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Undernutrition and its determinants among Ethiopian adolescent girls: a protocol for systematic review and meta-analysis

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ABSTRACT

Introduction In Ethiopia, undernutrition is the common public health concern, swaying the lives of lots of adolescent girls. Its sequelae are not only limited to them, but rather their upcoming offspring are vulnerable too. Even though some studies have been carried out in different parts of the country, the national pooled prevalence and determinants of undernutrition are not known. Therefore, this study is aimed at determining the pooled prevalence and determinants of undernutrition among adolescent girls in Ethiopia.

Methods Published articles will be retrieved from databases such as Medline and PubMed. Electronic search engines such as Google Scholar and Google will be used. To identify eligible studies, the Joanna Briggs Institute quality appraisal checklists prepared for different study designs will be used. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist will be used to maintain the scientific robustness of the study. The presence of heterogeneity among studies will be examined by forest plot as well as I^2 heterogeneity test. Potential causes of heterogeneity will be explored by carrying out sensitivity and subgroup analyses. The DerSimonian and Laird random-effects model will be used provided that heterogeneity is observed. Publication bias will be examined by observing funnel plots, and objectively by Egger's regression test. If the funnel plot is asymmetric and/or Egger's test was found to be statistically significant ($p<0.05$), the trim and fill (Duval and Tweedie's) analysis will be performed. The presence of a statistical association between independent and dependent variables will be declared if the p value is <0.05 with the 95% CI.

Ethics and dissemination Since this is a systematic review and meta-analysis, ethical clearance will not be a concern. The results of the study will be published in a peer-reviewed reputable journal and presented at different scientific research conferences.

Trial registration number CRD42018106180.

Strengths and limitations of this study

- The critical appraisal will be performed by three reviewers.
- The presence of heterogeneity among studies could be a threat to pooling the findings.
- Only articles published in the English language will be considered.

INTRODUCTION

According to the WHO, adolescent is defined as the age group of 10–19 years.[1] This segment of the population is neither young children nor young adults, and is the second most critical stage in human life.[2] At this stage, many macronutrients and micronutrients are highly demanded, associated with the onset of maturity, menstruation and participation in various sports activities.[3 4] Likewise, this is the period when some important body dimensions are increased; for instance, adolescents attain about 15%–25% of their final adult's stature,[5] 45% of increments in bone mass and half of the adult's weight.[6] In Ethiopia, children and adolescents together account for nearly half (48%) of the Ethiopian population, of which about a quarter are girls.[7]

In developing countries, although the burden of undernutrition among adolescents is not considered as severe as in young infants and children, nowadays it is becoming a major public health problem, and interferes the completion of normal growth and development.[8–10] This problem gradually exposes them to poor performance at school,[11] delays menstruation[8 12] and limits maximum productivity at work.[13] In addition, on the one hand, undernutrition during this period contributes to growth and developmental failure to their prospective children associated with its intergenerational cycle.[14] On the other hand, it increases the risk of developing overnutrition.[15] Preventing the development of protein–energy malnutrition among adolescent girls prevents anaemia and giving birth to low birthweight babies.[16] Furthermore, undernutrition weakens immunity, thereby

increasing their susceptibility to infection and also prolonging their recovery time from illness.[17 18]

Even though progressive economic growth has been observed in developing countries, undernutrition still remains a public health challenge affecting a lot of adolescents.[19 20] In these countries, the magnitude of undernutrition is reported in a problematic manner. For instance, in Asia, stunting is estimated to be between 28.5% and 50.3%,[21–23] and thinness between 32% and 55%.[21 22] In Africa, it has ranged from 10% to 57.8%,[24 25] and particularly in Ethiopia about a third (33%) of adolescent girls are underweight according to a report by Unicef.[26] Likewise, some local studies have also shown that undernutrition has ranged from 21.6% to 58.3%.[19 27 28]

Plenty of previous primary studies have largely shown that undernutrition is attributed to multiple factors. The likelihood of developing undernutrition is increased among adolescent girls who are residing in a rural area,[27] have consumed impure water and poorly diversified diet, eating fewer than three times per day, and having a family size of more than five.[29] Likewise, those who are living in food-insecure[30] and poor household income family are at higher risk.[31]

Even though multiple primary studies have been done to determine the prevalence as well as the factors that contribute to undernutrition in various parts of Ethiopia, the findings are reported in an inconclusive way. Therefore, this study aimed at determining the pooled prevalence and associated factors of undernutrition among Ethiopian adolescent girls. The findings may urge policymakers and nutrition programmers to design and implement a well-comprehensive nutritional intervention to mitigate the burden of undernutrition among this segment of the population.

Objectives

General objective

The general objective is to systematically collect, review and summarise available evidence on the prevalence and determinants of undernutrition among adolescent girls in Ethiopia.

Specific objectives

- To review and estimate the pooled prevalence of undernutrition (stunting and underweight/wasting) among adolescent girls in Ethiopia.
- To review and determine the pooled effect sizes of the determinants of undernutrition (stunting and underweight/wasting) among Ethiopian adolescent girls.

METHODS

Protocol registration and review reporting

This systematic review and meta-analysis has been registered at the international prospective register of systematic review and meta-analysis (PROSPERO). This review protocol was prepared based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (2015).[32] While reporting the methods and findings of the study, the authors will strictly adhere to the PRISMA checklist and the Meta-analysis Of Observational Studies in Epidemiology,[33 34] which will largely be helpful to maintain the scientific rigour of the study. All eligible original studies will be qualitatively described in terms of prevalence, study setting, sample size and other relevant characteristics as part of the review. The procedures of screening and selection of eligible studies will be presented using the PRISMA flow diagram. The results of the meta-analysis will be illustrated through figures and texts.

Information source and search strategy

Initially, databases were searched to check for the same systematic review in order to avoid duplicates. The website http://www.library.UCSF.edu and Cochrane/Wiley Library were explored to confirm whether previous systematic review and/or meta-analysis exists. To access published primary studies, PubMed, Medline, Scopus and Health InterNetwork Access to Research Initiative (HINARI) database sources will be used. Grey literature will be retrieved using Google and Google Scholar. In addition, the reference lists of the retrieved studies will be probed to collect articles that are not accessible through databases as well as electronic search engines.

During the search process, to suppress the number of irrelevant studies, the search will be restricted to only 'human studies' and 'English language' in the advanced search. The corresponding author(s) will be contacted via mail or other means of communication for articles with full texts that are hard to access. The following are the key search terms that will be used: "nutritional status", "undernutrition", "stunting", "wasting", "malnutrition", "determinants*", "associated factors", "school girls", "adolescent girls" and "Ethiopia". In the advanced search of databases, the search strategy will be built based on the above-mentioned terms using the 'Medical Subject Headings (MeSH)' and 'All fields' by linking "AND" and "OR" Boolean operator terms as appropriate. The search activity will be done by WWT, AAM and YFA, and the whole process is expected to be completed by 28 September 2018.

Eligibility criteria

Inclusion criteria

- All observational studies, including cross-sectional, analytical cross-sectional, case–control and cohort studies.
- All articles published only in the English language.
- As long as articles were done in Ethiopia and reporting the prevalence, as well as associated factors of all forms of undernutrition (stunting and underweight/wasting), they will be included without time restriction.

Exclusion criteria

Studies with one of the following criteria will be excluded:

- Studies conducted among the special population, such as studies done among adolescent girls living with HIV/AIDS, tuberculosis and mental disorders.
- Articles without full text and data that are difficult to extract, despite contacting the corresponding author(s).
- Studies done in healthcare facilities, as illness greatly affects the nutritional status of the study participants.
- Studies with methodological limitations, such as incorrect outcome ascertainment criteria.

Study screening and selection processes

First, articles gathered from different sources will be exported to EndNote V.6, and duplicates will be identified and removed. Second, the remaining articles will be evaluated in the context of the topic, study participants, language and study area. Third, irrelevant topics, studies conducted out of Ethiopia and articles documented other than the English language will be rejected. Finally, the abstracts and full texts of the remaining studies will be reviewed. Nevertheless, if the study's full text cannot be accessed, they will be excluded.

Patient and public involvement

The central objective of this protocol is simply qualitative reviewing, describing and pooling of the findings of the previous studies conducted by various scholars. Thus, patients as well as patient advisors will not be part of the study.

Risk of bias and quality assessment

The quality assessment appraisal will be performed by three independent reviewers (WWT, FW and ZAM). The quality of each article will be assessed using the standardised Joanna Briggs Institute critical appraisal tool prepared for cohort studies, case–control, cross-sectional[35] and analytical cross-sectional studies.[36] For cohort, case–control and analytical cross-sectional studies, the 10, 8 and 11 question items will be used, respectively. For simple cross-sectional studies, a tool with nine question items will be employed.

All tools have 'Yes' and 'No' types of questions, and scores will be given 1 and 0 for 'Yes' and 'No' responses, respectively. Scores will be summed and transformed into a percentage. Only studies that scored ≥50% will be considered for both systematic review and meta-analysis of prevalence. For any scoring disagreements, which might happen between the assessors, the sources of discrepancy will be investigated by a thorough revision. For persistent disagreements in spite of the detailed review, the average scores of the reviewers will be calculated. Similarly, for determinants, each factor with each outcome variable will be critically appraised. The similar cut-off point that we will be using for prevalence studies will be applied to factors. Moreover, the quality results of primary studies will be placed in a separate column of the data extraction format.

Data collection process

Once eligible studies are identified, two independent reviewers (AAM and ZAM) will extract the relevant data using a prepared format on Microsoft Excel spreadsheet. Information such as the primary investigator's name, sample size, number of undernourished (stunted, underweight/wasted) cases, response rate, study year, publication year, study setting/region, age groups of study participants (if applicable), study design and pertinent associated factors will be extracted.

For prevalence studies, prevalence, logarithm of prevalence and SE of logarithm of prevalence will be computed. Likewise, for determinants, OR, logarithms of OR and SE of the logarithms of OR will be calculated. For any difficulties that might be encountered during data extraction, the corresponding author(s) will be contacted by any means of communication.

Outcome variable

According to the WHO, stunting and underweight/wasting are defined as height for age and body mass index for age of below −2 SD, respectively.[37 38]

Data analysis and assessment of publication bias

The extracted data will be exported to STATA/SE V.14 for further analysis. The existence of heterogeneity among studies will be examined by forest plot as well as I^2 heterogeneity test.[39] The I^2 values of 25%, 50% and 75% will be interpreted as the presence of low, medium and high heterogeneity, respectively. I^2 heterogeneity test of ≥50% and a p value of <0.05 will be declared as the presence of heterogeneity. Thus, the DerSimonian and Laird random-effects model will be employed.[40] To identify the influential studies that resulted in variation, sensitivity analysis will be carried out using the 'metaninf' command.[41] Then, for extreme outlier studies, the extracted data will be checked for any error that might occur during the data extraction processes. Finally, if the data are free of errors, articles will be excluded from the analysis. Similarly, subgroup analyses will be employed by assuming the region and the year of the study as grouping variables and sources of variation.

Using the 'metafunnel' command[42] and objectively by Egger's regression test, publication bias will be detected.[43] Accordingly, asymmetry of the funnel plot and/or statistical significance of Egger's regression test ($p<0.05$) will be suggestive of publication bias. Therefore, using the 'metatrim' command, a non-parametric trim and fill (Duval and Tweedie's) method of analysis will be done.[44]

Using the Laird random-effects model, the pooled prevalence of stunting and wasting/underweight will be reported. The presence of an association between the determinants and the outcome (stunting and wasting/underweight) variables will be estimated based on the effect size. Furthermore, all statistical interpretations will be reported based on the 95% CI.

Moreover, the findings of the qualitative studies will be combined, and an integrative approach of quantitative–qualitative meta-synthesis will be carried out.

DISCUSSION

Adolescent girls are the most liable population to undernutrition associated with the highest macronutrient and micronutrient requirements. In addition, the deleterious effects of undernutrition are numerous. For instance, it could lead to poor educational achievement, adverse pregnancy outcomes, morbidity and delayed first menstruation.

In Ethiopia, most adolescent girls are experience both acute and chronic forms of undernutrition, with the prevalence ranging from 21.6%[19] to 58%.[28] This implies a deep-rooted problem which could jeopardise the health of many adolescents and make the problem hard to halt. Despite these established facts, they are the most ignored population. Therefore, designing a wide range of nutritional strategies and promoting healthcare services are highly required to terminate undernutrition. To realise this, estimating the national prevalence and determinants using high-level evidence is quite imperative. Therefore, this systematic review and meta-analysis will provide a summarised finding.

ETHICS AND DISSEMINATION

Since this is a systematic review and meta-analysis, ethical clearance will not be a concern. The results of the study will be published in a reputable peer-reviewed journal and presented at scientific research conferences.

AMENDMENTS

As long as the authors believe that some amendments are necessary, modifications will be made, and the details of the amendments, including the reasons for modification and the date the amendment was done, will be clearly noted.

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