp.
39. Gulf Cooperation Council.mp.
40. Gulf countries.mp.
41. exp Saudi Arabia/ or Eastern Arabia.mp.
42. Kuwait.mp. or exp Kuwait/
43. Bahrain.mp. or exp Bahrain/
44. Oman.mp. or exp Oman/
45. Qatar.mp. or exp Qatar/
46. United Arab Emirates.mp. or exp United Arab Emirates/

47. or/38-46
48. 11 and 37 and 47
49. advertisements/ or animation/ or architectural drawings/ or bibliography/ or biography/ or book illustrations/ or bookplates/ or charts/ or comment/ or letter/ or editorial/ or news/ or patient education handout/ or published erratum/ or "retraction of publication"/
50. 48 not 49

Appendix 2

Table 1 Summary of evidence on the prevalence/incidence, risk/prognostic factors for obesity in GCC countries

Author, year, country	Age range	Prevalence/incidence		Outcomes	Factors studied		Statistical analysis method	Results and comments
		Overweight	Obesity		Risk factors	Prognostic factors		

Table E1: The main features, main results of incidence and prevalence of obesity, and overall risk of bias assessment on the studies included in the systematic review on the epidemiology of obesity in GCC countries

Author, year, country	Study design	Inclusion/ exclusion criteria	Study population N, source of study population		Outcome assessment and definition		Occurrence measure(s)	Main results of the incidence or prevalence of obesity Percentage (95% CI)	Overall risk of bias assessment
			Number approached	Number participated	Outcome assessment	Outcome definition			

Table E2: Critical appraisal of included observational studies assessed by the Effective Public Health Practice Project (EPHPP)

Study, year	Design	Selection Bias			Study Design			Confounders			Blinding			Data Collection Method			Withdrawals and Dropouts			Global Rating		
		S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W

Abbreviations:

S	Strong
M	Moderate
W	Weak
NA	Not applicable

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol

Epidemiology of overweight and obesity in early childhood in the Gulf Cooperation Council countries: a systematic review and meta-analysis protocol

Section/topic	*#*	*Checklist item*	*Reported on page #*
ADMINISTRATIVE INFORMATION			
Title Identification Update	 1a 1b	 Identify the report as a protocol of a systematic review If the protocol is for an update of a previous systematic review, identify as such	 1
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	PROSPERO CRD42017073189
Authors: Contact Contributions	 3a 3b	 Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author Describe contributions of protocol authors and identify the guarantor of the review	 1 1, 7
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	NA
Support: Sources Sponsor Role of sponsor or funder	 5a 5b 5c	 Indicate sources of financial or other support for the review Provide name for the review funder and/or sponsor Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	 NA NA NA
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	2
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4
METHODS			

Section/topic	*#*	*Checklist item*	*Reported on page #*
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	4,5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	4-6
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	9,10
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	6
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	5
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	5
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	4-6
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	4
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	5
Data synthesis	15a 15b 15c 15d	Describe criteria under which study data will be quantitatively synthesised If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ) Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression) If quantitative synthesis is not appropriate, describe the type of summary planned	5,6 6 6 6
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	6
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	4-6