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Original Research

The price of health: unveiling the cost of diabetes treatment in Kingdom of Saudi Arabia (KSA); A systematic literature review protocol

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Abstract

Background: Non-communicable diseases (NCDs) place significant financial burdens on individuals, communities, and countries. However, very little information is available regarding the extent of diabetes expenses in the Kingdom of Saudi Arabia (KSA). As far as we are aware, no comprehensive systematic literature review on diabetes cost in KSA has been published yet. **Objective:** The purpose of the analysis is to gather information about the direct and indirect costs of diabetes mellitus in KSA from the literature, examine the techniques employed to estimate costs, and discover potential avenues for further investigation. **Methods:** A systematic literature search will be performed to identify studies that reported the cost of diabetes mellitus in KSA. A rigorous literature search will be conducted using the following academic electronic databases: Scopus, Medline (via PubMed), Cochrane, Springer, Science Direct, and Web of Science. The eligibility criteria employed for the study will encompass the following aspects: examination of peer-reviewed articles in English which were published within the timeframe of 2010 to 2023, articles presenting novel research outcomes regarding the cost of diabetes mellitus, and studies conducted in KSA. To gather the necessary information, data will be extracted in sheets, and the results will be systematically arranged within tables. **Results:** We have reviewed the cost of diabetes mellitus. Extracted articles will be analyzed in the results based on the direct and indirect costs per patient of diabetes mellitus. The papers will be analyzed on the bases of study design, data source, perspective, and the healthcare cost categories. **Conclusion:** Different approaches will be employed to calculate healthcare costs associated with diabetes mellitus.

Keywords: cost; direct cost; Indirect cost; cost of illness; antidiabetic medication; kingdom of Saudi Arabia

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INTRODUCTION

Diabetes mellitus is among the most difficult public health problems due to its high prevalence and extensive morbidity, which affects people, health systems, and entire countries' economies.[1] According to recent estimates, there are 537 million diabetic individuals globally, and 80% belong to LMICs (low- and middle-income countries).[2] Diabetes mellitus is very common in the Middle East due to fast urbanization, high rates

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of obesity, physical inactivity, and smoking.[3] One of the areas with the highest frequency of DM is the Gulf Cooperation Council (GCC), which consists of KSA, Kuwait, Bahrain, Oman, Qatar, and the United Arab Emirates.[4] According to the International Diabetes Federation (IDF) data per area, 8% to 22% of adults in Gulf countries between the ages of 20 and 79 had diabetes.[5] Kuwait had the greatest prevalence of diabetes in the GCC (22%), but KSA had the most deaths from the disease.[5]

The rise of diabetes mellitus has a significant negative impact on the economy as well. The estimated overall direct yearly cost of diabetes-related care in KSA in 2014 was 17 billion Riyals, and the estimated annual public medical healthcare cost for those with diabetes mellitus is ten times that of those without diabetes mellitus.[6,7] The projected cost for diabetes mellitus on the national healthcare system of KSA is estimated to surpass $0.87 billion, without taking into account additional expenses such as productivity losses caused by complications, absenteeism, disability-related unemployment, and premature disease mortality.[8] The opportunity costs of all types of resources utilized to treat diabetes are represented by direct expenses. Hospital inpatient treatment, physician inpatient and outpatient care, emergency room visits, nursing home care, specialist and other professional care, diagnostic tests, prescription medicines, and medical supplies are all included in direct medical costs.[9,10] Productivity losses resulting from illness and mortality are an example of indirect costs.[10] Productivity loss encompasses both lost productivity due to work absences (also known as "absenteeism") and productivity losses from those who continue to work while having diabetes (also known as "presenteeism").[11]

The pressing requirement to tackle the pandemic of NCDs has now become firmly embedded in one of the 17 Sustainable Development Goals (SDGs).[12] SDG 3, asserts the commitment to decrease premature mortality caused by NCDs by 33% and achieve universal health coverage by 2030.[12] Completion of this objective will bring about a decline in the occurrence of NCDs, which has the potential to counterbalance the financial burdens linked to NCDs and foster equitable healthcare affordability.

Poor availability and high drug prices are just two of the many reasons that limit access to medications.[13] To the best of our knowledge, no analysis has been done on the antidiabetic treatment cost in KSA. To offer an overview of the direct and indirect costs of anti-diabetic treatment, a systematic literature review will be done for this study.

Research Questions?

Our research question will address: 1) What is the economic burden of diabetes mellitus in the KSA, including both direct and indirect costs of the treatment?

Rationale

The rationale of this study is to provide a comprehensive and accurate assessment of the quality and outcomes of healthcare services. By treating different subgroups separately and excluding certain data that may introduce bias, the study aims to prevent any misleading or skewed results. The strict selection process, adherence to established norms, and evaluation of study quality using the Newcastle-Ottawa Scale ensure that only high-quality and relevant research is included.

METHOD

Literature review

This systematic review will follow the Preferred Reporting Items for Systematic Reviews (PRISMA) criteria. At PROSPERO, the protocol will be registered.[14]

Data source and search strategy

A thorough review of the literature will be done to find research that provide information on the cost of diabetes treatment in Saudi Arabia. The following academic electronic databases will be used to conduct a thorough literature search: Scopus, Medline (through PubMed), Springer, Cochrane, Science Direct, and Web of Science. Additionally, the reference lists of accepted studies will be checked to find studies that are pertinent. The papers published between January 2010 to August 2023 will be included in this review. The search key terms will be, (diabetes OR diabetic OR type 2 diabetes OR insulin OR glucose) AND (medication OR drug OR pharmaceutical OR therapy OR treatment OR pharmacotherapy) AND (cost OR price OR expense OR expenditure OR economic burden OR financial impact) AND (KSA OR Saudi OR Arabia OR Middle East OR Gulf region) AND (Direct cost OR Direct expenditure) AND (Indirect cost OR Indirect expenditure). We will use various combinations of the above search terms. Two reviewers will independently conduct each search. Included studies will be kept on Endnote reference management software, and Rayyan software will be used to make initial screening selections.

Article Screening

Papers other than English, repetitive articles, and other studies that have been blatantly identified as improper based on the standards of this review will all be removed from the initial round of title and abstract screening. We will take into account quantitative research techniques like case-control, cross-sectional, pre-post, and cohort studies.

All records will be subject to a single reviewer's inclusion screening; 10% of the records will then be subject to a second reviewer's independent screening. Any inconsistencies will be explored to assess the study's applicability and to improve the inclusion standards for the next stages of screening.

Inclusion Criteria

Only primary data results that would reflect genuine economic values and might help policymakers and practitioners in making decisions would be included. Studies that reported Cost of illness, healthcare expenditure, or resource utilization for type 2 Diabetes Mellitus. The analysis will only include original research articles. There will only be English-language studies included. Original research articles published in peer-reviewed publications will be the exclusive focus of the search.

Exclusion Criteria

Reviews, editorials, perspectives, and other media that are not full-text available and did not give the requisite data or any of the findings mentioned as inclusion conditions will be discarded.

Article Evaluation

Any records that are still available will then be subjected to a second round of evaluation, during which two reviewers independently read each record from beginning to end to see if it meets the criteria for inclusion. Any differences will be settled through discussion between the two reviewers, or if required, referred to a third reviewer, similarly to the screening procedure.

Data Extraction

An extraction sheet for data will be created and tested. From each qualifying publication, the following information will be extracted: the study population, the study sites, the costing methodology, and the reported costs in the categories that are made available (hospital care, outpatient consultations, complications care, medications, monitoring supplies, and diagnostic/laboratory tests) (Figure 1). The preliminary findings will be compiled onto a spreadsheet, and abstracts will be checked for papers that qualify. The first stage's chosen publications' abstracts will be examined to assess their applicability. Studies that did not match the inclusion criteria will not be considered at the full-text review stage.

Quality Assessment

The papers will be carefully chosen based on certain norms in order to provide accurate data and avoid bias in the study. The Newcastle-Ottawa Scale (NOS) for non-randomized studies will be used to assess the quality of the included studies.[15] Three factors—selection, comparability between exposed and non-exposed groups, and exposure/outcome assessment—were used by NOS to evaluate the study's quality. The Newcastle-Ottawa Scale, which assesses nine elements across three domains—outcome, selection, and comparability—was used to rate the quality of the studies. Each item was given a risk of bias assessment of high, low, or unclear; each incidence of low risk of bias was worth one point, for a maximum score of nine.[16]

The primary author will examine each article's title and abstract for internal validity and relevance. A second author will independently review subsets of research findings for inclusion and exclusion. The ultimate inclusion of research will be based on agreement among the review panel, and they will each be mentioned with their key features and findings. Any confusion or disagreement regarding the manuscript will be clarified by the review panel through conversation, and a consensus will be established. Instead of conducting a meta-analysis, we will have a narrative overview highlighting the key results and outcome metrics of the included research.

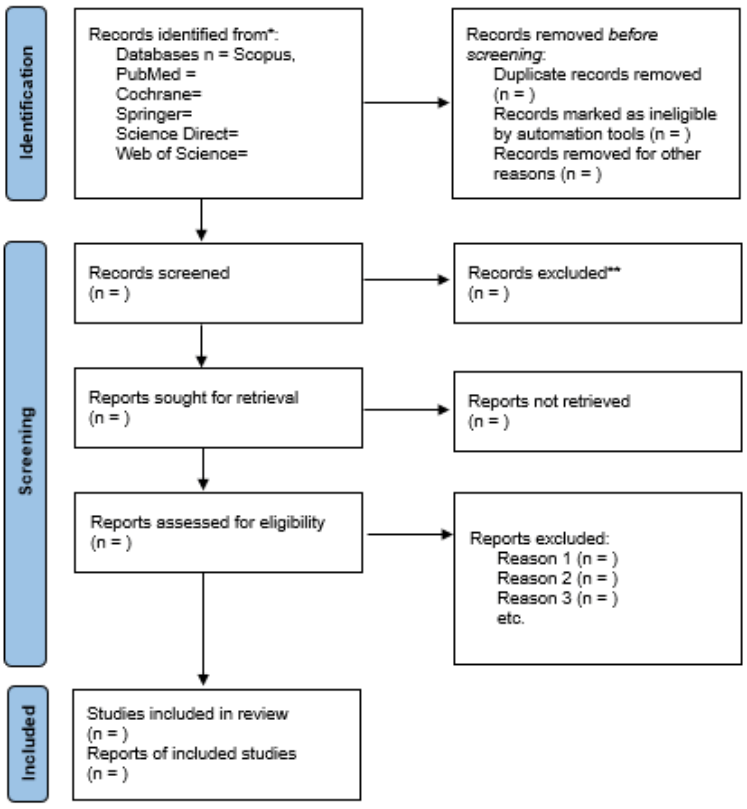

Figure 1. PRISMA flow diagram of studies selection[26]

RESULTS

The healthcare component examined the estimation of both direct and indirect costs differed across the studies (Table 1). Regarding direct cost estimation, the majority of studies encompassed expenses linked to hospital inpatient care, physician services, and medications. In terms of indirect cost estimates, nearly all studies incorporated costs related to absenteeism, and diabetes mellitus related presenteeism. The current cost of Diabetes mellitus for diagnosed patients is 17 billion Riyals per year.[8] According to the results by Ajulifi et al. indicate that the direct costs of diabetes treatment in Saudi Arabia are significant, with annual medical costs varying based on the level of glycemic control (HbA1c levels). The costs increase as the HbA1c levels worsen, indicating the impact of diabetes-associated comorbidities on healthcare expenses. Furthermore, the indirect costs of diabetes, such as absenteeism and presenteeism, contribute to the overall economic burden of the disease. These costs are not directly related to medical expenses but reflect the impact of diabetes on productivity and work performance.[17] Some studies analyzed the cost of diabetes mellitus medication.[7,18] Boutayeb et al. showed the cost incurred by the use of insulin and oral drugs. The cost of insulin amounts to approximately 12% of the total expenses, whereas the range for oral medications lies between 13.64% and 17.28%.[18] Apart from these factors, direct costs also include the physician counselling. Poor awareness and the restricted availability of diabetic education programs have been recognized as barriers to attaining improved treatment results, according to another prospective descriptive and comparative study. Participants who understand the significance of a low-sugar diet and exercise typically achieve better HbA1c levels than those who do not. Participants who thought a low-sugar diet had an effect on blood sugar levels had a mean HbA1c of 7.04, while those who did not think it had an effect had a mean HbA1c of 7.98.[19] Similarly, participants who believed in the importance of exercise had a mean HbA1c of 7.11, whereas those who did not believe in its effect had a mean HbA1c of 7.57. These findings indicate that increasing awareness about the benefits of a low-sugar diet and exercise may lead to better HbA1c results in individuals with diabetes. By educating and encouraging individuals to adopt a healthy lifestyle, healthcare providers can potentially help them achieve better blood sugar control. Indirect costs of diabetes mellitus are studies in various studies.[19-21] According to Finkelstein et al. KSA have the lowest absenteeism cost, representing only 0.4% of their respective Gross domestic product (GDPs). When it comes to presenteeism, KSA have the lowest presenteeism cost, standing at 2.0% of their GDPs. The modelling conducted for the study by Rasmussen B et al.[22] reveals that the economic consequences of absenteeism and presenteeism, will encompass 4-7% of GDP by 2030. Additionally, early retirement due to ill health will amount to 3-4% of GDP, resulting in an overall productivity impact of 6-10% of GDP. KSA is projected to bear the highest economic cost at 9.7%.

DISCUSSION

This is the first protocol which attempts to estimate the direct and indirect costs of Diabetes millets in KSA. Diabetes's growing threat has been a top concern for KSA.[23] Diabetes will continue to be prevalent in KSA as a result of rapid cultural and social change, including aging populations, altered diets, rapid urbanization, lack of regular exercise routines, obesity, and sedentary lifestyles.[4] This article's main goal is to review expenditures for both direct and indirect costs of diabetes mellitus from published literature. The reported cost elements in the current study will be indirect cost items (loss of wage, spending on health class, and travel expenditures) and direct cost items (expenditure on medicines, diagnostic expenses, transportation cost, hospitalization, and consultation fee). Multifaceted policy and program approaches by numerous stakeholders (including the government, payers, and pharmaceutical companies), such as effective resource allocation, decentralization of health care, patient assistance programs, special marketing arrangements, and the granting of mandatory licenses for procurement, will enable equitable access to effective and affordable diabetes mellitus treatment.[24]

In most cost of illness research, indirect costs typically make up a sizable fraction of total expenses.[10] These findings will provide valuable insights into the cost of diabetes mellitus medication in KSA and contribute to the understanding of the economic burden associated with this condition in the country. These findings will shed light on the diverse range of costs associated with diabetes mellitus medication in KSA. The variations in medication costs highlight the importance of considering different factors such as country-specific healthcare systems,

Table 1. Component of direct and indirect cost for diabetes mellitus

Study	Hospital inpatient	Physician services	Drugs	Laboratory tests	Absenteeism	Presenteeism
Aljulifi MZ et al[17]	✓					
Mokhtar SA et al. [25]	✓	✓	✓	✓	✓	✓
Alomar MJ et al.[19]		✓	✓			
Finkelstein EA et al. [21]	✓	✓	✓	✓	✓	✓
Mokdad AH et al. [7]	✓		✓	✓		
Boutayeb A et al. [20]			✓		✓	✓
Alhowaish AK et al.[6]			✓		✓	✓
Rasmussen B et al[22]			✓	✓	✓	✓

availability, and pricing policies when assessing the economic burden of diabetes treatment.

CONCLUSION

In conclusion, this systematic literature review protocol aims to address the direct and indirect cost of diabetes mellitus medication in KSA. We seek to assemble thorough data on the price of diabetic mellitus medications in KSA through a thorough search across numerous academic electronic databases and screening the reference lists of qualifying research. The results of this study will highlight the substantial financial burden that families and individuals bear because of the expensive drugs for diabetes mellitus. This study will help us comprehend the economic effects of diabetes mellitus in KSA and may help us make decisions about how to improve access to reasonably priced diabetic treatments**.**

The impact on practice

- Overall, the findings will emphasize the significant economic burden of diabetes mellitus in KSA, both in terms of direct healthcare costs and indirect costs related to productivity.
- It will underscore the need for effective prevention, management, and education strategies to mitigate the impact of diabetes on individuals and the healthcare system.
- By addressing these challenges, policymakers and healthcare providers will work towards reducing the economic burden and improving the overall well-being of individuals with diabetes in KSA.

AUTHOR CONTRIBUTIONS

We declare that all authors, have made substantial contributions to the conception, design of the work; the acquisition, analysis, interpretation of data, drafted the work, revised it critically for important intellectual content; approved the version to be published; and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

DECLARATIONS

SUPPORT SOURCES:

There is no any financial support or funding for this protocol of systematic review.

SPONSOR:

There is no any funder or sponsor for this protocol of systematic review.

ROLE OF FUNDER, SPONSOR AND/OR INSTITUTION:

There is no any funder, sponsor or institution for this systematic review.

CONFLICTS OF INTEREST/COMPETING INTERESTS:

No conflicts of interest or competing interests.

ETHICS APPROVAL:

Ethics approval not required for this type of protocol.

PROSPEROUS REGISTRATION:

Submitted for registration.

CONSENT TO PARTICIPATE:

Not applicable.

CONSENT FOR PUBLICATION:

We declare our consent for the publication of our article.

AVAILABILITY OF DATA AND MATERIAL (DATA TRANSPARENCY):

There was no any associated data.

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