ABSTRACT

Background Short birth interval (SBI) has been linked to an increased risk of adverse maternal, perinatal, infant and child health outcomes. However, the prevalence and maternal and child health impacts of SBI in the Asia-Pacific region have not been well understood. This study aims to identify and summarise the existing evidence on SBI including its definition, measurement prevalence, determinants and association with adverse maternal and child health outcomes in the Asia-Pacific region.

Methods Five databases (MEDLINE, Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Maternity and Infant Care, and Web of Science (WoS)) will be systematically searched from September 2000 up to May 2023. Data will be extracted, charted, synthesised and summarised based on the outcomes measured, and where appropriate, meta-analysis will be performed. The risk of bias will be assessed using Joanna Briggs Institute quality appraisal. Grading of Recommendation Assessment, Development and Evaluation framework will be used to evaluate the quality of cumulative evidence from the included studies.

Ethics and dissemination This review does not require ethics approval. Findings will be disseminated through peer-reviewed publications, policy briefs and conference presentations.

PROSPERO registration number A protocol will be registered on PROSPERO for each separate outcome before performing the review.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This protocol adheres to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols statement guidelines.
⇒ Our review will involve a rigorous search and screening process to maximise comprehensiveness and minimise bias.
⇒ The study will examine the risk of bias in the individual study and confidence in cumulative evidence using relevant tools.
⇒ This review will be limited to articles published in English this may not include some of the studies that may be published in other languages.

INTRODUCTION

Birth interval is the duration of time elapsing between two subsequent live births. Both short and long birth intervals have been linked to an increased risk of poor outcomes in children and their mothers. Birth interval is considered as a ‘modifiable’ risk factor because, with the provision of effective contraception, women can control when their next pregnancy/birth occurs. The World Health Organization (WHO) recommended that women should avoid pregnancy until at least 24 months after their previous live birth. Short birth interval (SBI) (i.e, short birth-to-birth interval) is, therefore, defined as occurring when the time interval between two successive live births is less than 33 months (i.e., 33 months=24 months of birth to conception period+9 months duration of pregnancy). However, there are some inconsistencies in the literature with cutoff points for short birth/interpregnancy interval varying from 6 to 24 months. Our study will investigate the measurements and definitions used by studies for SBI which are among the reasons for the inconsistency in the cut-off points.

A large body of evidence has illustrated that SBI is associated with an increased risk of adverse maternal, perinatal, infant and child health outcomes. These include preterm birth, low birth weight (LBW), small for gestational age, undernutrition, congenital anomalies, autism, child mortality, gestational diabetes and maternal anaemia. Literature,
predominantly from Africa, has documented that the risk factors for SBI are multifactorial, vary spatially and are disproportionately concentrated among the poor. However, the epidemiology of SBI including its prevalence, determinants and effects on maternal and child health outcomes in the Asia-Pacific region has not been well studied and described.

The Asia-Pacific region is home to more than half of the world’s population and most are low-and-middle-income countries (LMICs) with economic barriers to the delivery of high-quality maternal and child healthcare. The use of modern contraceptives, including the use of long-acting methods, which are the most effective methods for optimal birth spacing, varies across, and within, countries in this region. For instance, the prevalence of modern contraceptive use was 20% in Afghanistan in 2015, 25% both in Pakistan in 2017/18 and Tonga in 2019, 32.4% in Papua New Guinea, 40% in the Philippines in 2017 and 83% in Australia in 2015. Given the issues of SBI have not been well investigated and described in the region, this systematic review aimed at identifying and summarising existing evidence on SBI including its definition, measurement, prevalence, determinants and effects on adverse maternal and child health outcomes in the Asia-Pacific region. This protocol will produce comprehensive and multiple systematic reviews on SBI in the Asia-Pacific region.

METHODS
Protocol design
This study will be guided by the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols guidelines proposed by Moher et al. As this study will consist of five separate papers arising from an overarching search strategy, five separate protocols focusing on definition, measurement, prevalence and predictors; child mortality; child undernutrition; adverse perinatal outcomes; adverse maternal outcomes were registered with International Prospective Register of Systematic Reviews (PROSPERO).

Eligibility criteria
Eligible studies during the title and abstract screening will be guided based on the ‘population, concept and contexts (PCC)’ framework, proposed by Peters et al. (table 1). This framework was applied due to the multiple outcomes contained in this search strategy. The detailed search terms are provided in online supplemental material I.

Information sources
A comprehensive literature search will be conducted using the following electronic databases: MEDLINE, Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Maternity and Infant Care, and Web of Science (WoS). The reference lists of published review articles will be scrutinised for additional relevant publications. Peer-reviewed literature published from September 2000 (since the inception of the Millennium Development Goals) up to May 2023 will be retrieved.

Search strategy
The authors, in collaboration with an experienced librarian, developed a Boolean string from key search terms (online supplemental material I). Included will be terms related to SBI including its prevalence, neonatal health, infant health, under-five health, maternal health and countries in the Asia-Pacific region. Comprehensive search strategies will be used to identify the relevant studies and will be customised when reporting individual outcomes. Eligible studies will also be selected from the reference lists of retrieved articles.

Since the Asia-Pacific region varies in areas depending on the context, this study context will include countries from South Asia and East Asia and the Pacific region as described by the World Bank in 2022. The search strategy will be piloted to ensure the appropriateness of the proposed keywords and databases.

Table 1 Inclusion criteria using the PCC framework

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
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<tbody>
<tr>
<td>P-Population</td>
<td>Women of reproductive age (15–49 years) with at least 2 pregnancies resulting in live birth. Newborns (28 days or less). Infants (under 1 year). Under-five children (under 5 years).</td>
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<tr>
<td>C-Concept</td>
<td>Prevalence of SBI. Determinants of SBI. Effects of SBI on neonatal, infant, under-five and maternal health outcomes.</td>
</tr>
<tr>
<td>C-Context</td>
<td>Studies: Conducted in the Asia-Pacific region. Published between September 2000 and May 2023. Written in English. All primary studies (quantitative, qualitative and mixed-method published articles). For the meta-analysis, case-control, cross-sectional or cohort studies will be considered. Additionally, the inclusion of randomised controlled trials will be determined based on their relevance to the specific research question, such as investigating the effects of SBI on neonatal, infant, under-five and maternal health outcomes.</td>
</tr>
</tbody>
</table>

SBI, short birth interval.
Covidence, the first author will develop the eligibility criteria to determine inclusion/exclusion.

**Selection process**

Three authors will independently perform both title and abstract screening (DMS, CC and MH) and full-text review (TAH, CC and MH) using Covidence. Any disagreement will be resolved through a discussion between the three authors at both stages. Reference lists of potentially relevant publications will be manually searched. When the full text of potentially relevant publications cannot be located, an attempt will be made to get a copy either through the University library or by directly contacting the author(s) via email.

**Data collection process**

A spreadsheet of key factors will be developed to extract relevant data from each included study. Three authors (DMS, CC and MH) will test and refine the data extraction tool using 10 eligible studies before its use. Two members of the research team will then independently perform the data extraction for each of the specified outcomes (ie, definition, measurement, prevalence and predictors; child mortality; child undernutrition; adverse perinatal outcomes; adverse maternal outcomes). Any disagreements in data extraction will be resolved by consensus, and if necessary, through discussion with a third reviewer.

If any selected article has insufficient information, its corresponding author will be contacted by email or phone to receive the missing data. If the attempt to get the missing data will not be possible, the data will be deleted and will be commented on in the Discussion section.

**Data items**

The extracted data will include key variables such as (1) name of the first author and publication year, (2) country, (3) study setting, (4) study design, (5) participants’ characteristics (sample, inclusion criteria), (6) data collection methods, (7) key findings on SBI including its definition, measurement, reported prevalence, its association with adverse maternal and child health outcomes, and the confounders controlled in each study.

**Outcomes and prioritisation and synthesis**

Findings of the systematic review will be presented using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A PRISMA flow diagram will be used to demonstrate the literature study selection process and search results. A descriptive numerical summary will be used to present the characteristics of the included studies. Information on the definition or classification, measurement, prevalence and determinants of SBI will be summarised using narrative synthesis. Determinants of SBI will include several factors such as sociodemographic and economic factors, reproductive factors and child-related factors. Subjective to the scope of the literature that will be retrieved, the effects of SBI on adverse maternal and child health outcomes will be separately summarised and individually presented for the following outcomes: adverse maternal outcomes (ie, maternal anaemia, gestational diabetes, hypertensive disorder of pregnancy and depression), adverse perinatal outcomes (ie, LBW, preterm birth, small for gestational age, stillbirth, perinatal mortality), neonatal, infant and under-five mortalities, and under-five undernutrition (ie, underweight, wasting, stunting and anaemia). First, a narrative synthesis will be used to summarise the findings. Under each category, we will further provide data on the article’s characteristics, including, but not limited to, the total number of studies, types of study design, source of data, year of publications and key findings. Meta-analysis will be conducted, subject to the heterogeneity of the studies included. Studies that use different definitions and measurements for SBI will be analysed separately to ensure comparability among studies.

The evaluation of the heterogeneity will be realised according to the Cochrane Handbook criteria through the I^2 statistic. A value of 0% demonstrates a lack of heterogeneity in studies and ≥50% values indicate considerable heterogeneity. If the I^2 value is less than 50%, the heterogeneity is considered as low, and a fixed-effect model will be used. If the I^2 value is 50% or more, a random effects model will be used. Also, once moderate or higher heterogeneity will be identified, we will explore the source of heterogeneity using subgroup analysis and meta-regression. Based on the availability of data, study and participant characteristics such as study design, publication year, study setting and sample size, participants’ age will be considered in the subgroup and meta-regression. We will perform a sensitivity analysis based on level of risk of bias, by comparing random and fixed-effect model, and by excluding possible outlying studies, if the visual inspection of the forest plot shows poorly overlapping confidence interval (CI). Publication bias will be examined by visual inspection of Funnel Plot asymmetry and Egger’s regression test. The trim-and-fill method will be used when evidence of publication bias is found, and to estimate and adjust for potentially missing studies, the effect size will be recalculated accordingly. Forest plots will be constructed to show the study-specific relative risk (RR)/odds ratio (OR) estimates and pooled RR/OR estimates.

If a study is eligible for inclusion in the systematic review but does not provide adequate data for inclusion in the meta-analysis, other study characteristics and results will be summarised narratively to synthesise and tabulate the results.

**Risk of bias in individual studies**

Joanna Briggs Institute quality appraisal tools will be used to assess the methodological quality of research publications by evaluating the extent to which they addressed the possibility of bias in areas of study design, conduct and analysis (online supplemental material II). The magnitude of studies with a total score indicating poor quality will be discussed. Two members of the research team will independently assess each included
paper and any uncertainty regarding the quality of publications will be resolved through discussion. Although a formal assessment of the methodological quality of the included studies will be performed; articles with poor quality will not be excluded.

Confidence in cumulative evidence
In addition to risk of bias assessment for individual studies, the quality of cumulative evidence will also be rated using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) framework. GRADE tool classifies the studies as very low, low, moderate and high quality. Two authors will independently perform this evaluation, and any disagreements will be decided through discussion (third author).

Ethics and dissemination
Since the systematic review methods involve reviewing and collecting data from publicly available materials, this study will not require ethics approval. Findings will be disseminated through five peer-reviewed publications and comprehensive policy briefs. Additionally, the research team will present the findings to key health system stakeholders within the Asia-Pacific region.

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All authors (DMS, CC, TAH and MH) contributed to the design of the protocol; read, critically revised and approved the final manuscript. DMS drafted the manuscript.

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Supplemental material
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REFERENCES