ABSTRACT

Background: The double burden of malnutrition (DBM) increases the risk of developing non-communicable diseases among migrant and refugee populations living in developed countries. This systematic review aims to examine the DBM among migrants and refugees in developed countries. It aims to appraise, synthesise, and summarise literature to create an evidence base that looks at multiple faces of DBM.

Methods/Design: This protocol is informed by the standard Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) guidelines. A systematic review of peer-reviewed quantitative, qualitative and mixed-methods studies on DBM among migrants and refugees in developed countries will be undertaken. The review will include only studies published in English. Eight bibliographic databases will be searched: Ovid MEDLINE, EMBASE, PsycINFO, CINAHL, ProQuest, Scopus, PubMed, and web of science. Grey literature will also be searched. Studies that meet the inclusion criteria will be imported to Covidence. Screening for eligible studies will be conducted by two independent researchers. The quality of included studies will be appraised for risk of bias using validated tools. A narrative synthesis approach will be undertaken to report retrieved data.

Discussion: The protocol provides insight into the scope and parameters of the systematic review to be conducted.

Systematic review registration: The protocol was registered with the PROSPERO international prospective register of systematic reviews [CRD42020192416].

Keywords: Double burden of malnutrition, undernutrition, overnutrition, micro-nutrient deficiency, non-communicable diseases, migrants, refugees
1. Background

1.1 Introduction to the literature

Globally, diet-related epidemiology has seen a significant shift in recent decades being largely influenced by the forces of globalisation, income and economic growth, urbanisation, and demographic change (WHO, 2017; Popkin et al., 2020). This dynamic nutrition landscape has witnessed the coexistence of undernutrition along with overweight or obesity, micronutrient deficiency or diet-related non-communicable diseases (NCDs) emerging as a public health concern especially within migrant and refugee populations (Popkin et al., 2020; UNICEF, 2017). This double burden of malnutrition (DBM) amongst migrant and refugee population may be due to multiple socio-economic, environmental, and acculturative factors (Yu et al., 2014; WHO, 2020a) such as limited income, sub-optimal infant feeding practices, poor access to health services, clean water as well as limited food and humanitarian assistance (WHO, 2020b). The social, developmental, economic, and medical impacts of DBM are serious and lasting, for migrants and their families, as well as for the host countries (WHO, 2020b).

Globally, about one-third of people suffer from at least one form of malnutrition including stunting, wasting, underweight, micronutrient deficiency, overweight or obesity and diet-related NCDs (WHO, 2020a; WHO, 2020b). Nutrition-related factors mainly due to undernutrition contribute to approximately 45% of child mortality with most cases occurring in low- and middle-income countries (LMICs) (WHO, 2020a; WHO, 2020b). However, recent trend shows a simultaneous rise in childhood overweight and obesity in LMICs (WHO, 2020a; WHO, 2020b).

DBM can exist at the individual level where two or more forms of malnutrition could occur simultaneously in the same individual, for instance both obesity and micronutrient deficiency occurring concurrently in an individual. DBM could also occur across the life-course and be temporally separated, due to changing nutrition environments which may result from a shift in economic or other circumstances including migration, for instance in situations where an individual who was stunted during childhood becomes overweight/obese in adulthood. Evidence has shown that undernutrition early in life – and even in utero – may predispose to overweight and NCDs such as diabetes and heart disease later in life (WHO, 2017). At the household level, DBM could be seen when a mother is overweight or anaemic and her child or grandparent is underweight or diabetic (type 2). This situation is commonly seen in low- and particularly middle- income countries (Tzioumis & Adair, 2014) as well as among migrants and refugees undergoing a rapid nutrition transition (Renzaho, 2007). DBM could also exist at the population level, where there is a prevalence of both undernutrition and overweight, obesity or NCDs in the same community, region, or nation (WHO, 2017). Research has shown that women are disproportionately affected by DBM at the population level (AO, 2006; Tanumihardjo et al., 2007). The intersectionality of being a woman and a migrant exacerbates the DBM among migrant women population (AO, 2006; Tanumihardjo et al., 2007; Renzaho et al., 2010). These biological mechanisms operating at different levels alongside social, behavioural, and environmental factors greatly influence individual weight status and act as important drivers of DBM across the life course.

Migrants and refugees undergo the complex and dynamic (Thomson & McFeeter, 2019) process of acculturation which denotes the process by which minority groups adopt the culture of their host country (Satia-Aboura, 2003). Consequently, lifestyle and dietary acculturation specifically the adoption of Western nutritional practice, dietary habits, and sedentary lifestyle, may result in adverse health effects such as obesity (Regev-Tobias et al., 2012) and NCDs (Kandula et al., 2008). This change is often associated with a shift from a predominance of undernutrition in home country to higher rates of overweight, obesity and NCDs in the host country. DBM brought about by a nutrition transition characterised by changes in diet and

http://dx.doi.org/10.7565/ssp.v4.5394
lifestyle (Hasan et al., 2017; Grijalva-Eternod et al., 2012) could be due to socio-economic and environmental factors (Doak et al., 2005). Because of these factors, refugee and migrant populations living in developed countries face an increasingly high prevalence of both overnutrition and undernutrition (Kosaka et al., 2017), which poses unprecedented challenges to the migrant and refugee populations’ health, including increased incidence of NCDs (Grijalva-Eternod et al., 2012, Menon & Peñalvo, 2020).

Some studies have solely reported undernutrition among migrant communities (Renzaho et al., 2006; Hashmi et al., 2019) while others have provided evidence for the growing burden of overnutrition (Sundquist et al., 1999; Ngongalah et al., 2018; Renzaho, 2004). However, limited studies have synthesised evidence on the DBM among migrant and refugee populations living in developed countries to guide targeted interventions given the potential negative impact it exerts on both the migrants and the health system of host countries. Therefore, this systematic review will be conducted to examine DBM among migrants and refugees living in developed countries.

1.2 Aim of the review and its public health importance

The review is necessary to appraise, synthesise, and summarise the literature on the DBM among migrants and refugees in developed countries. To date, most studies have focused either on overnutrition or undernutrition or both in LMICs. However, no review has synthesised evidence on the DBM among migrants and refugees in developed countries. This proposed systematic review will look at overnutrition and various forms of undernutrition in the migrant and refugee populations. It will create an evidence base that looks at the multiple faces of DBM and findings will help inform policies and programs in host countries to invest in the prevention and management of all forms of malnutrition among migrant and refugee populations.

1.3 The review question

The systematic review will be guided by the following question: What is the DBM among migrants and refugees in developed countries?

2. Methods/Design

2.1 Study design

This protocol is informed by the standard Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) statement (Moher et al., 2015) which consist of a checklist (Supplementary file 1) and the PRISMA flowchart (Figure 1).
2.2 Outcomes of interest

The primary outcome is the DBM characterised by the coexistence of undernutrition along with overweight and obesity, micronutrient deficiency or diet-related noncommunicable diseases, within individuals, households, and populations, and across the life course (WHO, 2017). According to World Health Organization (WHO), undernutrition has four broad subforms which include wasting (low weight-for-height), stunting (low height-for-age), underweight (low weight-for-age), and the deficiencies of macronutrient (fats, protein, and carbohydrate) and micronutrient (minerals and vitamins) (WHO, 2020c). Overnutrition, on the other hand, develops from an abundant intake of nutrients, leading to excessive weight and obesity (high weight-for-height) (Mathur & Pillai, 2019). Diet-related NCDs include cardiovascular diseases (such as heart attacks and stroke, and often linked with high blood pressure), certain cancers, and diabetes.
2.3 Participants

The target population will be migrants and refugees residing in high income countries. According to the International Organization for Migration (IOM), a migrant is defined as a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons (IOM, 2020). Under Article 1A (2) of the 1951 Refugee Convention, a ‘refugee’ is defined as a person who is outside his country of nationality or habitual residence based on a well-founded fear of persecution because of his race, religion, nationality, membership in a particular social group or political opinion, and is unable or unwilling to avail himself of the protection of that country, or to return there, for fear of persecution (UNHCR, n.d.). There will be no limits to the age, gender, social status, or ethnicity of participants.

2.4 Inclusion and exclusion criteria

Studies will be included in the review if they are peer-reviewed observational studies (cross-sectional studies, cohort studies and case-control studies) which reported DBM among migrant and refugee populations. In addition to searching peer reviewed literature, a search of grey literature including publications from key institutions, organisations and government websites will also be conducted. Studies will also be included in the review if they focus on undernutrition (stunting, wasting, underweight and micronutrient deficiencies of iron, vitamin A, and zinc), over nutrition, obesity, or overweight in refugee or migrant populations. Furthermore, the review will include studies that are written in English and whose full texts are available and accessible. The research team does not have the financial and logistical capacity to retrieve and translate articles published in languages other than English. Studies will be excluded if they (i) do not report on undernutrition; (ii) do not focus on refugee or migrant populations living in developed countries; (iii) are study protocols, reviews, editorials, letters to editors, commentaries, and opinion pieces; (iv) are not published in English.

2.5 Search strategy

The search will apply appropriate search terms and subject heading truncations (*), and Boolean operators ("AND", "OR" and "NOT") depending on the specifications of databases to be searched. The following combination of keywords will be used in the search:

Migrant* OR immigrant* OR emigrant* OR expat* OR refugee* OR asylum seeker* OR displaced person*

AND
Malnutrition OR Undernutrition OR Undernourish* OR Stunting OR Wasting OR Underweight OR Overnutrition OR Obesity OR Overweight OR Micronutrient deficiency OR Vitamin A deficiency OR Vitamin D deficiency OR Iodine deficiency OR Iron deficiency OR Anaemia OR Non-communicable diseases OR NCD OR Diabetes OR Cancer OR Hypertension OR Cardiovascular diseases.

AND
Developed countries OR High-income countries OR Host countries OR United States OR United Kingdom OR Europe OR Australia OR OECD countries.

Eight databases including Ovid MEDLINE, EMBASE, PsycINFO, CINAHL, ProQuest, Scopus, PubMed, and web of science) for peer-reviewed studies will be searched using subject heading truncations and search terms. Authors will review the reference lists of studies.
included for relevant articles that meet the inclusion criteria. A search log will be kept for accountability and transparency. Database searches will be re-run prior to the final analysis.

2.6 Study selection

Studies generated in the search will be imported into Covidence and duplicates will be removed. The screening for eligible studies will follow a two-step process. First, titles and abstracts will be screened for eligibility and relevance. This will be followed by the screening of full texts for relevance. The screening process will be undertaken independently by two researchers and any disagreements will be resolved through discussion and consensus. In cases where a consensus could not be reached, a third researcher will adjudicate.

2.7 Data extraction

Data extraction will be based on a modified Cochrane Public Health Group Data Extraction and Assessment Template. The data to be extracted will include study details (such as author’s name, year of publication, country of study, study objective, study design and setting, intervention type, study characteristics, data collection methods, primary outcome measures (DBM) and comments section. This process will be undertaken independently by two researchers and any disagreements will be resolved through discussion and consensus. Where a consensus could not be reached, a third researcher will adjudicate.

2.8 Data synthesis

It is expected that the included studies will be highly heterogeneous in their study methods, measurements, and outcomes. Hence, a statistical aggregation of the data may not be appropriate. However, to develop a robust understanding of the DBM among migrants and refugees in developed countries, a narrative synthesis approach will be undertaken to report results of the eligible studies. This approach involves identifying and extracting common threads from quantitative narratives and modifying the format to provide more understanding of the DBM among migrants and refugees in developed countries (Popay et al., 2006). The study findings will be summarised, emerging themes narrated and reviewed for the appropriateness of the content as well as the consistency of the emerging themes. All study results will be aggregated to provide a holistic analysis.

2.9 Quality assessment

The Critical Appraisal Skills Programme (CASP) will be applied to assess the methodological quality of observational studies, including cohort studies (CASP 2018a) and case-control studies (CASP 2018b). Mixed-methods studies will be assessed based on the MMAT (mixed-methods appraisal tool) by Pluye and colleagues (Pluye et al., 2009). Grey literature will be appraised using the AACODS tool (Tyndall, 2018) which focuses on reviews’ authority, accuracy, coverage, objectivity, date, and significance. All studies will be appraised as high, medium, or low quality and the overall quality of the body of evidence will be examined applying the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach (Guyatt et al., 2008). The methodological quality assessment of included studies will be independently undertaken by two independent researchers. Differences in the quality assessment will be resolved by discussion between all the authors.

3. Discussion

Globally, there is growing interest among governments, donor community, the philanthropic and community development planners to understand and promote DBM-related interventions
to minimise the risk of NCDs among migrants and refugees in developed countries. A considerable body of literature exists on the subject matter but remains un-synthesised. The substantial body of literature supports the necessity for a review to provide a robust summary of evidence that could be drawn upon to influence policies and planning related to DBM among migrants and refugees in developed countries. Notably, assessing the DBM and risk of developing NCDs among migrants and refugees in developed countries will add to the knowledge base in diaspora and nutrition studies and direct future research. This study will inform future research efforts by identifying gaps and strengths in effective interventions targeting the needs of migrants and refugees in developed countries. In addition, findings from this review could further inform settlement and health policies and practice for migrants and refugees. The findings from the review will be shared at conferences, seminars, workshops, and other public forums. The target audiences for the review are public health researchers, practitioners, and policy-makers. The lead author (BAI) will also share these study findings with an advisory group of migrant and refugee populations to inform future research directions.

**List of Abbreviations**

AACODS Authority, Accuracy, Coverage, Objectivity, Date, Significance  
CASP Critical Appraisal Skills Programme  
CINAHL Cumulative Index to Nursing and Allied Health Literature  
DBM Double burden of malnutrition  
EMBASE Excerpta Medica dataBASE  
GRADE Grading of Recommendations Assessment, Development and Evaluation  
IOM International Organisation for Migration  
MMAT Mixed Methods Appraisal Tool  
MEDLINE Medical Literature and Retrieval System Online  
NCDs Non-Communicable Diseases  
PRISMA Preferred Reporting Items for Systematic Review  
PROSPERO International Prospective Register of Systematic Reviews  
SSA Sub-Saharan Africa

**Declarations**

**Ethics approval and consent to participate:** Not applicable.

**Consent for publication:** Not applicable.

**Availability of data and materials:** Not applicable.

**Competing interests:** The authors declare that they have no competing interests.

**Funding:** No grant was received for this study from any funding agency in the public, commercial or not-for-profit sectors.

**References**

Agriculture Organization. (2006). *The double burden of malnutrition: Case studies from six developing countries (Vol. 84).* Food & Agriculture Organization.  


### Supplementary File 1: PRISMA-P Checklist

<table>
<thead>
<tr>
<th>Section/topic</th>
<th>#</th>
<th>Checklist item</th>
<th>Information reported</th>
<th>Reported on pg. #</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADMINISTRATIVE INFORMATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identification</td>
<td>1a</td>
<td>Identify the report as a protocol of a systematic review</td>
<td>Yes</td>
<td>Title</td>
</tr>
<tr>
<td>Update</td>
<td>1b</td>
<td>If the protocol is for an update of a previous systematic review, identify as such</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Registration</td>
<td>2</td>
<td>If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract</td>
<td>Yes</td>
<td>Page 2</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact</td>
<td>3a</td>
<td>Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author</td>
<td>Yes</td>
<td>Page 1</td>
</tr>
<tr>
<td>Contributions</td>
<td>3b</td>
<td>Describe contributions of protocol authors and identify the guarantor of the review</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Amendments</td>
<td>4</td>
<td>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</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Support</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sources</td>
<td>5a</td>
<td>Indicate sources of financial or other support for the review</td>
<td>Yes</td>
<td>Page 9</td>
</tr>
<tr>
<td>Sponsor</td>
<td>5b</td>
<td>Provide name for the review funder and/or sponsor</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Role of sponsor/funder</td>
<td>5c</td>
<td>Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rationale</td>
<td>6</td>
<td>Describe the rationale for the review in the context of what is already known</td>
<td>Yes</td>
<td>Page 3-4</td>
</tr>
<tr>
<td>Objectives</td>
<td>7</td>
<td>Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)</td>
<td>Yes</td>
<td>Page 4</td>
</tr>
<tr>
<td><strong>METHODS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligibility criteria</td>
<td>8</td>
<td>Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status)</td>
<td>Yes</td>
<td>Page 6</td>
</tr>
<tr>
<td>Section/topic</td>
<td>#</td>
<td>Checklist item</td>
<td>Information reported</td>
<td>Reported on pg. #</td>
</tr>
<tr>
<td>---------------</td>
<td>---</td>
<td>----------------</td>
<td>----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to be used as criteria for eligibility for the review</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Information sources</strong></td>
<td>9</td>
<td>Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Search strategy</strong></td>
<td>10</td>
<td>Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td><strong>STUDY RECORDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data management</td>
<td>11a</td>
<td>Describe the mechanism(s) that will be used to manage records and data throughout the review</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td>Selection process</td>
<td>11b</td>
<td>State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td>Data collection process</td>
<td>11c</td>
<td>Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Data items</strong></td>
<td>12</td>
<td>List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Outcomes and prioritization</strong></td>
<td>13</td>
<td>List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Risk of bias in individual studies</strong></td>
<td>14</td>
<td>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</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td><strong>DATA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesis</td>
<td>15a</td>
<td>Describe criteria under which study data will be quantitatively synthesized</td>
<td>☐</td>
<td>☒</td>
</tr>
<tr>
<td></td>
<td>15b</td>
<td>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 (e.g., $I^2$, Kendall's tau)</td>
<td>☐</td>
<td>☒</td>
</tr>
<tr>
<td>Section/topic</td>
<td>#</td>
<td>Checklist item</td>
<td>Information reported</td>
<td>Reported on pg. #</td>
</tr>
<tr>
<td>--------------------</td>
<td>----</td>
<td>--------------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)</td>
<td>☑️ No NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15d</td>
<td>If quantitative synthesis is not appropriate, describe the type of summary planned</td>
<td>☑️ No Page 7</td>
<td></td>
</tr>
<tr>
<td>Meta-bias(es)</td>
<td>16</td>
<td>Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)</td>
<td>☑️ No Page 7</td>
<td></td>
</tr>
<tr>
<td>Confidence in cumulative evidence</td>
<td>17</td>
<td>Describe how the strength of the body of evidence will be assessed (e.g., GRADE)</td>
<td>☑️ No Page 7</td>
<td></td>
</tr>
</tbody>
</table>