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Association between birth interval and wasting in children under 5 years of age in Ethiopia: a systematic review and meta-analysis protocol

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ABSTRACT

Introduction According to the UNICEF, WHO and World Bank joint estimation, 1 in every 13 children suffered from wasting globally. The highest burden of undernutrition recorded in Asia and Africa. Wasting remains a considerable public health problem in Ethiopia despite the introduction of exhaustive nutritional programmes. As reported in the literature, the prevalence of wasting in Ethiopia has remained high over the last four decades. In Ethiopia, more than one-third of child deaths are associated with malnutrition. The current nutritional interventions implemented in Ethiopia need to be evidence based. For this purpose, systematic review is preferable as it can present a more reliable and precise estimate than individual studies. The aim of this review is to assess the pooled prevalence of wasting and its association with birth interval in Ethiopia.

Methodology Studies published after 20 January 2012 will be retrieved from databases, mainly PubMed/Medline, Scopus, Embase, CINAHL and HINARI. The articles retrieved from databases will be selected after reading the title, abstract and full text. Three reviewers will independently assess the quality of each study using both the Joanna Briggs Institute and Ottawa Scale critical appraisal checklists. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist will be used to maintain scientific strength. Funnel plots, Egger's test and Begg's test will be used to deal with publication bias, and I^2, forest plots and Cochrane's Q square statistics will be used for heterogeneity. Potential causes of heterogeneity will be explored through sensitivity and subgroup analyses. Because heterogeneity among studies is inevitable, given the wide geographical area and variety of study designs, the Der-Simonian and Laird random-effects model will be used. The presence of a statistical association between birth interval and wasting will be declared if the p value is <0.05 with the 95% CI.

Ethics and dissemination Ethical issues will not be applicable to this review and meta-analysis. This review and meta-analysis will report the pooled prevalence of wasting and its association with birth interval in Ethiopia. Effort will be made to publish the findings in a peer-reviewed journal such as the Ethiopian Journal of Health and Development, and the findings will be presented at national conferences. A hard copy will also be sent to Woldia University and Debre Berhan University.

Strengths and limitations of this study

► Heterogeneity of the output is inevitable as we will consider a variety of study designs from different geographical areas.
► This review will demonstrate the associations between birth interval and wasting among under 5 children in Ethiopia using a random-effects model.
► An advanced statistical test will be used to deal with heterogeneity and risk assessment.
► This is the first systematic review and meta-analysis to present the association of birth interval with wasting in Ethiopia.
► The search strategy will be limited to the English language only.

INTRODUCTION

Wasting poses a considerable public health problem in Ethiopia, which is the country with the highest prevalence of wasting in sub-Saharan Africa.[1] Wasting is one of the most commonly used anthropometric indicators to measure the nutritional status of children under 5 years of age.[2] According to the UNICEF, WHO and World Bank joint estimation, 1 in every 13 children, accounting for almost 7.4% of children, suffer from wasting globally.[3] The highest burden of undernutrition is recorded in Asia and Africa, estimated to be 94%.[3] The prevalence of wasting in Ethiopia was reported to be 9% among under 5 children.[4] The conceptual framework on the causes of malnutrition presents a generalised understanding of undernutrition. Those causes, classified as immediate, underlying and basic can be addressed through multisectorial intervention approaches.[5] The prevalence of wasting among Ethiopian regions is comparable. The prevalence of wasting was reported to be 11.6% in Tigray,[6] 17.7% in the Gumbrit district,[7] 14.8% in Gojjam[8] and 12.8% in the Afar region.[9] Other studies have

demonstrated that undernutrition in Ethiopia is a serious problem that presents regional variation. For example, the prevalence of wasting was 51.4% in Tigray, 41.4% in Oromia and 44.1% in Southern Nations, Nationalities and Peoples' Region as per the 2011 Ethiopian Demography and Health Survey report.[10] The literature presented above indicates a high prevalence of wasting in Ethiopia over the last four decades according to the WHO criteria. More than one-third of child deaths in Ethiopia are associated with malnutrition.[11] The target for the year 2015 was to reduce the prevalence of wasting from 9.7% to 3%.[12] A study conducted in southern Ethiopia reported that the prevalence of wasting among children did not differ significantly between food-insecure (14.8%) and food-secure households (14.1%).[13] In line with the 2015 plan, Ethiopia implemented a target to reduce wasting from 10% to 3%.[14] However, no significant improvement was attained.[15] A study performed in Bangladesh, Ethiopia and Vietnam showed that food insecurity was associated with wasting in Vietnam and Bangladesh, but not in Ethiopia.[16] Other studies have indicated that wasting is associated with the birth interval. For example, a study performed in southern Ethiopia reported that a birth interval of less than 2 years increases the odds of stunting by 3.44 times when compared with a birth interval of greater than 3 years.[13] Similar studies found that a birth interval of less than 2 years was associated with wasting.[15 17] Hence, the current nutritional intervention employed in Ethiopia needs to be evidence based. For this purpose, a systematic review and meta-analysis is preferable to individual studies to provide a reliable and precise estimate. The results generated from this review will be used to recommend a tailored nutrition education programme to mothers or caretakers to improve the nutritional status of their children.

Why is it important to do this review?
The WHO recommends birth-to-pregnancy intervals of at least 24 months, or about 3 years between births.[18] However, in Ethiopia, the birth interval is less than 2 years among many mothers. A number of studies have reported factors associated with malnutrition, including factors related to wasting. Of these, birth interval is frequently reported to be a risk factor for wasting (13, 15 and 17). Wasting has harmful short-term consequences for children. It is driven by infectious diseases and an inadequate diet. It is a direct cause of mortality among children under 5 years of age.[1] According to WHO, long birth interval can prevent child mortality and morbidity including wasting. In addition to preventing wasting, birth spacing is an essential component of family planning and fertility control.[19] On the other side, religion, suboptimum breast feeding, unwanted pregnancy and non-use of contraceptives are associated with narrow birth intervals.[20] These increase the burden of wasting among children under 5 years of age indirectly (13, 15 and 17). Thus, the aim of this review was to assess the pooled prevalence of wasting, and its associations with birth interval

in Ethiopia. The result will be used as evidence for policymakers in combating wasting on children under 5 years of age. Ahead of this, the review will be used as a baseline data for further researches.

Objectives
General objective
The aim of this review and meta-analysis is to assess the pooled prevalence of wasting and its association with birth interval in under 5 children in Ethiopia in 2020.

Specific objectives
- ► To assess the pooled prevalence of wasting among under 5 children in Ethiopia in 2020.
- ► To assess the associations of birth interval with wasting in children under 5 years of age in Ethiopia in 2020.

METHODS
Protocol registration
The protocol developed for this review has been published in the PROSPERO international prospective register of systematic reviews (http://www.crd.york.ac.uk/PROSPERO) under the protocol number CRD42020168380.

Searching strategies
A comprehensive search strategy will be designed, developed using Boolean operators and adapted to available and accessible databases. Several databases will be examined, mainly PubMed/MEDLINE, Scopus, EMBASE, CINAHL and HINARI. The articles that will be searched from databases will focus on wasting or thinness among children under 5 years of age in Ethiopia. Those articles design might be cross-sectional, analytical cross-sectional, case–control or cohort, and can be done in community or health facilities. The articles must report prevalence/proportion of wasting/thinness or odds of wasting in short-spaced birth than long-spaced births to be included in this review. In addition, the articles might be conducted at national, regional or district levels among children birth to 5 years or birth to 2 years or 2–5 years of age. The searches will be limited to the English language and to publication dates from 20 January 2012. The grounds we limit the review year to be after 2012 is that the social, economic and healthcare service of Ethiopia is improved after the millennium, 2008, in particular in 2012 after 4 years of the millennium. Thus, we believe that studies conducted after 2012 would be homogeneous and produce strong evidence for policymakers. The search grid or combination of terms used in the PubMed database will be (((((((((((((((((child) OR children) OR under-five children) OR infant) OR newborn) OR preschool children) AND short interval) OR long interval) OR less than 2 years) AND birth interval) OR birth spacing) AND wasting) OR malnutrition) OR nutritional status) OR acute malnutrition) OR thinness) OR under nutrition) AND Ethiopia) OR developing country) OR eastern Africa). The search terms were build-up in considering population, exposure, condition, outcome, context and time (PECO) as explained in table 1.

Table 1 The search mnemonics considered in building the searching terms

Population	Exposure	Condition	Outcome	Context	Time
Child	Short interval	Birth interval	Wasting	Ethiopia	20/01/2012
Children	Long interval	Birth spacing	Malnutrition	Eastern Africa	
Under-five children	Less than 2 years		Nutritional status	Developing country	
Infant			Acute malnutrition		
Newborn			Thinness		
Preschool children			Under nutrition		

The search terms used in Scopus differ from those used in PubMed. The combination of terms used for the Scopus database will be (*TITLE-ABS-KEY (Wasting) ORTITLE-ABS-KEY (malnutrition) ORTITLE-ABS-KEY (Under-nutrition) OR TITLE-ABS-KEY (Acute malnutrition) ORTITLE-ABS KEY (thinness) OR TITLE-ABS-KEY (nutritional status) ANDTITLE-ABS-KEY (Under-five children) OR TITLE-ABS-KEY (Pre-school children)OR TITLE-ABS-KEY (infant)ORTITLE-ABS-KEY (child) ORTITLE-ABS-KEY (newborn) ORTITLE-ABS-KEY (children) AND TITLE-ABS-KEY (Ethiopia) ORTITLE-ABS-KEY (developing countries) ORTITLE-ABS-KEY (eastern Africa)) ANDTITLE-ABS-KEY (birth-interval)ORTITLE-ABS-KEY (birth-spacing) AND(LIMIT TO (DOCTYPE,"ar") ORLIMIT TO (DOCTYPE, "re")) AND (LIMIT-TO (LANGUAGE, "English")) AND(LIMIT TO (SRCTYPE, "j"))*).

Patient and public involvement
No patients are involved in the design and conception of this study.

Inclusion and exclusion criteria
Inclusion criteria
All observational studies (cross-sectional, analytical cross-sectional, case–control and cohort) that meet all of the following criteria will be included:
▶ Studies performed on children under 5 years old.
▶ Articles published in the English language.
▶ Studies published after January 2012 that reported the prevalence of wasting or birth interval as a factor related to wasting.

Exclusion criteria
Studies that meet one of the following criteria will be excluded:
▶ Articles without full text and difficulty extracting the OR, despite contacting the corresponding author(s).
▶ Studies performed in healthcare facilities, as illness greatly affects the nutritional status of study participants.
▶ Studies with methodological limitations, such as incorrect outcome ascertainment criteria.
▶ Studies that measure the outcome variable (wasting) without measuring children's anthropometric indices (other than Z-score).
▶ Randomised controlled trials (RCTs) and quasi-experimental studies since such type of designs are

very limited on this research title and cannot be in line with the PECO framework of the Boolean systematic review operators.

Measurement of the outcome variable
Wasting reflects a loss of body mass relative to height; it is a measure of acute or short-term exposure to a negative environment. It is sensitive to calorie intake or the effect of diseases. Wasting reflects a deficit in tissue and fat mass and indicates that the child does not weigh as much as they should for their height. Wasting is a recent and severe process of weight loss that is often associated with acute starvation and/or severe disease. It is the first response to a nutritional and/or infectious insult. Thus, for this review and meta-analysis, wasting will be defined as a low weight-for-height ratio, below 2 SDs of the reference population.[21][22]

Study selection and data collection
Studies identified through different database searches will be combined, exported and managed using EndNote V.X9.2[23] software. Duplicated studies will be removed, and full-text articles will be retrieved through manual EndNote search. Three reviewers (MKW, BBA and AMK) will independently screen studies. The review will involve reviewing articles by reading the title, abstract and full text. Any discrepancy between the three reviewers will be resolved by discussion in the presence of other authors (SAM and AMA).

Quality assessment of individual studies
The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist will be used to maintain scientific strength. The study design, participants, outcome, definition of wasting, statistical methods used to identify the associations, presentation of results (eg, two by two table), and OR with CI will be extracted and assessed. The quality of the included studies will be assessed using the Newcastle–Ottawa Scale for case–control, cohort and observational studies,[24] and the Joanna Briggs Institute (JBI) critical appraisal checklist for analytical cross-sectional studies,[25] case–control studies[26] and cohort studies.[27] In the critical appraisal process, studies that scored 5 out of 8 for cross-sectional, 6 out of 11 for cohort, and 5 out of 10 for case–control design according to the JBI checklist will be considered good quality or low risk. However, studies that do not meet

the cut-off point for the JBI checklist will be considered poor quality or high risk. On the Ottawa Scale, papers should get at least one star for selection, one star for comparability and one star for the outcome.[24] The critical appraisal result for both the JBI and Newcastle–Ottawa Scale will be presented in a table for comparison.

Data extraction and management

The data extraction format will be prepared by all authors using the JBI data extraction tool for prevalence and associations. The data extraction sheet will be piloted using sample papers that will be selected randomly, and data will be subjected to adjustment. The findings, prevalence section and OR will be independently summarised by two authors (AMA and MKW). Any discrepancies between the two authors will be managed through discussion with the third and fourth authors (BBA and AMK). Consequently, the mistyping of data will be resolved through cross-checking with the included papers. From each study, the authors, year of publication, study design, sample size, outcome, anthropometric data, prevalence of wasting and its SE, and birth interval estimates with its SE will be extracted.

Statistical analysis

The extracted data will be imported into Stata V.14 software. A descriptive summary of the included studies will be presented in the text, figures and tables. The pooled estimate of wasting and the associations between wasting and birth interval will be determined using a Der-Simonian-Laird random-effects model.[28] The studies retrieved are expected to be heterogeneous because we are considering a variety of study areas, sample sizes, designs, populations and study periods. Thus, we can declare that we will use a random-effects model in advance. Our statement is also consistent with evidence that heterogeneity in meta-analyses is generally inevitable due to differences in study quality, sample size, method and outcome measures across studies.[29 30] The statistical heterogeneity will be subjectively checked by forest plot and objectively assessed by Cochrane Q-test and I^2 statistics.[29] In order to minimise the variance of point estimates between primary studies, a subgroup analysis will be carried out according to the study region, residence and design. When the heterogeneity becomes consistent, sensitivity analysis will be performed by removing papers identified as being low quality or high risk to determine the effect of the studies on the pooled estimate. The presence of publication bias (small study effect) will be checked using a graphical test (funnel plot), together with objective tests, including Egger's statistical test[30] and Begg's statistical test. In both Egger's and Begg's tests, a statistically significant p value (<0.05) indicates the presence of a small study effect. Whenever there is publication bias, it will be handled by non-parametric trim and fill analysis.[31] The presence of statistical associations between birth interval and wasting will be declared if the p value is <0.05 with the 95% CI.

Strengths

This is the first systematic review and meta-analysis to present the association of birth interval with wasting in Ethiopia. This systematic review will demonstrate the association between birth interval and wasting among children under 5 years of age in Ethiopia using random-effects model. When there is heterogeneity, an advanced statistical test will be used to deal with, and risk of publication bias will be assessed too.

Limitations

Heterogeneity is inevitable in this meta-analysis as we consider a variety of study designs and diversified study population from different geographical areas. The other limitation is that the search strategy will be limited to the English language only but there might be articles that published using another language. This systematic review considers only observational studies and excludes RCT and quasi-experimental studies that are the gold standard. This may affect the strength of our evidences we produce for policy briefing. We only include studies conducted and published after 2012 that may be a cause to loss papers and consequently introduce publication bias.

Collating, summarising and reporting the results

The study selection process will be summarised using flow diagram. The reasons for excluding studies will be described and documented. The data extracted from each of the studies will be presented in a form that logically reflects the objectives of this review. For articles that are not available online, an email will be sent to the corresponding or first author of the studies for missing information, and then we will wait 3–4 weeks for their response. If there is no response, the papers will be excluded with the reason 'the papers are not available'. The result of the review will be reported according to the PRISMA flowchart.[32] In addition to PRISMA, tabular and graphical representations of the data may be used to illustrate the identified results and will be supported with narrative descriptions of the data. We will extract the prevalence and OR for the associations of wasting and birth interval. We plan to report the quality scores and risk of bias for each eligible study in tables.

Disclaimer The funder will not have contribution in searching, appraising, analysing and writing the review except for the financial expenses.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

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