PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Prevalence of overweight/obesity among the adult population in Ethiopia: A systematic review and meta-analysis
AUTHORS	Kassie, Ayelign; Abate, Biruk; Wudu, Mesfin

VERSION 1 – REVIEW

REVIEWER	Prof Adrian Esterman University of South Australia, Australia
REVIEW RETURNED	24-Apr-2020

GENERAL COMMENTS	Page 7: Lines 47-50: In this study, heterogeneity was interpreted as an I2 value of 0% = no heterogeneity, ≤ 25% = low, 25%-50% = moderate, and ≥ 75% = high You have missed out a category! In the PRISMA flow diagram, the numbers don't add up

REVIEWER	Kufre J. Okop University of Cape Town, Cape Town, South Africa
REVIEW RETURNED	08-Jun-2020

GENERAL COMMENTS	The paper is well written, but the discussion and conclusion needs to be critically tied to the analysis and the findings. Reviewer's comments Abstract: In your abstract, you stated obesity prevalence in relation to locale, but not in relation to gender. Was there any difference in prevalence by gender in the entire samples, and in rural-urban setting? This should be indicated. The prevalence rate of overweight and obesity was different from rural to urban and from time to time with an increasing fashion. The above statement needs clarification, as I struggle to get a clear understanding of what you mean. Introduction: Lines 4-7 (page 3). The first two introductory sentences need are not quite succinct. They need to be reframed to properly introduce the health problem in question. Overnutrition is becoming a major global health problem. It includes, overweight, obesity and diet-related non-communicable diseases. The authors refer to indicated in error that overnutrition 'includes overweight, obesity and diet-related non-communicable diseases. Lines 39-41 It is important to state the findings alongside the year – that is, when the research was conducted.

	The statement in line 39-41 (page 3) could read According to a study conducted in 2013 on the global trends of overweight and obesity, 26.9% of adults in Africa are overweight and obese. Lines 1-4 (Page 4) …obesity kills… is not a an appropriate scientific statement. It could be written an better way. This statement “Most of the world's population live in countries where overweight and obesity kills more people than underweight’ should either be framed appropriately, or deleted. Moreover, underweight among adult population may not be considered as a risk factor for mortality, and hence comparing obesity/overweight and underweight here, do not make a logical argument. I suggest that the paragraph 1 in page 4 should begin with the last sentence of the current paragraph 1. That is: The latest WHO reports also showed that overweight and obesity are becoming the leading causes of death worldwide (1, 13). Page 4: Paragraph 3 - Lines 29-34 Ethiopia is not different. According to the 2016 EDHS report, the proportion of overweight and obesity among women has increased from 3% in 2000 to 8% in 2016. Similarly, 3% of men were overweight or obese (15). The first sentence above is hanging. Ethiopia is not different – about what? What is EDHS? Acronyms must be written in actual words when it is used the first time. Importantly, the argument on the reason why review on obesity and overweight in Ethiopia is needed is not convincing to me. See the statement made by the authors below (on page 5 – lines 4-6): However, primary studies on the prevalence of overweight and obesity in Ethiopia are inconclusive Let readers know what you have in mind here. What does inclusive entails here? Explain to the readers, and make us convince that the research topic is worthwhile. Methods: On literature search strategy I am not convince of the rigour in the search strategy. I did not see clear information on how the authors enhanced quality and avoided errors in literature search. It is quite necessary to plan the search strategy carefully, which includes ‘consulting the MeSH database to identify the concepts and choose all appropriate terms’. This, I have not seen clearly stated in this paper, if this strategy was adopted. It is important to stated strategy adopted categorically. Kindly read this article by Salvador-Oliván et al, 2019. See the link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466507/pdf/jmla-107-210.pdf Eligibility criteria and outcomes of interest were probably stated by the authors. However, reasons were not given why studies published in Amharic (an key Ethiopian language) or those articles in other languages were omitted. How this omission could affect the results were not also stated. Statistical analysis

	Page 7. Lines 43-45 What is I2 tests? This should be written correctly, and also explained to the reader what it is used for. Results: Page 9: Lines 13-16 The studies included in this systematic review and meta- analysis varied substantially in sample size ranging from 68 to 6,602. I do not think a sample size of 68 is 'substantial' sample. It will be very appropriate if the authors uses sample size as part of the selection or inclusion criteria. This is important because, some studies have arrived at prevalence of obesity with very small sample size (like 68 – 100), which does not gives good statistical standing. Publication Bias Page 12: The authors indicated publication biases for obese and overweight articles. However, they have not explained the extent of the biases, and why where these studies with biases where still considered suitable for inclusion in the review. We want to see the arguments around these. How valuable is the trim and fill analysis in making adjustment to address highly of biases? This should be explained in the methods, and also discussed appropriately. Discussions/Conclusion: The authors have made discussions and conclusion pointing to obesity and overweight increasing in Ethiopia. This is expected, as we have seen in your introduction, and also in the available literature. What I was looking for as a reader, was to see a somewhat different argument around methods of reporting and presenting of obesity data (including prevalence) in studies that were considered. Also, I was expecting an argument around the usual disparity of obesity by gender in Africa countries, including Ethiopia. Also, a question around why studies on obesity/overweight were mostly (>85%) conducted in the urban areas in Ethiopia; and why do you allege that obesity prevalence was different in rural and urban?. This has implication on programmatic strategies for prevention intervention for obesity in Ethiopia. Also, I saw that the studies were all in the urban setting, except two that were in both (I guess these were in rural and urban settings respectively) –see Supplementary table 1). There is a need to discuss how this has affected your overall findings. Would there be a difference in your findings, if for instance, half of the studies were those conducted in the rural areas? Study Limitations: More study limitations needs to be stated (especially on methods – cross-sectional, and reporting on mostly urban settings, etc), and explicit explanation given as to how this can impact on the findings.

VERSION 1 – AUTHOR RESPONSE

Reviewer 1:
Comment: Page 7: Lines 47-50: In this study, heterogeneity was interpreted as an I2 value of 0% = no heterogeneity, ≤ 25% = low, 25%-50% = moderate, and ≥ 75% = high. You have missed out a category!

Author's response:
Corrected as: an I2
value of 0% = no heterogeneity, ≤ 25% = low, 25%-50% = moderate,
50-75= substantial and ≥ 75% = high heterogeneity.
Comment: In the PRISMA flow diagram, the numbers don't add up
Author's response: Re-done with corrections.
Abstract:
Comment: In your abstract, you stated obesity prevalence in relation to locale, but not in relation to gender. Was there any difference in prevalence by gender in the entire samples, and in rural urban setting? This should be indicated.
Author's response:
Yes there was difference from rural to urban. But, there was no analysis based on gender because studies were involving either women participant only or both men and women which make to run sub-group analysis based on gender very difficult. I am saying there was no study which was conducted on men only. The revision is stated as follows in the abstract section: The prevalence of overweight was higher, 22.6% in studies published since 2015, 22.4% in studies conducted in urban settings and 24.4% in studies with a sample size of less than or equal to 384 participants. Similarly, the prevalence of obesity was found to be 6.9% in studies published since 2015, 6.2% in studies conducted in urban settings, 6.4% in institution based settings and 9.6% in studies with a sample size of less than or equal to 384 participants. Abstract result section
Comment: The prevalence rate of overweight and obesity was different from rural to urban and from time to time with an increasing fashion. The above statement needs clarification, as I struggle to get a clear understanding of what you mean.
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Author's response:
It is clarified as follows: The prevalence of overweight was higher, 22.6% in studies published since 2015, 22.4% in studies conducted in urban settings and 24.4% in studies with a sample size of less than or equal to 384 participants. Similarly, the prevalence of obesity was found to be 6.9% in studies published since 2015, 6.2% in studies conducted in urban settings, 6.4% in institution based settings and 9.6% in studies with a sample size of less than or equal to 384 participants. Abstract result section
Introduction:
Comment: Lines 4-7 (page 3). The first two introductory sentences need are not quite succinct. They need to be reframed to properly introduce the health problem in question. Overnutrition is becoming a major global health problem. It includes, overweight, obesity and diet-related noncommunicable diseases. The authors refer to indicated in error that overnutrition „includes overweight, obesity and diet-related non-communicable diseases.
Author's response:
Reframed as suggested in the following way, Overnutrition is becoming the major public health problem globally. Overweight, obesity and diet-related non-communicable diseases are included under problems of overnutrition.
Comment: Lines 39-41, It is important to state the findings alongside the year – that is, when the research was conducted. The statement in line 39-41 (page 3) could read
According to a study conducted in 2013 on the global trends of overweight and obesity, 26.9% of adults in Africa are overweight and obese.
Author's response: It is revised as suggested "According to a study conducted in 2013 on the global trends of overweight and obesity, 26.9% of adults in Africa are overweight and obese"
Comment: Lines 1-4 (Page 4)
…obesity kills… is not a an appropriate scientific statement. It could be written an better way. This statement "Most of the world's population live in countries where overweight and obesity kills more people than underweight" should either be framed appropriately, or deleted.

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Moreover, underweight among adult population may not be considered as a risk factor for mortality, and hence comparing obesity/overweight and underweight here, do not make a logical argument. I suggest that the paragraph 1 in page 4 should begin with the last sentence of the current paragraph 1. That is:
The latest WHO reports also showed that overweight and obesity are becoming the leading causes of death worldwide (1, 13).
Author's response:
Thank you very much for giving us a very important insight to this paragraph. The paragraph is re-written as suggested in the following way, the argument is deleted:
The latest WHO reports showed that overweight and obesity are becoming the leading causes of death worldwide. In 2015, high body mass index (BMI) has caused an estimated 4 million deaths globally, and nearly 40% of these deaths occurred in persons who were overweight but not obese. More than two-thirds of the deaths related to high BMI were due to cardiovascular diseases.
Comment: Page 4: Paragraph 3 - Lines 29-34
Ethiopia is not different. According to the 2016 EDHS report, the proportion of overweight and obesity among women has increased from 3% in 2000 to 8% in 2016. Similarly, 3% of men were overweight or obese (15). The first sentence above is hanging. Ethiopia is not different – about what? What is EDHS? Acronyms must be written in actual words when it is used the first time.
Author's response:
The paragraph is re-written as follows:
Like other countries, the burden of overweight and obesity is becoming a major problem in Ethiopia. According to the 2016 Ethiopian demographic and health survey report, the proportion of overweight and obesity among women has increased from 3% in 2000 to 8% in 2016. Similarly, 3% of men were overweight or obese in 2016
Comment: Importantly, the argument on the reason why review on obesity and overweight in Ethiopia is needed is not convincing to me. See the statement made by the authors below (on page 5 – lines 4-6):
However, primary studies on the prevalence of overweight and obesity in Ethiopia are inconclusive.
Let readers know what you have in mind here. What does inclusive entails here? Explain to the readers, and make us convince that the research topic is worthwhile.
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Author's response:
Here it is to mean there is no national study on the prevalence of overweight and obesity in the general population, even the Ethiopian demographic and health survey report is for a certain population only. Hence, the paragraph is rewritten as follows accordingly:
Therefore, knowing the prevalence of overweight and obesity is paramount to design preventive strategies. However, there is no national study on the prevalence of overweight and obesity in the general adult population Ethiopia. Furthermore, findings from small studies are inconsistent with the combined prevalence rate overweight and obesity reported ranging from 4.5% (21) to 21.4% (22) in the country. Hence, this systematic review and meta-analysis aimed to determine the pooled prevalence of overweight and obesity among adults in Ethiopia
Methods:
Comment: On literature search strategy
I am not convince of the rigour in the search strategy. I did not see clear information on how the authors enhanced quality and avoided errors in literature search. It is quite necessary to plan the search strategy carefully, which includes „consulting the MeSH database to identify the concepts and choose all appropriate terms". This, I have not seen clearly stated in this paper, if this strategy was adopted. It is important to stated strategy adopted categorically. Kindly read this article by Salvador-Oliván et al, 2019. See the link:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466507/pdf/jmla-107-210.pdf
Author's response:
Thank you for giving us an insight for the search strategy.
Though the search strategy was developed after consulting the MeSH database to identify the concepts and choose all appropriate terms "All fields" was employed during search after identification of the terms. The terms identified using MeSH data base were: "overweight", "obesity", "nutrition", "malnutrition", "undernutrition", "over nutrition", "adults", "elders", "geriatrics" and "Ethiopia". The key terms were used in combination using Boolean operators like "OR" or "AND". The searches were restricted to full texts, free articles, human studies, and English language publications. The PubMed search strategy was employed and is written in the methodology section as follows but after identification of the terms „All fields" was employed during search.: PubMed search strategy: ((((((((((overweight)) OR (obesity)) OR (nutrition)) OR (malnutrition)) OR (overnutrition)) OR (undernutrition)) AND (Adults)) OR (Elders)) OR
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(Geriatrics)) AND (Ethiopia)) AND (("2010/01/01"[Date - Entry]: "2020/10/03"[Date - Entry])).
Filters applied: Free full text, in the last 10 years.
Furthermore, grey literatures like surveillance report, academic dissertations, and conference abstracts were also examined and included when they deemed low risk. Besides, the reference lists of included articles in this systematic review and meta-analysis were handsearched to identify any relevant additional articles.
Comment: Eligibility criteria and outcomes of interest were probably stated by the authors. However, reasons were not given why studies published in Amharic (an key Ethiopian language) or those articles in other languages were omitted. How this omission could affect the results were not also stated.
Author's response:
It is re-written as follows after the clarification of inclusion criteria.
It was considered that the exclusion of articles published in other languages due to translation issues might create language bias. However, no articles published in other languages including the Amharic language were obtained during the search period.
Statistical analysis
Comment: Page 7. Lines 43-45
What is I2 tests? This should be written correctly, and also explained to the reader what it is used for.
Author's response:
Thank you. It is re-written as: Cochran‟s Q chi-square statistic and the I2 tests were run to
assess the random variations between primary studies. The I2 test is used to indicate the percentage of variance in a meta-analysis that is attributable to heterogeneity among the studies.
Results:
Comment: Page 9: Lines 13-16
The studies included in this systematic review and meta- analysis varied substantially in sample size ranging from 68 to 6,602.
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I do not think a sample size of 68 is „substantial" sample. It will be very appropriate if the authors uses sample size as part of the selection or inclusion criteria. This is important because, some studies have arrived at prevalence of obesity with very small sample size (like 68 – 100), which does not gives good statistical standing.
Author's response:
It is not to mean the sample size 68 is substantial, rather it is to mean there was big difference in sample size among the studies. Of course yes small sample size can affect the estimate. For that we have used sample size as a unit in the sub-group analysis. Therefore, it is

re-phrased to avoid ambiguity as “The studies included in this systematic review and metaanalysis varied significantly in sample size ranging from 68 (the small) to 6,602 (the large)”.

Publication Bias

Comment: Page 12:

The authors indicated publication biases for obese and overweight articles. However, they have not explained the extent of the biases, and why where these studies with biases where still considered suitable for inclusion in the review. We want to see the arguments around these. How valuable is the trim and fill analysis in making adjustment to address highly of biases? This should be explained in the methods, and also discussed appropriately.

Author’s response:

It is re-written as follows in the methods section.

Methods of avoiding publication bias like identifying and including unpublished studies, meeting abstracts and dissertation theses were considered. Furthermore, potential publication bias was assessed by visually inspecting funnel plots and objectively using the Egger"s bias test during analysis. The trim and fill analysis was done to assess for and adjust any publication bias based on the assumption that the effect sizes of all the studies are normally distributed around the center of a funnel plot in the absence of publication bias.

The trim-and-fill method is used to first trim the studies that cause asymmetry in the funnel"s plot so that the overall effect estimate produced by the remaining studies can be considered minimally affected by publication bias, and then to fill imputed missing studies in the funnel plot based on the bias-corrected overall estimate.

In the result section it is discussed as follows:

To reduce and adjust publication bias in the studies, trim and fill analysis was performed to estimate the number of missing studies that might exist. During analysis, only one study was 8
imputed for missing studies and after adjustment for publication bias, the estimated pooled prevalence of overweight among adults in Ethiopia appeared to be 19.02

Likewise, studies included in obesity estimation among adults in Ethiopia were adjusted with trim and fill analysis. During the analysis, only one study was imputed for missing studies. However, after adjustment, the estimated pooled prevalence of obesity was found to be 5.44% (95% CI: 4.37, 6.51). This finding is similar with the unadjusted prevalence rate of obesity, but with different levels of heterogeneity among the studies in the random-effects model analysis (I^2 = 3.71%, $p \leq 0.001$).

Discussions/Conclusion:

Comment: The authors have made discussions and conclusion pointing to obesity and overweight increasing in Ethiopia. This is expected, as we have seen in your introduction, and also in the available literature.

What I was looking for as a reader, was to see a somewhat different argument around methods of reporting and presenting of obesity data (including prevalence) in studies that were considered. Also, I was expecting an argument around the usual disparity of obesity by gender in Africa countries, including Ethiopia.

Author’s response:

Discussions added as suggested.

The prevalence of overweight reported in the country ranges from 4.7% (41) to 40.1% (40). This difference could be due to differences in the study population because unlike the first study which was conducted on nutritional status of lactating mothers, the second study was conducted among office-based urban civil servants. Office-based civil servants are one of the highest groups for overweight and obesity due to their occupational exposure to sedentary type lifestyle (47, 48).

Besides, the prevalence of obesity reported in the country ranges from 1.6% (42) to 16.2% (34). This discrepancy might be due to differences in the study population. The first finding that is 1.6% was reported from the study in lactating mothers and the later, 16.2% was

reported from a study conducted among the general adult population and only in the urban setting, a well-known risk factor for overweight and obesity because people living in urban
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settings are at increased risk of sedentary type lifestyles and consumption of more energy dense foods (50, 51). On the other hand, lactating mothers have increased nutritional demand and are at greater risk of undernutrition if the nutritional requirements are not properly fulfilled (52, 53).
Comment: Also, a question around why studies on obesity/overweight were mostly (>85%) conducted in the urban areas in Ethiopia; and why do you allege that obesity prevalence was different in rural and urban?. This has implication on programmatic strategies for prevention intervention for obesity in Ethiopia.
Author's response:
Thank you, among the included studies majority were conducted only in urban settings and only two studies were conducted involving participants from both urban and rural areas. For this what we did is comparing the prevalence rate of overweight and obesity among studies conducted only urban settings vs. studies conducted both in urban and rural settings. Therefore, during discussion we have clarified it as:
There was a significant level of heterogeneity among the primary studies included in this systematic review and meta-analysis. Thus, a subgroup analysis was conducted through stratification using study year, residence, study setting, and sample size in order to identify the sources of heterogeneity to the pooled prevalence of overweight and obesity. The prevalence of overweight was found to be higher in some groups; 22.6% in studies conducted since 2015, 22.4% in studies conducted only in urban settings, 20.4% in institution-based settings and 24.4% in studies with a sample size of less than or equal to 384 participants compared to their counter parts. This indicates that overweight has increased among adults in Ethiopia compared to previous studies (14).
Besides, the prevalence of obesity was found to be 6.9% in studies conducted since 2015, 6.2% in studies conducted only in urban settings, 6.4% in institution-based settings and 9.6% in studies with a sample size of less than or equal to 384 participants. This means the prevalence of overweight and obesity is increasing from time to time especially among urban residents. However, no study was found involving rural participants only. Majority of the studies were conducted in urban areas and only two studies were conducted involving participants from both urban and rural settings. If sufficient studies were found in rural areas the results might not have been like this (Table 1).
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Because, the prevalence rate of overweight and obesity is significantly different in rural and urban settings across low and middle-income countries with the highest rates occurring in urban settings. For example, the Ghanaian study has reported a higher prevalence of overweight (27.2% in urban and 16.7% in rural), and obesity (20.6% in urban and 8.0% in rural settings) among urban than rural residents (54). Similar findings have been reported from the Ethiopian demographic and health survey 2016 report and from other African countries that the prevalence rate of overweight and obesity is higher among urban residents compared to the rural residents (14, 17, 61).
In the conclusion section it is revised as: The prevalence of overweight and obesity was higher in studies conducted only in urban settings compared with studies that are conducted in both urban and rural settings. Furthermore, the rates were also higher in studies conducted since 2015 and in small sample size studies. However, as I stated above no analysis was done based on gender because no study that is conducted among men only was obtained among the included studies.
Comment: Also, I saw that the studies were all in the urban setting, except two that were in both (I guess these were in rural and urban settings respectively) –see Supplementary table 1). There is a need to discuss how this has affected your overall findings. Would there be a difference in your findings, if for instance, half of the studies were those conducted in the rural areas?

Author's response:
Of course yes, majority of the studies were conducted in urban settings and only two studies in both urban and rural settings. No study was found in rural settings alone.
Re-written as follows:
Besides, the prevalence of obesity was found to be 6.90% in studies conducted since 2015, 6.23% in studies conducted only in urban settings, 6.41% in institution-based settings and 9.61% in studies with a sample size of less than or equal to 384 participants. This means the prevalence of overweight and obesity is increasing from time to time especially among urban residents. However, no study was found involving rural participants only. Majority of the studies were conducted in urban areas and only two studies were conducted involving participants from both urban and rural settings. If, sufficient studies were found in rural areas the results might not have been like this (Table 1).
Because, the prevalence rate of overweight and obesity is significantly different in rural and urban settings across low and middle-income countries with the highest rate occurring in 11
urban settings. For example the Ghanaian study has reported a higher prevalence of overweight (27.2% in urban and 16.7% in rural), and obesity (20.6% in urban and 8.0% in rural settings) among urban than rural residents (54). Similar findings have been reported from other countries that the prevalence rate of overweight and obesity is higher among urban residents compared with the rural residents (17, 52, 61).
Comment: Study Limitations: More study limitations needs to be stated (especially on methods – cross-sectional, and reporting on mostly urban settings, etc), and explicit explanation given as to how this can impact on the findings.
Author's response:
Limitations revised as:
 It is difficult to determine if the results from various regions are representative of the entire country, as no data were found for all region of the country.
 Furthermore, majority of the studies were conducted in urban settings and only two studies were obtained involving participants from both rural and urban settings. Hence, the results may not truly reflect the rural population of Ethiopia.
However, since the outcomes are based on measurement of body mass index, the limitations of cross-sectional studies like responder bias, recall bias, interviewer bias and social acceptability bias might not apply. Hence, we have not included it. Besides, this systematic review and met analysis do not study the factors associated with overweight and obesity. Therefore, no further limitations for it can apply for this study.

VERSION 2 – REVIEW

REVIEWER	Prof Adrian Esterman University of South Australia Australia
REVIEW RETURNED	16-Jun-2020

GENERAL COMMENTS	Thank you for making the suggested corrections.

REVIEWER	Kufre J.Okop University of Cape Town, South Africa
REVIEW RETURNED	13-Jun-2020

GENERAL COMMENTS	The authors have attended to the queries on the paper, and I would be accept the paper for publication in your journal.