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Racial and ethnic disparities in children and adults in the usage of continuous glucose monitors: a scoping review protocol

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ABSTRACT

Introduction This scoping review synthesises the existing literature on racial and ethnic disparities in the utilisation of continuous glucose monitors (CGMs) among adults and children with diabetes in the USA. The primary objective is to describe the extent and nature of these disparities, with the broader goal of informing future research and interventions to address health inequities.

Methods and analysis Guided by the Joanna Briggs Institute methodological framework, this review will systematically search PubMed, Embase and Scopus for relevant studies. Included studies will focus on individuals diagnosed with type 1 or type 2 diabetes in the USA. Selection criteria will prioritise studies reporting demographic factors, CGM usage patterns and associated health outcomes. The primary outcome is the extent of racial and ethnic disparities in CGM utilisation. Data synthesis will use the National Institute on Minority Health and Health Disparities Framework (NIMHD) to uncover patterns of CGM utilisation among racial–ethnic groups. The NIMHD facilitates a multilevel examination of the factors influencing CGM initiation, continued use and attrition by integrating individual, interpersonal, community and societal level influences. This comprehensive approach provides a nuanced understanding of the barriers and facilitators shaping CGM usage across diverse populations. By applying the NIMHD framework, this review aims to identify existing disparities, uncover gaps in the literature and offer direction for future research and interventions.

Ethics and dissemination As this study involves a review of previously published literature and does not involve human subjects research, institutional review board approval will not be pursued. Findings will be disseminated through peer-reviewed publications, conference presentations and lay summaries.

Literature review registration number https://doi.org/10.17605/OSF.IO/RGW6M.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Comprehensive Scope: the review employs a broad search strategy across multiple databases, ensuring a thorough mapping of the literature on racial and ethnic disparities in continuous glucose monitor utilisation.
⇒ Use of the Joanna Briggs Institute (JBI) framework: adherence to the JBI methodological framework enhances the rigour and reproducibility of the scoping review process.
⇒ Focus on health equity: the study addresses a critical public health issue by concentrating on disparities in healthcare technology utilisation, providing valuable insights for future interventions.
⇒ Scoping review scope: while a scoping review allows for the identification and mapping of broad trends and gaps in the literature, it may not have the same depth of analysis found in a systematic review, particularly in terms of assessing the quality of evidence or providing a meta-analysis of findings.

INTRODUCTION

Diabetes represents a significant public health concern, with the Centers for Disease Control and Prevention (CDC) reporting a sharp increase in prevalence across the USA over the past two decades.[1] As of 2021, diabetes affects more than 38.4 million people, accounting for 11.6% of the US population, up from 37.3 million people, or 11.3%.[1] Diabetes disproportionately impacts racial–ethnic minorities as well as those with fewer financial resources and lower educational attainment.[1] The CDC reports that 16% of American Indian or Alaska Native, 12.5% of black non-Hispanic, 10.3% of Hispanic, but only 8.5% of white non-Hispanic US adults were diagnosed with diabetes in 2021.[1] Moreover, these same racial–ethnic minority groups experience higher incidence, worse metabolic control and more complications due to diabetes.[2]

These elevated rates of diabetes among racial–ethnic minorities may be influenced by factors operating at individual, interpersonal, community and societal levels. These multilevel factors align with the National Institute on Minority Health and Health

Disparities Framework (NIMHD) and can be understood within the broader context of social determinants of health (SDOH).[2 3] SDOH are the conditions and environments where people are born, live, work, play, worship and age that affect health outcomes and quality of life.[3] SDOH play a role in glycaemic levels.[4] Walker *et al* found that lower levels of social support and lower self-efficacy were linked to worse glycaemic control.[4] Additionally, Cooper *et al* found that SDOH factors were influential in predicting elevated glycated haemoglobin (HbA1c) and higher body mass index.[5] Some SDOH factors associated with elevated HbA1c were poverty, literacy, lack of healthcare access and history of incarceration.[5]

Recent findings suggest that use of a continuous glucose monitor (CGM) is associated with reductions in HbA1c, average glucose and glycaemic variability.[6 7] CGM usage was also associated with increases in the percentage of time in range and decreases in the percentage of time above range in individuals with diabetes who were treated with either basal insulin and/or non-insulin therapy.[6] These improvements were achieved while patients maintained targets for the percentage of time above range.[6] Not only that, but CGMs have been found to reduce hospital admissions, thereby providing advantages that extend beyond glucose lowering.[8] With extensive potential health benefits, coupled with the fact that CGM devices are now more compact, cost-effective, precise and easier to use, there is increasing enthusiasm for expanding CGM usage across diabetes populations.[9] The American Diabetes Association Standards of Care states, "CGMs can be helpful in improving HbA1c levels in people with diabetes on noninsulin as well as insulin regimens."[10] Despite the potential benefits of CGM devices, significant disparities in diabetes care and outcomes persist, driven by barriers at the system, provider and individual levels.[11]

Understanding these disparities is crucial, as the benefits from wearable devices are currently inequitably distributed, reinforcing existing healthcare inequalities.[11–13] This review seeks to explore disparities present in the utilisation of CGMs, and the lack of comprehensive literature reviews on this topic underscores the need for a thorough exploration. Moreover, identifying potential barriers faced by black and indigenous people of colour could guide research and interventions aimed at enhancing equitable access to and use of these emerging tools for all individuals diagnosed with diabetes, regardless of their racial or ethnic background.

An initial search was conducted within the PROSPERO database, revealing no ongoing or completed systematic reviews or scoping reviews on the topic in question. This scoping review has been registered with Open Science Framework prior to protocol submission.

REVIEW QUESTION

What disparities exist in the utilisation of CGMs among individuals with diabetes in the USA?

Table 1 Population, concept and context framework

Population	Individuals with type 1 or type 2 diabetes
Concept	Disparities and inequities in CGM usage and/or distribution
Context	The USA

CGM, continuous glucose monitor.

FRAMEWORK

Population

This literature review will include research studies that involve individuals from the age of 2 years and older, diagnosed with either type 1 or type 2 diabetes. The selected age corresponds to the minimum age approved for the utilisation of the Dexcom device, aimed at increasing the scope of potentially relevant articles.[14] Individuals who do not have a diagnosis of diabetes will be excluded from this review, as will individuals with rarer or population-specific forms of diabetes such as gestational diabetes, maturity-onset diabetes, latent autoimmune diabetes, etc. Additionally, studies that do not involve human subjects will not be considered for this review of literature. Studies that include CGM users will be included in this literature review, and they will be defined as individuals who were prescribed a CGM device for the management of their diabetes (table 1).

Concept

This literature review will include studies related to the adoption, utilisation and discontinuation of CGMs among groups of individuals with differences in age, gender, socioeconomic status, geographic location, racial or ethnic background. Studies that do not stratify their findings by racial–ethnic demographics cannot contribute to the central objectives of this review and will therefore be excluded. More details on these variables and criteria can be found below in the Methods section (table 1).

Context

This literature review will include individuals living in the USA due to the history of institutional racism and its impact on healthcare delivery and attainment.[15] The USA has a unique set of societal level factors, such as lack of access to affordable healthcare, that sets it apart from other industrialised nations.[16] Finally, this population was chosen due to the cultural familiarity and language proficiency of the study team. These studies will include both urban and rural environments. Studies involving data collection occurring outside of the USA will not be considered (table 1).

Types of studies

This scoping review will encompass a broad range of peer-reviewed study designs including both experimental and quasi-experimental approaches. Observational studies such as retrospective cohort studies, case–control studies and cross-sectional studies will also be incorporated. Qualitative

studies, such as those using interviews and focus groups will further contribute to the evidence synthesis. Additionally, descriptive studies, including case series and case reports, will be included. This review will include studies involving individuals diagnosed with type 1 or type 2 diabetes, published in English, that provide data on CGM utilisation among racial–ethnic groups. Only studies published since 1999 will be considered, as this marks the year the first CGM received United States Food and Drug Administration (FDA) approval for use in the USA.[17] Studies will be excluded if they do not involve individuals with diabetes, lack data on CGM utilisation, fail to stratify data by racial–ethnic group, are not published in English, are conducted outside the USA, are not peer-reviewed or were published before 1999.

METHODS

The scoping review will follow the Joanna Briggs Institute (JBI) methodological framework for scoping reviews, which is a framework that has been refined based on user feedback and experiences centring around population, concept and context.[18] The JBI framework contains guidance for milestones of the scoping review broken down into the following sections: abstract, introduction, methods, results, discussion, funding and other considerations. Each section contains content and criteria relevant to each area of the scoping review.[18] This begins with providing a structured summary, describing the rationale and objectives, registration of the protocol, selection of sources, data charting, synthesis of results, summary of evidence, limitations and conclusion.[18]

Search strategy

A preliminary search in PubMed was conducted to locate articles related to the subject. Keywords and Medical Subject Heading (MeSH) index terms from pertinent articles were employed to devise a comprehensive search strategy in PubMed. The following databases were searched from inception to August 2024: PubMed, SCOPUS and Embase.

Search terms

The search strategy comprises search terms in three concept areas: diabetes, CGMs and disparities. These areas were chosen in order to generate an evidence synthesis that would capture studies that include individuals diagnosed with diabetes who are using glucose monitors. The disparity criteria are included in order to narrow the search to studies that include differences in care. The following is the search developed for PubMed, which will be adapted for use in Embase and Scopus.

1. Diabet* [tiab] OR "Insulin Resistan*" [tiab] OR Hyperglycemi* [tiab] OR Hypoglycemi* [tiab] OR "Glucose Intoleran*" [tiab] OR "Diabetes Mellitus" [Mesh]

AND

2. CGM [tiab] OR "Glucose Monitor*" [tiab] OR "Glucose Sensor*" [tiab] OR "Monitoring Device*" [tiab] OR "Remote Monitor*" [tiab] OR "Non-invasive monitoring" [tiab] OR "Noninvasive monitoring" [tiab] OR Dexcom [tiab] OR Abbott [tiab] OR Medtronic [tiab] OR "Freestyle Libre" [tiab] OR Garmin [tiab] OR "Eversense" [tiab] OR Senseonics [tiab] OR "Continuous Glucose Monitoring" [Mesh]

AND

3. Disparit* [tiab] OR Inequalit* [tiab] OR equit* [tiab] OR racial [tiab] OR race [tiab] OR ethnic [tiab] OR minority [tiab] OR prejudice [tiab] OR bias [tiab] OR discriminat* [tiab] OR divers* [tiab] OR inclus* [tiab] OR "Health Inequities" [Mesh] OR "Social Discrimination" [Mesh] OR "Social Marginalization" [Mesh] OR "Prejudice" [Mesh] OR "Diversity, Equity, Inclusion" [Mesh] OR "Health Services Accessibility" [Mesh] OR "Culturally Competent Care" [Mesh] OR "Bias" [Mesh]

Study selection

A preliminary screening phase will involve the screening of titles and abstracts by at least two independent reviewers to determine eligibility based on the predefined inclusion criteria. Prior to screening, duplicate records will be identified and removed using EndNote V.21 (Clarivate). Following the removal of duplicates, all resulting citations will be uploaded into Rayyan for title/abstract screening.[19] Next, full texts will be screened by two or more independent evaluators to confirm adherence to the inclusion criteria using Covidence.[20] Exclusions at this stage, due to non-compliance with the criteria, will be documented and disclosed in the scoping review. Any discrepancies arising among reviewers during the selection process will be addressed and resolved through discussion and consensus between the two reviewers. If consensus cannot be reached, the medical librarian will be consulted to provide a final determination.

Data extraction

Data will be extracted from studies included in the scoping review by two or more independent reviewers into a shared Excel document. The following data elements will be extracted if available.

Study population data

Age: age of participants.

Sex: sex assigned at birth.

Gender: gender identity of participants.

Socioeconomic status variables: income level, education level, occupation, insurance status, household number and zip code.

SDOH factors: economic insecurity, education access and quality, healthcare access and quality, neighbourhood and built environment and social and community context.

Geographic location: specific state, urban versus rural setting.

Provider type: primary care physician, community health centre, specialist.

Care settings: hospital, specialty clinic, federally qualified health centre, emergency room.

Racial and ethnic background: black non-Hispanic, white non-Hispanic, Hispanic, American Indian/Alaska Native, Asian/Pacific Islander, multiracial, other, unknown.

Diabetes type: type 1 or type 2 diabetes.

Disease duration: how long since participants were diagnosed with diabetes.

Disease status: HbA1c, use of insulin, years of study, complications of diabetes.

Body mass index.

Number of prescribed CGM devices, percentage of prescribed CGM devices.

Presence of comorbid conditions.

Medications.

Study design data

Study design: type of research (randomised control trial, observational study, case study, etc).

Sample size: number of participants.

Study duration: length of time the study was conducted.

Data collection method: techniques used to gather information (surveys, electronic health records, interviews, etc).

Study CGM data

CGM usage: initiation, continued usage, attrition

Duration of CGM usage: how long participants have been using the CGM.

Percentage of CGM usage.

Type of CGM device: brand or model, if specified.

Insulin pump usage.

Study outcome data

Glycaemic control: HbA1c levels, fasting blood glucose, time in range, time above range, time below range and glucose variability.

Psychosocial outcomes: impact on stress, anxiety, depression or quality of life.

Healthcare utilisation: hospital admissions, emergency visits or routine check-ups.

Data analysis

Data will be synthesised using the NIMHD to uncover patterns of CGM utilisation among racial–ethnic groups. The NIMHD facilitates a multilevel examination of the factors influencing CGM initiation, continued use and attrition by integrating individual, interpersonal, community and societal level influences. This comprehensive approach provides a nuanced understanding of the barriers and facilitators shaping CGM usage across diverse populations. Additionally, applying the NIMHD will help identify existing disparities while highlighting gaps in the literature, offering direction for future research and interventions. FM will synthesise the data, which will be reviewed by LJK.

ETHICS AND DISSEMINATION

As this study is a review of previously published literature and does not involve human subjects research, institutional review board approval will not be pursued. Data will be presented in tabular form, accompanied by a narrative summary describing how the results relate to the research question. Data will be organised using the NIMHD framework. The findings will be disseminated through peer-reviewed publications, conference presentations and lay summaries.

Patient and public involvement statement

Patients and the public were not directly involved in the design or development of this protocol. The research question and protocol design were informed by the existing literature on CGM usage and health disparities. The authors plan to ensure that the findings from this protocol are accessible to the communities most impacted by this research.

Contributors All authors were involved in writing the protocol and gave final approval of the submitted and published versions. FM is the guarantor.

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Competing interests PR has received research support from Dexcom. This funding was unrelated to the present study. The authors declare no conflicts of interest.

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

Patient consent for publication Not applicable.

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