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BMJ Open

Incidence and Prevalence of Type 1 Diabetes in Africa: a systematic review and meta-analysis protocol

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2022-061605
Article Type:	Protocol
Date Submitted by the Author:	31-Jan-2022
Complete List of Authors:	Katte, Jean-Claude; Hopital Central de Yaounde, National Obesity Centre and Endocrinology and Metabolic Diseases Unit; RSD Institute Agoons, Batakeh; University of Yaounde I, Department of Internal Medicine and Specialities, Faculty of Medicine and Biomedical Sciences; Bafang District Hospital Akem Dimala, Christian; Reading Hospital Tower Health Sobngwi, Eugene; National Obesity Centre and Endocrinology and Metabolic Diseases Unit, Yaounde Central Hospital; RSD Institute
Keywords:	DIABETES & ENDOCRINOLOGY, Health economics < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, EPIDEMIOLOGY

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Incidence and Prevalence of Type 1 Diabetes in Africa: a systematic review and meta-analysis protocol

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Abstract

Introduction

Type 1 diabetes is reported to have significant mortality in Africa. However, there is a paucity of data on pooled estimates of its incidence and prevalence in Africa. This first systematic review and meta-analysis will be conducted to determine the incidence and prevalence of this condition in Africa.

Methods

Based on predefined criteria, electronic databases including PubMed, Excerpta Medica database, Africa Journal Online, Web of Science, and Africa Index Medicus, will be searched for relevant studies involving paediatric and adult patients, with no language restrictions. Any disagreement in screening, selecting, quality assessment, and data extraction between the two independent reviewers will be resolved by consensus. A third expert opinion will be sought if the disagreement is not resolved. Appropriate meta-analysis will then be used to pool studies judged to be clinically homogenous. Egger's test will be used to detect publication bias.

Ethics and Dissemination

Since this review will use previously published studies, it will not require the consent of an Ethics Committee. The results will be prepared and disseminated through a peer-reviewed journal and will be presented in relevant conferences.

Prospero registration number

CRD42021278227

Keywords: Type 1 diabetes, Africa, Public health

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Article summary:

Strengths and limitations of this study

- We will employ robust methods and statistical analyses to determine the burden of type 1 diabetes mellitus, providing evidence for public health strategies
- The review will include primary studies without language restrictions, allowing the maximum inclusion of studies published on the topic
- The review uses an inclusive search in large databases, with a long-time range
- Methodological biases in the primary studies included may cause uncertainty in the final results obtained.

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Introduction

The true burden of type 1 diabetes is unknown in Africa despite recent reports suggesting an increase in the number of persons with the condition in the continent [1,2]. In 2013, the International Diabetes Federation (IDF) reported that about 39,000 individuals were living with type 1 diabetes in Africa, with an incidence of 6.4/1,000,000 amongst those less than 14 years old [3]. In 2017, the IDF reported an estimated 50,600 children and adolescents below 20 years living with type 1 diabetes in Africa[4]. However, this increase in the number of people with type 1 diabetes in Africa has never been formally elucidated and confirmed.

A previous narrative review of some early population-based studies across different countries in Africa stated that the prevalence of type 1 diabetes was <1/1000, with incidence rates ranging from 1.5 to 10.1/100,000 per year [5]. This was not a systematic review and only presented results in ranges, reporting conflicting findings regarding the prevalence of type 1 diabetes in sex-specific groups across east to west Africa.

Also, type 1 diabetes is reported to have high mortality in Africa. It stands out as an almost neglected disease in the continent, receiving very little scientific attention and funding for research [1]. A possible reason for this neglect is the high cost of confirmatory diagnostic tests for type 1 diabetes, potentially underestimating true prevalence estimates. Therefore, in this context, there is a need for accurate, evidence-based epidemiological data summarising the burden and trends of the condition, which may serve as a basis for developing adequate public health strategies, health service organisations, and interventions in the African continent [6]. To our knowledge, this is the first systematic review and meta-analysis aiming to summarise available data on the incidence and prevalence of type 1 diabetes in Africa. We will also examine the burden of the condition with regards to age, sex, geographical region, and temporal trends.

Review Question

What is the burden of type 1 diabetes on the African continent?

Objectives

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The primary objective of the present systematic review and meta-analysis is to estimate the prevalence and incidence of type 1 diabetes in patients (of any age, including paediatrics or adults) in Africa.

Secondary Objectives:

1. Estimate the incidence and prevalence of type 1 diabetes by gender, age and geographical delimitations
2. Determine the temporal trend of the prevalence and incidence of type 1 diabetes in Africa.
3. Compare incidence and prevalence of type 1 diabetes between North Africa and sub-Saharan Africa

Methods and Design

The Preferred Reporting Items for Systematic Reviews and Meta-analysis for Protocols (PRISMA-P) guidelines served as the template for reporting this protocol [7]. This systematic review and meta-analysis will be conducted as recommended in the Joanna Briggs Institute reviewer's manual for prevalence and incidence review [8]. The PRISMA-P checklist is attached as online supplementary form 1.

Patient and public involvement

Patients and the public will not be involved in the design or planning of the study.

Criteria for considering studies for the review

Types of studies This study shall select all hospital-based and population-based observational studies that correctly provide data estimates on the incidence and prevalence of type 1 diabetes in Africa. These observational studies will include population-based cross-sectional studies for estimating the prevalence and prospective, population-based cohort studies for estimating the incidence.

Population We will consider studies involving children, adolescents and adults with no particular age limit with a formal diagnosis of type 1 diabetes.

Outcome Studies included in this review will be studies reporting on the prevalence and/or incidence of type 1 diabetes or Insulin Dependent Diabetes Mellitus (IDDM) or Juvenile Diabetes conducted in Africa. Studies lacking explicit method descriptions will be excluded if the information was not provided after contacting authors twice. The minimum acceptable sample size for the preliminary studies is 30

Research strategy for identifying relevant studies The search strategy will be conducted as discussed below.

Bibliographic database searches: A comprehensive search of PubMed, Excerpta Medica database, Africa Journal Online, Web of Science, and Africa Index Medicus will be conducted to identify all published relevant articles without any language and period of publication

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restriction. A search strategy based on the combination of relevant terms will be designed and applied. This search strategy was built according to PRESS guidelines [9]. The primary search strategy in PubMed is shown in Supplementary Table 1. This search strategy will be adapted for search in other databases. The search strategy will be applied in all databases on January 3, 2022. A manual search consisting of scanning reference lists of eligible studies and relevant reviews will be performed to identify missed studies during the review process or by search strategy or for studies not indexed in the five targeted electronic databases. For articles published in a language other than English and French, an experienced translator in the concerned language will be contacted for translation. Studies published from 01/01/1980 till 31/12/2021 will be deemed eligible for assessment.

Searching for other sources We will scan the references of all selected articles for additional data sources missed during our search, and their full texts obtained. All studies that meet our selection criteria will be included for analyses.

Selection of studies to include in the review Two investigators (JCK and BBA) will independently screen records for eligibility based on titles and abstracts. Full texts of articles deemed potentially eligible will be retrieved. Further, these investigators will independently assess the full text of each study for eligibility and consensually retained studies to be included. Disagreements will be resolved by consensus and following an independent review by a third reviewer in case of unresolved disagreements.

Data extraction and management Data will be extracted using a preconceived, piloted and standardised data abstraction form. Two investigators (JCK and BBA) will independently extract data, including the name of the first author, year of publication, study design, period of inclusion of participants, recruitment site (country, number of locations), sampling method, sample size, number of cases, age distribution, proportion male, and presence of specific conditions/disease.

Methodological quality assessment We will use an adapted version of the tool developed by the Joanna Briggs Institute to assess the risk of bias in included studies [8]. Two investigators (JCK and BBA) will independently run the assessment. These investigators will discuss and resolve discrepancies through discussion and consensus with the contribution of a third investigator (CAD).

Data synthesis and analysis

Meta-analyses will be conducted using the *meta* packages of the R statistical software (version 3.6.0, The R Foundation for statistical computing, Vienna, Austria). Only populations with the same clinical profile (specific disease or condition) will be pooled together. With *metaprop* function; we will use the reference method to synthesise prevalence data as recommended by Barendregt and colleagues [9]. All prevalence estimates will be reported with their 95% confidence intervals (95%CI); alongside their 95% prediction interval that can help better understand the uncertainty [11]. To minimize the effect of studies with extremely small or extremely large prevalence estimates on the overall estimate, the variance of study-specific

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prevalence will be stabilized with the Freeman-Tukey double arcsine transformation before pooling the data with the random effects meta-analysis model [10].

Heterogeneity will be assessed by the χ^2 test on Cochrane's Q statistic [12], and quantified by I^2 values, assuming I^2 values of 25, 50 and 75%, representing low, medium, and high heterogeneity [13]. The Egger test will be used to assess the presence of publication bias [14]. A p value < 0.10 will be considered indicative of a statistically significant publication bias [15]. It was decided a priori that if publication bias were present, it would not be adjusted for since we believed that the prevalence estimates of interest would likely be published even if substantially different from previously reported estimates. We will conduct subgroup analyses according to sub-regions in Africa (Northern, Southern, Western, Central, and Eastern), level of country human development index, age group, and sex. We will calculate R^2 through meta-regression analysis (with *metareg* function) to identify covariates that explain the heterogeneity in the overall estimate and quantify the heterogeneity. Inter-rater agreements between investigators for study inclusion and methodological quality assessment will be assessed using Cohen's κ.

Presentation and reporting of results

The study selection process will be summarised using a flow diagram. Quantitative data will be presented in tables of individual studies and in summary tables or forest plots where appropriate. The quality scores of bias for each eligible study will be reported accordingly.

Potential study amendments

We do not plan to modify the protocol to avoid reporting bias. However, if necessary, any amendment in the review process will be reported for transparency.

Ethics and dissemination

Since primary data will not be collected in this study, ethical approval is not required. This review is expected to provide accurate data on the incidence and prevalence of type 1 diabetes in Africa. The final report will be published in an international peer-reviewed journal.

Footnotes

Author Contributions: JCK, and ES developed the idea, design for this protocol. JCK, BBA, CAD wrote the first draft of the manuscript. JCK, ES, are the guarantors of the review. All authors critically revised the methodology and intellectual content and approved the final version of this manuscript.

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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Competing interests: None declared.

Patient consent for publication: Not required.

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References

1. Bahendeka S. Diabetes in sub-Saharan Africa: let us not forget type 1. Lancet Diabetes Endocrinol. 2017;5. doi:10.1016/S2213-8587(17)30223-1

2. Motala AA, Omar MAK, Pirie FJ. Epidemiology of Type 1 and Type 2 Diabetes in Africa. J Cardiovasc Risk. 2003;10: 77–83. doi:10.1177/174182670301000202

3. Peer N, Kengne A-P, Motala AA, Mbanya JC. Diabetes in the Africa Region: an update. Diabetes Res Clin Pract. 2014;103: 197–205. doi:10.1016/j.diabres.2013.11.006

4. IDF Diabetes Atlas 9th edition 2019. [cited 11 Oct 2021]. Available: https://www.diabetesatlas.org/en/

5. Majaliwa ES, Elusiyan BEJ, Adesiyun OO, Laigong P, Adeniran AK, Kandi CM, et al. Type 1 diabetes mellitus in the African population: epidemiology and management challenges. Acta Bio-Medica Atenei Parm. 2008;79: 255–259.

6. Atun R, Davies JI, Gale EAM, Bärnighausen T, Beran D, Kengne AP, et al. Diabetes in sub-Saharan Africa: from clinical care to health policy. Lancet Diabetes Endocrinol. 2017;5: 622–667. doi:10.1016/S2213-8587(17)30181-X

7. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ. 2009;339: b2700. doi:10.1136/bmj.b2700

8. Munn Z, Moola S, Lisy K, Riitano D, Tufanaru C. Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and cumulative incidence data. Int J Evid Based Healthc. 2015;13: 147–153. doi:10.1097/XEB.0000000000000054

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9. McGowan J, Sampson M, Salzwedel DM, Cogo E, Foerster V, Lefebvre C. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. J Clin Epidemiol. 2016;75: 40–46. doi:10.1016/j.jclinepi.2016.01.021

10. Barendregt JJ, Doi SA, Lee YY, Norman RE, Vos T. Meta-analysis of prevalence. J Epidemiol Community Health. 2013;67: 974–978. doi:10.1136/jech-2013-203104

11. IntHout J, Ioannidis JPA, Rovers MM, Goeman JJ. Plea for routinely presenting prediction intervals in meta-analysis. BMJ Open. 2016;6: e010247. doi:10.1136/bmjopen-2015-010247

12. Cochran WG. The Combination of Estimates from Different Experiments. Biometrics. 1954;10: 101–129. doi:10.2307/3001666

13. Higgins JPT, Thompson SG. Quantifying heterogeneity in a meta-analysis. Stat Med. 2002;21: 1539–1558. doi:10.1002/sim.1186

14. Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997;315: 629–634. doi:10.1136/bmj.315.7109.629

15. Seagroatt V, Stratton I. Bias in meta-analysis detected by a simple, graphical test. Test had 10% false positive rate. BMJ. 1998;316: 470–471.

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Incidence and prevalence of type 1 diabetes in Africa: a systematic review and meta-analysis

Table 1: Search Strategy for PubMed

Search	Search terms
#1	"type 1 diabetes" OR "type 1 diabetes mellitus" OR "juvenile diabetes" OR "juvenile diabetes mellitus" OR "insulin dependent diabetes mellitus" or "insulin-dependent diabetes mellitus" OR "early-onset diabetes mellitus" OR "young-onset diabetes mellitus" OR "childhood diabetes"
#2	Africa* OR Angola OR Benin OR Botswana OR "Burkina Faso" OR Burundi OR "Cabo Verde" OR Cameroon OR "Canary Islands" OR "Central African Republic" OR Chad OR Comoros OR Congo OR "Democratic Republic of the Congo" OR Djibouti OR "Equatorial Guinea" OR Eritrea OR Eswatini OR Ethiopia OR Gabon OR Gambia OR Ghana OR Guinea OR "Guinea Bissau" OR "Ivory Coast" OR "Cote d'Ivoire" OR Kenya OR Lesotho OR Liberia OR Madagascar OR Malawi OR Mali OR Mauritania OR Mauritius OR Mayotte OR Mozambique OR Namibia OR Niger OR Nigeria OR Réunion OR Rwanda OR "Sao Tome and Principe" OR Senegal OR Seychelles OR "Sierra Leone" OR Somalia OR "South Africa" OR "South Sudan" OR "Saint Helena" OR Togo OR Uganda OR "United Republic of Tanzania" OR Zambia OR Zimbabwe OR "Eastern Africa" OR "Middle Africa" OR "Southern Africa" OR "Western Africa" OR "East Africa" OR "East African" OR "Eastern Africa" OR "South African" OR "Southern African" OR "West Africa" OR "West African" OR "Western African" OR "Central Africa" OR "Central African" OR "Western Sahara" OR "sub Saharan Africa" OR "sub Saharan African" OR "subSaharan Africa" OR "subSaharan African"
#3	#1 AND #2
#4	#Limit [1980/01/01 to 2021/12/31

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Page Number
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	2
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	7
Amendments	4	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	7
Support:			
Sources	5a	Indicate sources of financial or other support for the review	
Sponsor	5b	Provide name for the review funder and/or sponsor	7
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	4
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4,5
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of	6

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		coverage	
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	5, 6 and supplementary
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	6
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	6
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	6, 7
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	6
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	5
Risk of bias in individual studies	14	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	6,7
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	6
	15b	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 (such as I^2, Kendall's τ)	6
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	6
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	6
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	7

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

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Incidence and Prevalence of Type 1 Diabetes in Africa: a systematic review and meta-analysis protocol

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2022-061605.R1
Article Type:	Protocol
Date Submitted by the Author:	24-Jun-2022
Complete List of Authors:	Katte, Jean-Claude; Hopital Central de Yaounde, National Obesity Centre and Endocrinology and Metabolic Diseases Unit; RSD Institute Agoons, Batakeh; University of Yaounde I, Department of Internal Medicine and Specialities, Faculty of Medicine and Biomedical Sciences; Bafang District Hospital Akem Dimala, Christian; Reading Hospital Tower Health Bigna, Jean Joel; Centre Pasteur of Cameroon, Department of Epidemiology and Public Health Sobngwi, Eugene; National Obesity Centre and Endocrinology and Metabolic Diseases Unit, Yaounde Central Hospital; RSD Institute
Primary Subject Heading:	Diabetes and endocrinology
Secondary Subject Heading:	Diabetes and endocrinology
Keywords:	DIABETES & ENDOCRINOLOGY, Health economics < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, EPIDEMIOLOGY

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Word count: 1739

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Abstract

Introduction

Type 1 diabetes is reported to have significant mortality in Africa. However, there is a paucity of data on pooled estimates of its incidence and prevalence in Africa. This first systematic review and meta-analysis will be conducted to determine the incidence and prevalence of this condition in Africa.

Methods

Based on predefined criteria, electronic databases including PubMed, Excerpta Medica database, Africa Journal Online, Web of Science, and Africa Index Medicus, will be searched for relevant studies involving paediatric and adult patients, with no language restrictions. The Q-statistic test and I^2 statistic test will be used to assess statistical heterogeneity. Appropriate meta-analysis will then be used to pool studies judged to be clinically homogenous. Egger's test will be used to detect publication bias. The planned search dates for the eligible articles are from September 1st to September 30th 2022.

Ethics and Dissemination

Since this review will use previously published studies, it will not require the consent of an Ethics Committee. The results will be prepared and disseminated through a peer-reviewed journal and will be presented in relevant conferences.

Prospero registration number

CRD42021278227

Keywords: Type 1 diabetes, Africa, Public health

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- Methodological biases in the primary studies included may cause uncertainty in the final results obtained.

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Introduction

The true epidemiologic feature of type 1 diabetes is unknown in Africa despite recent reports suggesting an increase in the number of persons with the condition in the continent [1,2]. In 2013, the International Diabetes Federation (IDF) reported that about 39,000 individuals were living with type 1 diabetes in Africa, with an incidence of 6.4/1,000,000 amongst those less than 14 years old [3]. In 2017, the IDF reported an estimated 50,600 children and adolescents below 20 years living with type 1 diabetes in Africa[4]. Interestingly, these IDF reports are limited to a cohort of subjects aged less than 20 years old. It is therefore necessary to provide supplementary data on type 1 diabetes in all age categories in Africa.

A previous narrative review of some early population-based studies across different countries in Africa stated that the prevalence of type 1 diabetes was <1/1000, with incidence rates ranging from 1.5 to 10.1/100,000 per year [5]. This was not a systematic review and only presented results in ranges, reporting conflicting findings regarding the prevalence of type 1 diabetes in sex-specific groups across east to west Africa.

Type 1 diabetes is reported to have high mortality in Africa. It stands out as an almost neglected disease in the continent, receiving very little scientific attention and funding for research [1]. A possible reason for this neglect is the high cost of confirmatory diagnostic tests for type 1 diabetes (dosage of islet autoantibodies), potentially underestimating true prevalence estimates. Therefore, in this context, there is a need for accurate, evidence-based epidemiological data summarising the trends of the condition, which may serve as a basis for developing adequate public health strategies, health service organisations, and interventions in the African continent [6]. To our knowledge, this is the first systematic review and meta-analysis aiming to summarise available data on the incidence and prevalence of type 1 diabetes in Africa. We will also examine the epidemiology of the condition with regards to age, sex, geographical region, and temporal trends.

The findings of this study are intended to serve as a supplement to the recent IDF atlas reports on the incidence and prevalence of type 1 diabetes in Africa. While the results of the IDF are based on a single study per African Country available and are limited to data in the 0-20 years age group, this study will aim to provide estimates using multiple studies available per given African country, and also inform on epidemiologic estimates of type 1 diabetes in adults aged 20 years and above.

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Review Question

What are the epidemiologic features of type 1 diabetes on the African continent?

Objectives

The objective of the present systematic review and meta-analysis is to estimate the prevalence and incidence of type 1 diabetes in patients (of any age, including paediatrics or adults) in Africa.

Secondary Objectives:

1. Assess the quality of published incidence and prevalence data of type 1 diabetes in Africa
2. Estimate the incidence and prevalence of type 1 diabetes by gender, age and geographical delimitations
3. Determine the temporal trend of the prevalence and incidence of type 1 diabetes in Africa.
4. Compare incidence and prevalence of type 1 diabetes between North Africa and sub-Saharan Africa

Methods and Design

The Preferred Reporting Items for Systematic Reviews and Meta-analysis for Protocols (PRISMA-P) guidelines served as the template for reporting this protocol [7]. This systematic review and meta-analysis will be conducted as recommended in the Joanna Briggs Institute reviewer's manual for prevalence and incidence review [8]. The PRISMA-P checklist is attached (see supplementary file 1).

Patient and public involvement

Patients and the public will not be involved in the design or planning of the study.

Criteria for considering studies for the review

Types of studies This study shall select all hospital-based and population-based observational studies that correctly provide data estimates on the incidence and prevalence of type 1 diabetes in Africa. These observational studies will include population-based cross-sectional studies for estimating the prevalence and prospective, population-based cohort studies for estimating the incidence.

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Outcome Studies included in this review will be studies reporting on the prevalence and/or incidence of type 1 diabetes or Insulin Dependent Diabetes Mellitus (IDDM) or Juvenile

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Diabetes conducted in Africa. Studies lacking explicit method descriptions will be excluded if the information was not provided after contacting authors twice. The minimum acceptable sample size for the preliminary studies is 30 participants from the general population. This is to ensure that we recruit studies with large sample sizes, in order to provide accurate estimates on type 1 diabetes incidence and prevalence.

Research strategy for identifying relevant studies The search strategy will be conducted as discussed below.

Bibliographic database searches: A comprehensive search of PubMed, Excerpta Medica database, Africa Journal Online, Web of Science, and Africa Index Medicus will be conducted to identify all published relevant articles without any language and period of publication restriction. A search strategy based on the combination of relevant terms will be designed and applied. This search strategy was built according to PRESS guidelines [9]. The primary search strategy in PubMed is shown in Supplementary file 2. This search strategy will be adapted for search in other databases. The search strategy will be applied in all databases on January 3, 2022. A manual search consisting of scanning reference lists of eligible studies and relevant reviews will be performed to identify missed studies during the review process or by search strategy or for studies not indexed in the five targeted electronic databases. For articles published in a language other than English and French, an experienced translator in the concerned language will be contacted for translation. Studies published from 01/01/1980 till 31/12/2021 will be deemed eligible for assessment.

Searching for other sources We will scan the references of all selected articles for additional data sources missed during our search, and their full texts obtained. All studies that meet our selection criteria will be included for analyses.

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Heterogeneity will be assessed by the χ^2 test on Cochrane's Q statistic [12], and quantified by I^2 values, assuming I^2 values of 25, 50 and 75%, representing low, medium, and high heterogeneity [13]. The Egger test will be used to assess the presence of publication bias [14]. A p value < 0.10 will be considered indicative of a statistically significant publication bias [15]. It was decided a priori that if publication bias were present, it would not be adjusted for since we believed that the prevalence estimates of interest would likely be published even if substantially different from previously reported estimates. We will conduct subgroup analyses according to sub-regions in Africa (Northern, Southern, Western, Central, and Eastern), level of country human development index, age group, and sex. We will calculate R^2 through meta-regression analysis (with *metareg* function) to identify covariates that explain the heterogeneity in the overall estimate and quantify the heterogeneity. Inter-rater agreements between investigators for study inclusion and methodological quality assessment will be assessed using Cohen's κ.

Presentation and reporting of results

The study selection process will be summarised using a flow diagram. Quantitative data will be presented in tables of individual studies and in summary tables or forest plots where appropriate. The quality scores of bias for each eligible study will be reported accordingly.

Potential study amendments

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We do not plan to modify the protocol to avoid reporting bias. However, if necessary, any amendment in the review process will be reported for transparency.

Ethics and dissemination

Since primary data will not be collected in this study, ethical approval is not required. This review is expected to provide accurate data on the incidence and prevalence of type 1 diabetes in Africa. The final report will be published in an international peer-reviewed journal.

Footnotes

Author Contributions: JCK, and ES developed the idea, design for this protocol. JCK, BBA, CAD wrote the first draft of the manuscript. CAD and JJB developed the search strategy. All authors critically revised this manuscript. JCK, ES, are the guarantors of the review. All authors critically revised the methodology and intellectual content and approved the final version of this manuscript.

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests: None declared.

Patient consent for publication: Not required.

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References

1. Bahendeka S. Diabetes in sub-Saharan Africa: let us not forget type 1. Lancet Diabetes Endocrinol. 2017;5. doi:10.1016/S2213-8587(17)30223-1

2. Motala AA, Omar MAK, Pirie FJ. Epidemiology of Type 1 and Type 2 Diabetes in Africa. J Cardiovasc Risk. 2003;10: 77–83. doi:10.1177/174182670301000202

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3. Peer N, Kengne A-P, Motala AA, Mbanya JC. Diabetes in the Africa Region: an update. Diabetes Res Clin Pract. 2014;103: 197–205. doi:10.1016/j.diabres.2013.11.006

4. IDF Diabetes Atlas 9th edition 2019. [cited 11 Oct 2021]. Available: https://www.diabetesatlas.org/en/

5. Majaliwa ES, Elusiyan BEJ, Adesiyun OO, Laigong P, Adeniran AK, Kandi CM, et al. Type 1 diabetes mellitus in the African population: epidemiology and management challenges. Acta Bio-Medica Atenei Parm. 2008;79: 255–259.

6. Atun R, Davies JI, Gale EAM, Bärnighausen T, Beran D, Kengne AP, et al. Diabetes in sub-Saharan Africa: from clinical care to health policy. Lancet Diabetes Endocrinol. 2017;5: 622–667. doi:10.1016/S2213-8587(17)30181-X

7. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ. 2009;339: b2700. doi:10.1136/bmj.b2700

8. Munn Z, Moola S, Lisy K, Riitano D, Tufanaru C. Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and cumulative incidence data. Int J Evid Based Healthc. 2015;13: 147–153. doi:10.1097/XEB.0000000000000054

9. McGowan J, Sampson M, Salzwedel DM, Cogo E, Foerster V, Lefebvre C. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. J Clin Epidemiol. 2016;75: 40–46. doi:10.1016/j.jclinepi.2016.01.021

10. IntHout J, Ioannidis JPA, Rovers MM, Goeman JJ. Plea for routinely presenting prediction intervals in meta-analysis. BMJ Open. 2016;6: e010247. doi:10.1136/bmjopen-2015-010247

11 Barendregt JJ, Doi SA, Lee YY, Norman RE, Vos T. Meta-analysis of prevalence. J Epidemiol Community Health. 2013;67: 974–978. doi:10.1136/jech-2013-203104

12. Cochran WG. The Combination of Estimates from Different Experiments. Biometrics. 1954;10: 101–129. doi:10.2307/3001666

13. Higgins JPT, Thompson SG. Quantifying heterogeneity in a meta-analysis. Stat Med. 2002;21: 1539–1558. doi:10.1002/sim.1186

14. Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997;315: 629–634. doi:10.1136/bmj.315.7109.629

15. Seagroatt V, Stratton I. Bias in meta-analysis detected by a simple, graphical test. Test had 10% false positive rate. BMJ. 1998;316: 470–471.

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Incidence and prevalence of type 1 diabetes in Africa: a systematic review and meta-analysis

Table 1: Search Strategy for PubMed

Search	Search terms
#1	"type 1 diabetes" OR "type 1 diabetes mellitus" OR "juvenile diabetes" OR "juvenile diabetes mellitus" OR "insulin dependent diabetes mellitus" or "insulin-dependent diabetes mellitus" OR "early-onset diabetes mellitus" OR "young-onset diabetes mellitus" OR "childhood diabetes"
#2	Africa* OR Angola OR Benin OR Botswana OR "Burkina Faso" OR Burundi OR "Cabo Verde" OR Cameroon OR "Canary Islands" OR "Central African Republic" OR Chad OR Comoros OR Congo OR "Democratic Republic of the Congo" OR Djibouti OR "Equatorial Guinea" OR Eritrea OR Eswatini OR Ethiopia OR Gabon OR Gambia OR Ghana OR Guinea OR "Guinea Bissau" OR "Ivory Coast" OR "Cote d'Ivoire" OR Kenya OR Lesotho OR Liberia OR Madagascar OR Malawi OR Mali OR Mauritania OR Mauritius OR Mayotte OR Mozambique OR Namibia OR Niger OR Nigeria OR Réunion OR Rwanda OR "Sao Tome and Principe" OR Senegal OR Seychelles OR "Sierra Leone" OR Somalia OR "South Africa" OR "South Sudan" OR "Saint Helena" OR Togo OR Uganda OR "United Republic of Tanzania" OR Zambia OR Zimbabwe OR "Eastern Africa" OR "Middle Africa" OR "Southern Africa" OR "Western Africa" OR "East Africa" OR "East African" OR "Eastern Africa" OR "South African" OR "Southern African" OR "West Africa" OR "West African" OR "Western African" OR "Central Africa" OR "Central African" OR "Western Sahara" OR "sub Saharan Africa" OR "sub Saharan African" OR "subSaharan Africa" OR "subSaharan African"
#3	Incidence* OR Prevalence*
#4	#1 AND #2 AND #3
#5	#Limit [1980/01/01 to 2021/12/31

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Page Number
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	2
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	7
Amendments	4	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	7
Support:			
Sources	5a	Indicate sources of financial or other support for the review	
Sponsor	5b	Provide name for the review funder and/or sponsor	7
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	4
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4,5
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of	6

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		coverage	
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	5, 6 and supplementary
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	6
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	6
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	6, 7
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	6
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	5
Risk of bias in individual studies	14	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	6,7
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	6
	15b	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 (such as I^2, Kendall's τ)	6
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	6
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	6
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	7

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2022-061605.R2
Article Type:	Protocol
Date Submitted by the Author:	11-Aug-2022
Complete List of Authors:	Katte, Jean-Claude; Hopital Central de Yaounde, National Obesity Centre and Endocrinology and Metabolic Diseases Unit; RSD Institute Agoons, Batakeh; University of Yaounde I, Department of Internal Medicine and Specialities, Faculty of Medicine and Biomedical Sciences; Bafang District Hospital Akem Dimala, Christian; Reading Hospital Tower Health Bigna, Jean Joel; Centre Pasteur of Cameroon, Department of Epidemiology and Public Health Sobngwi, Eugene; National Obesity Centre and Endocrinology and Metabolic Diseases Unit, Yaounde Central Hospital; RSD Institute
Primary Subject Heading:	Diabetes and endocrinology
Secondary Subject Heading:	Diabetes and endocrinology
Keywords:	DIABETES & ENDOCRINOLOGY, Health economics < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, EPIDEMIOLOGY

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Incidence and Prevalence of Type 1 Diabetes in Africa: a systematic review and meta-analysis protocol

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Word count: 1739

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Abstract

Introduction

Type 1 diabetes is reported to have significant mortality in Africa. However, there is a paucity of data on pooled estimates of its incidence and prevalence in Africa. This first systematic review and meta-analysis will be conducted to determine the incidence and prevalence of this condition in Africa.

Methods

Based on predefined criteria, electronic databases including PubMed, Excerpta Medica database, Africa Journal Online and Web of Science, will be searched for relevant studies involving paediatric and adult patients, with no language restrictions. Quality assessment of the individual studies will be performed, and the Q-statistic test and I^2 statistic test will be used to assess statistical heterogeneity. Appropriate meta-analysis will then be used to pool studies judged to be clinically homogenous. Egger's test will be used to detect publication bias. The planned search dates for the eligible articles are from September 1st to September 30th 2022.

Ethics and Dissemination

Since this review will use previously published studies, it will not require the consent of an Ethics Committee. The results will be prepared and disseminated through a peer-reviewed journal and will be presented in relevant conferences.

Prospero registration number

CRD42021278227

Keywords: Type 1 diabetes, Africa, Public health

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Article summary:

Strengths and limitations of this study

- We will employ robust methods and statistical analyses to determine the burden of type 1 diabetes mellitus, providing evidence for public health strategies
- The review will include primary studies without language restrictions, allowing the maximum inclusion of studies published on the topic
- The review uses an inclusive search in large databases, with a long-time range
- Methodological biases in the primary studies included may cause uncertainty in the final results obtained.
- This study will also assess the quality of published incidence and prevalence data of type 1 diabetes in Africa

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Introduction

The true epidemiologic feature of type 1 diabetes is unknown in Africa despite recent reports suggesting an increase in the number of persons with the condition in the continent [1,2]. In 2013, the International Diabetes Federation (IDF) reported that about 39,000 individuals were living with type 1 diabetes in Africa, with an incidence of 6.4/1,000,000 amongst those less than 14 years old [3]. In 2017, the IDF reported an estimated 50,600 children and adolescents below 20 years living with type 1 diabetes in Africa[4]. Interestingly, these IDF reports are limited to a cohort of subjects aged less than 20 years old. It is therefore necessary to provide supplementary data on type 1 diabetes in all age categories in Africa.

A previous narrative review of some early population-based studies across different countries in Africa stated that the prevalence of type 1 diabetes was <1/1000, with incidence rates ranging from 1.5 to 10.1/100,000 per year [5]. This was not a systematic review and only presented results in ranges, reporting conflicting findings regarding the prevalence of type 1 diabetes in sex-specific groups across east to west Africa.

Type 1 diabetes is reported to have high mortality in Africa. It stands out as an almost neglected disease in the continent, receiving very little scientific attention and funding for research [1]. A possible reason for this neglect is the high cost of confirmatory diagnostic tests for type 1 diabetes (dosage of islet autoantibodies), potentially underestimating true prevalence estimates. Therefore, in this context, there is a need for accurate, evidence-based epidemiological data summarising the trends of the condition, which may serve as a basis for developing adequate public health strategies, health service organisations, and interventions in the African continent [6]. To our knowledge, this is the first systematic review and meta-analysis aiming to summarise available data on the incidence and prevalence of type 1 diabetes in Africa. We will also examine the epidemiology of the condition with regards to age, sex, geographical region, and temporal trends.

The findings of this study are intended to serve as a supplement to the recent IDF atlas reports on the incidence and prevalence of type 1 diabetes in Africa. While the results of the IDF are based on a single study per African Country available and are limited to data in the 0-20 years

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age group, this study will aim to provide estimates using multiple studies available per given African country, and also inform on epidemiologic estimates of type 1 diabetes in adults aged 20 years and above.

Review Question

What are the epidemiologic features of type 1 diabetes on the African continent?

Objectives

The objective of the present systematic review and meta-analysis is to estimate the prevalence and incidence of type 1 diabetes in patients (of any age, including paediatrics or adults) in Africa.

Secondary Objectives:

1. Assess the quality of published incidence and prevalence data of type 1 diabetes in Africa
2. Estimate the incidence and prevalence of type 1 diabetes by gender, age and geographical delimitations
3. Determine the temporal trend of the prevalence and incidence of type 1 diabetes in Africa.
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children/adolescents/adults with diabetes on Insulin therapy, and confirmed by the treating physician as "type 1 diabetes".

Outcome Studies included in this review will be studies reporting on the prevalence and/or incidence of type 1 diabetes or Insulin Dependent Diabetes Mellitus (IDDM) or Juvenile Diabetes conducted in Africa. Studies lacking explicit method descriptions will be excluded if the information was not provided after contacting authors twice. The minimum acceptable sample size for the preliminary studies is 30 participants from the general population. This is to ensure that we recruit studies with large sample sizes, in order to provide accurate estimates on type 1 diabetes incidence and prevalence.

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Meta-analyses will be conducted using the *meta* packages of the R statistical software (version 3.6.0, The R Foundation for statistical computing, Vienna, Austria). Only populations with the same clinical profile (specific disease or condition) will be pooled together. The aim of pooling data from patients/population with the same clinical profile is to reduce clinical heterogeneity. With *metaprop* function; we will use the reference method to synthesise prevalence data as recommended by Barendregt and colleagues [9]. All prevalence estimates will be reported with their 95% confidence intervals (95%CI); alongside their 95% prediction intervals that can help better understand the uncertainty [10]. The prediction interval predicts the range in which a future individual observation will fall, while the confidence interval will show the likely range of values associated with a statistical parameter of the epidemiologic data of interest. To minimize the effect of studies with extremely small or extremely large prevalence estimates on the overall estimate, the variance of study-specific prevalence will be stabilized with the Freeman-Tukey double arcsine transformation before pooling the data with the random effects meta-analysis model [11].

Heterogeneity will be assessed by the χ^2 test on Cochrane's Q statistic [12], and quantified by I^2 values, assuming I^2 values of 25, 50 and 75%, representing low, medium, and high heterogeneity [13]. The Egger test will be used to assess the presence of publication bias [14]. A p value < 0.10 will be considered indicative of a statistically significant publication bias [15]. It was decided a priori that if publication bias were present, it would not be adjusted for since we believed that the prevalence estimates of interest would likely be published even if substantially different from previously reported estimates. We will conduct subgroup analyses according to sub-regions in Africa (Northern, Southern, Western, Central, and Eastern), level of country human development index, age group, and sex. We will calculate R^2 through meta-regression analysis (with *metareg* function) to identify covariates that explain the heterogeneity in the overall estimate and quantify the heterogeneity. Inter-rater agreements between investigators for study inclusion and methodological quality assessment will be assessed using Cohen's κ.

Presentation and reporting of results

The study selection process will be summarised using a flow diagram. Quantitative data will be presented in tables of individual studies and in summary tables or forest plots where appropriate. The quality scores of bias for each eligible study will be reported accordingly.

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Potential study amendments

We do not plan to modify the protocol to avoid reporting bias. However, if necessary, any amendment in the review process will be reported for transparency.

Ethics and dissemination

Since primary data will not be collected in this study, ethical approval is not required. This review is expected to provide accurate data on the incidence and prevalence of type 1 diabetes in Africa. The final report will be published in an international peer-reviewed journal.

Footnotes

Author Contributions: JCK, and ES developed the idea, design for this protocol. JCK, BBA, CAD wrote the first draft of the manuscript. CAD and JJB developed the search strategy. All authors critically revised this manuscript. JCK, ES, are the guarantors of the review. All authors critically revised the methodology and intellectual content and approved the final version of this manuscript.

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests: None declared.

Patient consent for publication: Not required.

References

1. Bahendeka S. Diabetes in sub-Saharan Africa: let us not forget type 1. Lancet Diabetes Endocrinol. 2017;5. doi:10.1016/S2213-8587(17)30223-1

2. Motala AA, Omar MAK, Pirie FJ. Epidemiology of Type 1 and Type 2 Diabetes in Africa. J Cardiovasc Risk. 2003;10: 77–83. doi:10.1177/174182670301000202

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3. Peer N, Kengne A-P, Motala AA, Mbanya JC. Diabetes in the Africa Region: an update. Diabetes Res Clin Pract. 2014;103: 197–205. doi:10.1016/j.diabres.2013.11.006

4. IDF Diabetes Atlas 9th edition 2019. [cited 11 Oct 2021]. Available: https://www.diabetesatlas.org/en/

5. Majaliwa ES, Elusiyan BEJ, Adesiyun OO, Laigong P, Adeniran AK, Kandi CM, et al. Type 1 diabetes mellitus in the African population: epidemiology and management challenges. Acta Bio-Medica Atenei Parm. 2008;79: 255–259.

6. Atun R, Davies JI, Gale EAM, Bärnighausen T, Beran D, Kengne AP, et al. Diabetes in sub-Saharan Africa: from clinical care to health policy. Lancet Diabetes Endocrinol. 2017;5: 622–667. doi:10.1016/S2213-8587(17)30181-X

7. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ. 2009;339: b2700. doi:10.1136/bmj.b2700

8. Munn Z, Moola S, Lisy K, Riitano D, Tufanaru C. Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and cumulative incidence data. Int J Evid Based Healthc. 2015;13: 147–153. doi:10.1097/XEB.0000000000000054

9. McGowan J, Sampson M, Salzwedel DM, Cogo E, Foerster V, Lefebvre C. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. J Clin Epidemiol. 2016;75: 40–46. doi:10.1016/j.jclinepi.2016.01.021

10. IntHout J, Ioannidis JPA, Rovers MM, Goeman JJ. Plea for routinely presenting prediction intervals in meta-analysis. BMJ Open. 2016;6: e010247. doi:10.1136/bmjopen-2015-010247

11 Barendregt JJ, Doi SA, Lee YY, Norman RE, Vos T. Meta-analysis of prevalence. J Epidemiol Community Health. 2013;67: 974–978. doi:10.1136/jech-2013-203104

12. Cochran WG. The Combination of Estimates from Different Experiments. Biometrics. 1954;10: 101–129. doi:10.2307/3001666

13. Higgins JPT, Thompson SG. Quantifying heterogeneity in a meta-analysis. Stat Med. 2002;21: 1539–1558. doi:10.1002/sim.1186

14. Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997;315: 629–634. doi:10.1136/bmj.315.7109.629

15. Seagroatt V, Stratton I. Bias in meta-analysis detected by a simple, graphical test. Test had 10% false positive rate. BMJ. 1998;316: 470–471.

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Page Number
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	2
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	7
Amendments	4	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	7
Support:			
Sources	5a	Indicate sources of financial or other support for the review	
Sponsor	5b	Provide name for the review funder and/or sponsor	7
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	4
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	4,5
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of	6

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		coverage	
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	5, 6 and supplementary
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	6
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	6
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	6, 7
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	6
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	5
Risk of bias in individual studies	14	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	6,7
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	6
	15b	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 (such as I^2, Kendall's τ)	6
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	6
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	6
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	7

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

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Incidence and prevalence of type 1 diabetes in Africa: a systematic review and meta-analysis

Search	Search terms
#1	"type 1 diabetes" OR "type 1 diabetes mellitus" OR "juvenile diabetes" OR "juvenile diabetes mellitus" OR "insulin dependent diabetes mellitus" or "insulin-dependent diabetes mellitus" OR "early-onset diabetes mellitus" OR "young-onset diabetes mellitus" OR "childhood diabetes"
#2	Africa* OR Angola OR Benin OR Botswana OR "Burkina Faso" OR Burundi OR "Cabo Verde" OR Cameroon OR "Canary Islands" OR "Central African Republic" OR Chad OR Comoros OR Congo OR "Democratic Republic of the Congo" OR Djibouti OR "Equatorial Guinea" OR Eritrea OR Eswatini OR Ethiopia OR Gabon OR Gambia OR Ghana OR Guinea OR "Guinea Bissau" OR "Ivory Coast" OR "Cote d'Ivoire" OR Kenya OR Lesotho OR Liberia OR Madagascar OR Malawi OR Mali OR Mauritania OR Mauritius OR Mayotte OR Mozambique OR Namibia OR Niger OR Nigeria OR Réunion OR Rwanda OR "Sao Tome and Principe" OR Senegal OR Seychelles OR "Sierra Leone" OR Somalia OR "South Africa" OR "South Sudan" OR "Saint Helena" OR Togo OR Uganda OR "United Republic of Tanzania" OR Zambia OR Zimbabwe OR "Eastern Africa" OR "Middle Africa" OR "Southern Africa" OR "Western Africa" OR "East Africa" OR "East African" OR "Eastern Africa" OR "South African" OR "Southern African" OR "West Africa" OR "West African" OR "Western African" OR "Central Africa" OR "Central African" OR "Western Sahara" OR "sub Saharan Africa" OR "sub Saharan African" OR "subSaharan Africa" OR "subSaharan African"
#3	Incidence* OR Prevalence*
#4	#1 AND #2 AND #3
#5	#Limit [1980/01/01 to 2021/12/31

Table 1: Search Strategy for PubMed

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Search strategy for Embase (Excerpta Medica)

Search	Search terms
#1	'type 1 diabetes'/exp OR 'type 1 diabetes' OR 'type 1 diabetes mellitus'/exp OR 'type 1 diabetes mellitus' OR 'juvenile diabetes'/exp OR 'juvenile diabetes' OR 'juvenile diabetes mellitus'/exp OR 'juvenile diabetes mellitus' OR 'insulin dependent diabetes mellitus'/exp OR 'insulin dependent diabetes mellitus' OR 'insulin-dependent diabetes mellitus'/exp OR 'insulin-dependent diabetes mellitus' OR 'early-onset diabetes mellitus'/exp OR 'early-onset diabetes mellitus' OR 'young-onset diabetes mellitus' OR 'childhood diabetes'
#2	africa* OR angola OR benin OR botswana OR 'burkina faso' OR burundi OR 'cabo verde' OR cameroon OR 'canary islands' OR 'central african republic' OR chad OR comoros OR congo OR 'democratic republic of the congo' OR djibouti OR 'equatorial guinea' OR eritrea OR eswatini OR ethiopia OR gabon OR gambia OR ghana OR guinea OR 'guinea bissau' OR 'ivory coast' OR 'cote ivoire' OR kenya OR lesotho OR liberia OR madagascar OR malawi OR mali OR mauritania OR mauritius OR mayotte OR mozambique OR namibia OR niger OR nigeria OR réunion OR rwanda OR 'sao tome and principe' OR senegal OR seychelles OR 'sierra leone' OR somalia OR 'south africa' OR 'south sudan' OR 'saint helena' OR togo OR uganda OR 'united republic of tanzania' OR zambia OR zimbabwe OR 'middle africa' OR 'southern africa' OR 'western africa' OR 'east africa' OR 'east african' OR 'eastern africa' OR 'south african' OR 'southern african' OR 'west africa' OR 'west african' OR 'western african' OR 'central africa' OR 'central african' OR 'western sahara' OR 'sub saharan africa' OR 'sub saharan african' OR 'subsaharan africa' OR 'subsaharan african'
#3	incidence* OR prevalence*
#4	#1 AND #2 AND #3
#5	#1 AND #2 AND #3 AND [1980-2021]/py

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Search strategy of Web of Science

Search	Search terms
#1	(type 1 diabetes OR juvenile diabetes OR insulin dependent diabetes mellitus OR insulin-dependent diabetes mellitus OR early-onset diabetes mellitus OR young-onset diabetes mellitus OR childhood diabetes)
#2	africa* OR angola OR benin OR botswana OR burkina faso OR burundi OR cape verde OR cameroon OR central african republic OR chad OR comoros OR congo OR democratic republic of the congo OR djibouti OR equatorial guinea OR eritrea OR eswatini OR ethiopia OR gabon OR gambia OR ghana OR guinea OR guinea bissau OR ivory coast OR cote ivoire OR kenya OR lesotho OR liberia OR madagascar OR malawi OR mali OR mauritania OR mauritius OR mayotte OR mozambique OR namibia OR niger OR nigeria OR réunion OR rwanda OR sao tome and principe OR senegal OR seychelles OR sierra leone OR somalia OR south africa OR south sudan OR saint helena OR togo OR uganda OR united republic of tanzania OR zambia OR zimbabwe OR middle africa OR southern africa OR western africa OR east africa OR east african OR eastern africa OR south african OR southern african OR west africa OR west african OR western african OR central africa OR central african OR western sahara OR sub saharan africa OR sub saharan african OR subsaharan africa OR subsaharan African OR north africa
#3	incidence OR prevalence OR epidemiology
#4	#1 AND #2 AND #3
#5	#1 AND #2 AND #3 AND [1980-2021]/py

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Search strategy of AJOL

Search	Search terms
#1	(type 1 diabetes OR type 1 diabetes mellitus OR juvenile diabetes OR juvenile diabetes mellitus OR insulin-dependent diabetes mellitus OR insulin dependent diabetes mellitus OR early-onset diabetes OR early-onset diabetes mellitus OR young-onset diabetes OR childhood diabetes)
#2	africa* OR angola OR benin OR botswana OR 'burkina faso OR burundi OR cape verde OR cameroon OR central african republic OR chad OR comoros OR congo OR democratic republic of the congo OR djibouti OR equatorial guinea OR eritrea OR eswatini OR ethiopia OR gabon OR gambia OR ghana OR guinea OR guinea bissau OR ivory coast OR cote ivoire OR kenya OR lesotho OR liberia OR madagascar OR malawi OR mali OR mauritania OR mauritius OR mayotte OR mozambique OR namibia OR niger OR nigeria OR réunion OR rwanda OR sao tome and principe OR senegal OR seychelles OR sierra leone OR somalia OR south africa OR south sudan OR togo OR uganda OR united republic of tanzania OR zambia OR zimbabwe OR middle africa OR southern africa OR western africa OR east africa OR east african OR eastern africa OR south african OR southern african OR west africa OR west african OR western african OR central africa OR central african OR western sahara OR sub-saharan africa OR sub saharan african OR subsaharan africa OR subsaharan African OR north africa
#3	incidence OR prevalence OR epidemiology
#4	#1 AND #2 AND #3
#5	#1 AND #2 AND #3 AND [1980-2021]/py

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