

REVIEW ARTICLE

Health System Financing Effect on The Outcome of Diabetes Management in Low-Middle Income Countries: A Systematic Review

Alif Ramli¹, Adora Muiyou¹, Abraham Chiu En Loong¹, Ahmad Nabeil Alias¹, Ramalingam Thulasiraman¹, Azimatun Noor Aizuddin², Adriyan Pramono⁴, Abdul Rahman Ramdzan^{1,3*}

¹ Department of Public Health Medicine, Faculty of Medicine & Health Sciences, Universiti of Malaysia Sabah, Jalan UMS, Kota Kinabalu 88400, Malaysia.

² Department of Community Health, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur 56000, Malaysia.

³ Health Economic Evaluation Research (HEER) Group, Universiti of Malaysia Sabah, Jalan UMS, Kota Kinabalu 88400, Malaysia.

⁴ Department of Nutrition, Faculty of Medicine, Diponegoro University (UNDIP), 50275 Kota Semarang, Indonesia

*Corresponding author's email:
abdul.rahman@ums.edu.my

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ABSTRACT

Background: Diabetes continues to rise sharply in low- and middle-income countries (LMICs), where fragmented health system financing contributes to poor clinical outcomes and heightened financial vulnerability. Updated global estimates indicate that 537 million adults were living with diabetes in 2021, with 81% residing in LMICs, and the number is projected to reach 643 million by 2030 (International Diabetes Federation, 2021). Understanding how financing models influence diabetes management outcomes is critical to advancing universal health coverage (UHC). **Objective:** To systematically review the effect of health system financing mechanisms on diabetes management outcomes including awareness, treatment, adherence, and glycemic control in LMICs. **Methods:** This systematic review followed PRISMA 2020 guidelines. Searches were conducted in PubMed, Scopus and SpringerLink for studies published from 2011–2021. Eligible studies included adult populations in LMICs, examined financing models and reported diabetes management outcomes. Two independent reviewers performed screening, extraction, and quality appraisal using the Joanna Briggs Institute checklist. **Results:** From 1,463 records screened, 10 studies met the inclusion criteria. Most studies reported high OOP spending as a major barrier to diabetes care, contributing to catastrophic health expenditure, poor treatment adherence, and delayed diagnosis. In contrast, insurance-based and subsidized



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financing models were associated with better medication affordability, improved follow-up, and higher treatment uptake, though service-level constraints such as limited primary care capacity continued to impede optimal outcomes. Themes identified included (i) financial access and affordability, (ii) care continuity and treatment adherence, and (iii) system readiness and primary care availability.

Conclusion: Health system financing strongly shapes diabetes management outcomes in LMICs. Heavy reliance on OOP payments undermines adherence, early diagnosis, and continuity of care, whereas pooled financing mechanisms improve access and reduce financial hardship. Sustainable, equitable financing reforms aligned with strengthened primary care systems are essential for improving diabetes outcomes in LMICs.

INTRODUCTION

Background

The administrative and managerial capacities, organizational structures, and processes necessary to finance and deliver health services more economically, effectively, and equitably are all covered under public health management for public health leaders (USAID, 2021). Health system financing is a critical component of health-care systems that can help move populations closer to universal health coverage by enhancing service coverage and financial security (WHO, 2022). Currently, millions of individuals are unable to use services given the high cost and even when they pay out of pocket, many others receive inadequate care (WHO, 2022). Health system financing strategies that are carefully planned and executed can assist to solve these difficulties.

Diabetes is a chronic disease that has expanded across the globe in past few decades, not just in high-income countries (HICs), but also in numerous low- and middle-income countries (LMICs). According to the International Diabetes Federation (IDF),

diabetes afflicted 382 million people globally in 2013, with that figure anticipated to rise to 592 million by 2035 (International Diabetes Federation, 2013). In 2013, the projected global prevalence among persons aged 20–79 years was 8.3 percent, with the world's two most populous nations, India and China, achieving prevalence rates of 9 and 10%, equal to 65 and 100 million people in total numbers, correspondingly (International Diabetes Federation, 2013). The International Diabetes Federation (2021) estimates that 537 million people globally were living with diabetes in 2021, with LMICs bearing more than four-fifths of the burden. Epidemiological transitions, urbanisation, dietary shifts, and sedentary lifestyles have contributed to this rising trend (Hu, 2011). Type 2 diabetes is the most common type of diabetes, involving over 90% of persons with diabetes, with the remainder 10% having type 1 diabetes or gestational diabetes (International Diabetes Federation, 2013).

Diabetes exerts an economic burden on individuals and households affected, as well as healthcare systems, due to its negative impact on people's health. Ettaro et al. validated the economic burden of diabetes in a review of cost-of-illness (COI) studies on diabetes mellitus published in 2004, which included the literature up to the year 2000 (Ettaro et al., 2004). The authors found that diabetes has a "significant" direct and indirect economic impact, and that expenses have risen over time. However, the assessment found that major differences in costing methodology made direct comparisons of cost estimates nearly difficult. The research evaluated by Ettaro et al., on the other hand, were nearly entirely focused on the United States, with just a few from European HICs and none from LMICs (Ettaro et al., 2004).

The purpose of this study is to conduct a comprehensive assessment of the literature on the health system financing effect on the outcome of diabetes management in LMICs

published since 2011, as we anticipate many new studies, including those from LMICs. There is an information gap on the effectiveness of diabetes management in LMICs, which is due in part to the heterogeneity of healthcare financing (Gupta & Ayles, 2019). We conducted a systematic review of the literature to see how health system financing influences diabetes outcomes in LMICs.

METHODS

This systematic review adhered to PRISMA 2020 reporting guidelines. The review question was framed using the PICO framework:

- Population (P): Adults with diabetes in LMICs
- Intervention (I): Health system financing models (OOP payments, health insurance, pooled financing)
- Comparison (C): Usual care or alternative financing mechanisms
- Outcome (O): Diabetes management outcomes (awareness, treatment uptake, medication adherence, glycemic control)

Search Strategy:

Searches were conducted in PubMed, Scopus, and SpringerLink for studies published January 2011–December 2021. Search terms included combinations of:

- “health financing”, “out-of-pocket”, “catastrophic expenditure”, “insurance”
- “diabetes”, “diabetes management”, “treatment adherence”, “glycemic control”
- “low- and middle-income countries”, “LMICs”

Reference lists of included studies were screened manually. Only English-language full-text studies were included.

Eligibility Criteria:

We included original research articles (quantitative, qualitative, or mixed methods) conducted in LMICs that reported associations between health system financing and diabetes management outcomes. Reviews,

commentaries, studies focused exclusively on complications or subgroups and studies without extractable financing data were excluded.

Inclusion criteria:

- Conducted in countries classified as LMICs by the World Bank
- Focused on adults with diabetes
- Reported a financing mechanism and its association with diabetes outcomes
- Original research (quantitative, qualitative, or mixed methods)

Exclusion criteria:

- Review articles, editorials, conference abstracts
- Studies focused solely on complications, small subgroups, or cost-of-illness without linking to diabetes outcomes
- Non-English articles

Study Selection and Data Extraction:

After removal of duplicates, two independent reviewers screened titles and abstracts. Full texts of potentially relevant articles were assessed for eligibility. Disagreements were resolved by consensus or consultation with a third reviewer. Data were extracted using a standardized form, capturing study characteristics, financing model, and diabetes outcomes.

Quality Assessment:

The methodological quality of included studies was assessed independently by two reviewers using the Joanna Briggs Institute (JBI) critical appraisal tools. Discrepancies were discussed with a third reviewer.

Study Flow:

The search identified 1,463 records. After screening, 128 full-text articles were assessed for eligibility, of which 10 studies met the inclusion criteria and were included in the final synthesis (Figure 1).

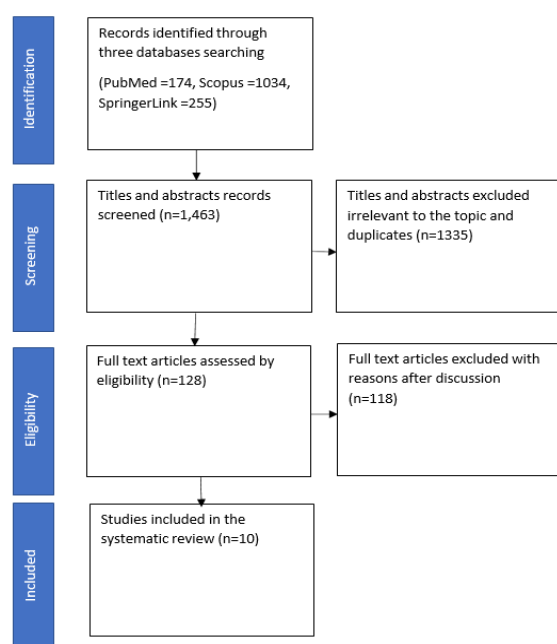


Figure 1: PRISMA flowchart of Health system financing effect on the outcome of diabetes management in low-middle income countries based PRISMA Preferred Reporting Items for Systematic Reviews and Meta-Analyses (Moher et al., 2009).

RESULTS

Characteristics of Included Studies

The 10 included studies spanned Asia, Latin America, Eastern Europe, and global LMIC datasets. Most used cross-sectional or cohort designs and examined OOP expenditure, insurance schemes, or national health financing mechanisms. Further extracted information included the year of publication, the country or region studied, study source, study design, sampling population and model of provider payment mechanism (PPM) as well as information of method of research (qualitative or quantitative) as shown in table 1.

The major findings were the model of health system financing i.e., health insurance and out-of-pocket (OOP) payments, whilst the major outcomes were disparities of economic burden due to low socio-economic status and catastrophic spending as shown in table 2. Across the ten included studies,

several consistent themes emerged regarding the influence of health system financing on diabetes management in LMICs. A major finding was the significant financial burden imposed by out-of-pocket (OOP) payments, which often resulted in catastrophic health expenditure and constrained access to essential diabetes care. Studies from Bangladesh and Pakistan demonstrated that high OOP medication costs forced households to reduce clinic visits, delay diagnosis, or forego treatment altogether (Datta et al., 2018; 2019; 2020; Harris et al., 2019). These financial barriers directly affected treatment adherence and continuity of care, with low-income and uninsured individuals showing higher rates of medication non-adherence and irregular follow-up compared to insured populations (Smith-Spangler et al., 2012).

Insurance-based or subsidised financing models, such as those implemented in Moldova, improved the affordability of medicines and supported sustained care, though their effectiveness was moderated by persistent system-level limitations (Ferrario et al., 2016). Service readiness emerged as another key theme, as health systems in several LMIC contexts lacked adequate staffing, diagnostic capacity, and reliable medication supply chains, leading to inconsistent monitoring and suboptimal control of blood glucose and related risk factors (Cardenas et al., 2016; Gakidou et al., 2011). Finally, disparities in socioeconomic status strongly influenced diabetes outcomes, with poorer households bearing a disproportionate share of OOP expenditure and experiencing greater financial hardship, ultimately deepening pre-existing health inequities (Arredondo & Reyes, 2013). Together, these themes illustrate how financing mechanisms and the broader system capacities that support them will shape the accessibility, continuity, and equity of diabetes management in LMICs.

DISCUSSIONS

Table 1: Study characteristics of reviewed literature

No	Author, Year	Database Source	Study site	Study design	Sampling Population
1	(Liu et al., 2013)	SpringerLink	China	Modelling (Quantitative)	Type 2 diabetes patients
2	(Harris et al., 2019)	SpringerLink	Malaysia (Coastal villages in Semporna)	Cross sectional (Mixed method)	Respondents above 18 years old
3	(Arredondo & Reyes, 2013)	PubMed	Mexico	Cross sectional (Quantitative)	Diabetes patients
4	(Biplab K. Datta et al., 2020)	Scopus	Pakistan	Cohort (Quantitative)	Pakistan households
5	(Biplab Kumar Datta et al., 2019)	Scopus	Pakistan	Cross sectional (Mixed method)	Pakistan households
6	(Biplab Kumar Datta et al., 2018)	Scopus	Bangladesh	Cross sectional (Quantitative)	Household with NCD
7	(Ferrario et al., 2016)	Scopus	Moldova	Cohort (Quantitative)	NCD
8	(Cardenas et al., 2016)	Scopus	Peru	Cross sectional (Mixed method)	Type 2 diabetes patients
9	(Smith-Spangler et al., 2012)	Scopus	LMICs	Cohort (Quantitative)	Type 2 diabetes patients
10	(Gakidou et al., 2011)	Scopus	Global	Cohort (Quantitative)	Type 2 diabetes patients

Table 2: Health system financing model and outcome

No	Author, Year	Model of health system financing	Outcome
1	(Liu et al., 2013)	OOP	Patients may still be unwilling to pay the costs.
2	(Harris et al., 2019)	Global budget and OOP	Semporna has two publicly funded health clinics where such health checks are available for a minimal payment. However, access to health clinics for NCD detection in this rural coastal community might have been a challenge. The cost of access to health checks at private clinics is beyond the reach of most individuals in this rural coastal community.
3	(Arredondo & Reyes, 2013)	OOP more than Public Health Insurance	Diabetes care in Mexico is distributed in the following way: 48% of the population is taken care of by social security institutions; 42% by institutions that serve the uninsured; and 10% of the population uses private care institutions. There are disparities of economic burden of diabetes in Mexico.
4	(Biplab K. Datta et al., 2020)	OOP	Expenditures are associated with crowding out of food and crowding in of other medical expenditures for all households, but the magnitudes of crowding out and crowding in are larger for the poorer households.
5	(Biplab Kumar Datta et al., 2019)	OOP	Medication cost for managing two major NCDs and household catastrophic health expenditure have strong associations. The findings inform policies toward ensuring access to necessary healthcare services and protecting households from NCD treatment related financial hardship.
6	(Biplab Kumar Datta et al., 2018)	OOP (63%), Government global budget (26%), Private health insurance (1%), NGO (10%)	Household with NCDs have 6.7% points higher probability of incurring catastrophic medical expenditure than household without NCD. OOP for NCD related health expenditure is associated with financial distress and worsening poverty in Bangladesh.
7	(Ferrario et al., 2016)	National health insurance	Affordability of subsidized medicines improved over time. More funds need to be (re-) allocated to strengthening primary care to manage chronic conditions and raise population awareness.
8	(Smith-Spangler et al., 2012)	Health insurance and OOP	Diabetic individuals experience differentially higher OOP medical spending, particularly among individuals with high levels of spending and a greater chance of incurring catastrophic medical spending compared with otherwise similar individuals without diabetes.
9	(Cardenas et al., 2016)	Health insurance	Low political commitment, as well as several barriers that directly affect access to medicines, regular laboratory check-ups and follow-up appointments for diabetes, especially at the primary healthcare level. Three major system-level barriers were identified: (1) the availability of information at different healthcare system levels that affects several processes in the healthcare provision; (2) insufficient financial resources; and (3) insufficient human resources trained in diabetes management.
10	(Gakidou et al., 2011)	Health insurance	There are many missed opportunities to reduce the burden of diabetes through improved control of blood glucose levels and improved diagnosis and treatment of arterial hypertension and hypercholesterolaemia. While no large socioeconomic inequalities were noted in the management of individuals with diabetes, financial access to care was a strong predictor of diagnosis and management.

This review demonstrates that health system financing substantially influences diabetes management outcomes in LMICs. The reliance on OOP payments is a major contributor to delayed diagnosis, poor treatment adherence, and inadequate glycemic control—core diabetes management outcomes. These findings are consistent with global evidence that financial barriers undermine chronic disease management (Seuring et al., 2015; Ong et al., 2018).

Insurance-based or pooled financing models showed benefits including improved affordability of essential medicines and better continuity of care. For example, Moldova's national insurance reforms increased affordability and access to diabetes medicines (Ferrario et al., 2016). Similarly, insured diabetic individuals in multi-country analyses had lower OOP spending and improved treatment uptake (Smith-Spangler et al., 2012).

However, financing mechanisms alone were insufficient. Persistent challenges such as limited primary care capacity, human resource shortages, and weak supply chains continued to impede treatment adherence and diabetes control (Cardenas et al., 2016; Harris et al., 2019). This echoes broader LMIC literature emphasizing that financing reforms must be integrated with system strengthening. Importantly, OOP expenditure while a financial measure is directly tied to diabetes management outcomes. Catastrophic spending reduces the likelihood of individuals purchasing medications, attending regular follow-ups, or accessing diagnostic services, thus impairing adherence and glycemic control. Thus, the findings reaffirm that financing mechanisms operate as upstream determinants of diabetes management outcomes, directly influencing the PICO-specified outcomes.

Study limitations

This review has several limitations. Most included studies were cross-sectional, limiting

causal inference. Outcome definitions varied across studies, restricting the ability to conduct meta-analysis. Geographic coverage was uneven, with fewer studies from Africa and Latin America. Restricting to English-language publications may have omitted relevant evidence. Despite these limitations, consistent patterns across diverse LMIC contexts strengthen the validity of the findings.

Recommendation

Reducing reliance on OOP payments should be a priority, as these expenditures consistently undermine diabetes treatment adherence and continuity of care. Expanding pooled financing mechanisms such as social health insurance or tax-funded schemes would enhance financial protection and promote equitable access to diabetes services. Financing reforms must be aligned with efforts to strengthen primary healthcare, improve supply chains for essential medicines, and support training and retention of healthcare workers. Governments should also invest in robust, context-specific research, including longitudinal analyses and economic modelling, to guide financing reforms. Aligning financing policies with system strengthening will improve diabetes outcomes and advance progress toward UHC.

CONCLUSIONS

Diabetes management outcomes in LMICs are strongly shaped by health system financing. Heavy reliance on OOP payments contributes to catastrophic health expenditure, reduced adherence, and delayed diagnosis, while pooled financing mechanisms improve access and affordability. Sustainable financing reforms, integrated with strengthened primary care, essential medicines provision, and health workforce capacity, are essential for improving diabetes outcomes. As LMICs strive toward UHC, diabetes care should serve as a priority tracer for evaluating financing reform progress.

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APPENDIX

JBI CRITICAL APPRAISAL CHECKLIST FOR SYSTEMATIC REVIEWS AND RESEARCH SYNTHESSES

No	Question	Article									
		Liu et al., 2013	Harris et al., 2019	Arredondo & Reyes, 2013	Biplab K. Datta et al., 2020	Biplab Kumar Datta et al., 2019	Biplab Kumar Datta et al., 2018	Ferrario et al., 2016	Cardenas et al., 2016	Smith-Spangler et al., 2012	Gakidou et al., 2011
1	Is the review question clearly and explicitly stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Were the inclusion criteria appropriate for the review question?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Was the search strategy appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Were the sources and resources used to search for studies adequate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	Were the criteria for appraising studies appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Was critical appraisal conducted by two or more reviewers independently?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	Were there methods to minimize errors in data extraction?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	Were the methods used to combine studies appropriate?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	Was the likelihood of publication bias assessed?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	Were recommendations for policy and/or practice supported by the reported data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	Were the specific directives for new research appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

NA – Not Applicable