REVIEW ARTICLE

Navigating NCDs' Self-Management: A Comprehensive Review of Barriers & Facilitators in LMICs through Quantitative and Qualitative Lenses

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ABSTRACT

Introduction: Despite significant global and national investments in health, primarily aimed at primary and preventive measures, progress in alleviating toll of non-communicable diseases (NCDs) remains sluggish in low- and middle-income countries, hindering the achievement of Sustainable Development Goals by 2030. This review intends to elucidate the barriers and facilitators affecting self-management of NCDs and their determinants, with purpose of informing the development of more accessible and practical preventive strategies.

Methods: An extensive electronic literature search was conducted across PubMed, PsycINFO, CINAHL, and Scopus for studies published between 2013 to June 2024, resulting in total of 78 included studies: 56 quantitative, 20 qualitative, and 2 mixed-methods.

Findings: The synthesis of findings across these studies identified critical factors influencing NCDs' self-management. The quantitative analysis highlighted 31 factors grouped into five main determinants: socio-demographic, psychosocial, behavioural, biological, resource-related, and health-system-related. Notably, increased age and educational attainment correlated positively with self-management compliance, while barriers such as forgetfulness and misconceptions negatively impacted adherence. The qualitative review identified 21 sub-themes under five broad themes, emphasizing personal challenges, financial limitations, environmental factors, social stigma, and issues with health providers.

Conclusion: Together, these insights reveal the multifaceted challenges of self-management and necessity for tailored interventions.

Key words: Self- Management, Non-Communicable diseases, Low-Middle-Income- Countries

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INTRODUCTION

Non-communicable diseases (NCDs) are a major global health issue, especially in low- and middle-income countries (LMICs), causing 41 million deaths annually, 77% of which occur in these regions. Cardiovascular diseases are the leading cause, responsible for 17.9 million deaths each year.[1] The rise of NCDs in LMICs is linked to factors such as urbanization, aging populations, and shifts in diet and lifestyle, with metabolic syndrome being a key risk factor. Additionally, LMICs face the challenge of addressing both increasing chronic disease rates and ongoing infectious disease burdens amid struggling health systems.[2-5]

The rising NCDs rates in LMICs are largely due to preventable lifestyle factors like tobacco use, poor diet, and inactivity, but must also be viewed in the context of globalization, economic shifts, industrialization, and urbanization. Limited healthcare access complicates early detection and management of these diseases.[6]

Addressing NCDs is a critical global health priority, with Sustainable Development Goal (SDG) 3.4 targeting a one-third reduction in premature NCD mortality by 2030.[7] Aligned with this goal, the WHO's Global Action Plan 2013–2020 provides a strategic framework for combating NCDs.[8] This framework advocates a multidisciplinary approach to tackle the complex interactions among individuals, communities, and their environments using innovative strategies beyond traditional healthcare. It emphasizes a shift towards primary and preventive care to reduce modifiable risk factors, with a focus on empowering individuals to actively manage their health behaviours in collaboration with healthcare providers.[9]

Community-wide measures to address risk factors can significantly reduce the burden of NCDs. High-income countries have focused on supporting individual self-management to enhance disease prevention and health outcomes, with primary healthcare targeting modifiable risk factors as an effective prevention strategy.[10-12] However, only 14 countries are on track to meet the SDG goal of reducing premature NCD deaths by one-third by 2030.[13] In LMICs, the effectiveness of self-management strategies is limited by various barriers, and successful self-management relies on collaboration among individuals, families, communities, and healthcare providers, influenced by factors like perceived disease susceptibility.[14-16]

Despite these insights, self-management of chronic diseases remains suboptimal in LMICs,[17,18] highlighting the need for targeted interventions. Despite recent progress in understanding these influences, no comprehensive reviews have synthesized their relative importance in LMICs. This review aims to summarize barriers and facilitators of NCD self-management in LMICs to inform future research and intervention strategies.

METHODOLOGY

Data search strategy:

The authors conducted a comprehensive electronic literature search across several databases, including PubMed, PsycINFO, CINAHL, and Scopus, targeting studies published from 2013 to June 2024 in English. The search also encompassed grey literature from sources such as Google Scholar, Google, and various health organization websites. Additionally, the reference lists of relevant studies obtained through the electronic search were reviewed to include pertinent articles in the review. A thorough search utilized MeSH terminology and specific keywords, including "Self-Management," "Self-Care," "NCDs," "Diabetes Mellitus," "COPD," "Asthma," "Cardiovascular," "Risk Reduction," "LMICs," "Chronic Diseases," and "Medicine Adherence." Boolean search operators were applied as appropriate in the databases mentioned.

Selection criteria:

The authors systematically screened, evaluated, and selected relevant studies based on predefined inclusion criteria. The contributors incorporated primary quantitative, qualitative, & mixed-method studies focusing on self-management adherence for major non-communicable diseases (NCDs) and their key risk factors, specifically Type 2 Diabetes Mellitus, Hypertension, COPD, Asthma, & Stroke, conducted in LMICs as classified by the World Bank. Our analysis utilized the list of self-management behaviours defined by the American Diabetes Association, which encompasses “healthy eating, monitoring, physical activity, medication adherence, risk reduction, healthy coping, and problem-solving.” Additionally, we excluded studies that examined self-management as an intervention and those focused on other chronic diseases, such as heart failure, multiple sclerosis, cancer, and depression, as their self-management behaviours differ significantly from the criteria being used in this study.

Data Extraction & Data Synthesis:

Our initial search identified 19,547 potential sources through electronic databases and reviews of references and grey literature. Figure 1 illustrates the process of our literature search. After eliminating duplicates and studies not focused on LMICs, we screened 2,308 titles and abstracts. Of these, 107 were advanced to full-text review. Two reviewers independently assessed each study for eligibility, with any conflicts resolved by a third author to ensure consensus.

Data synthesis was conducted using Narrative approach based upon study design, as statistical analysis was not feasible. Ultimately, 78 articles were incorporated in the final review, & Figure 1 illustrates complete search and screening process in accordance with the PRISMA 2009 framework.

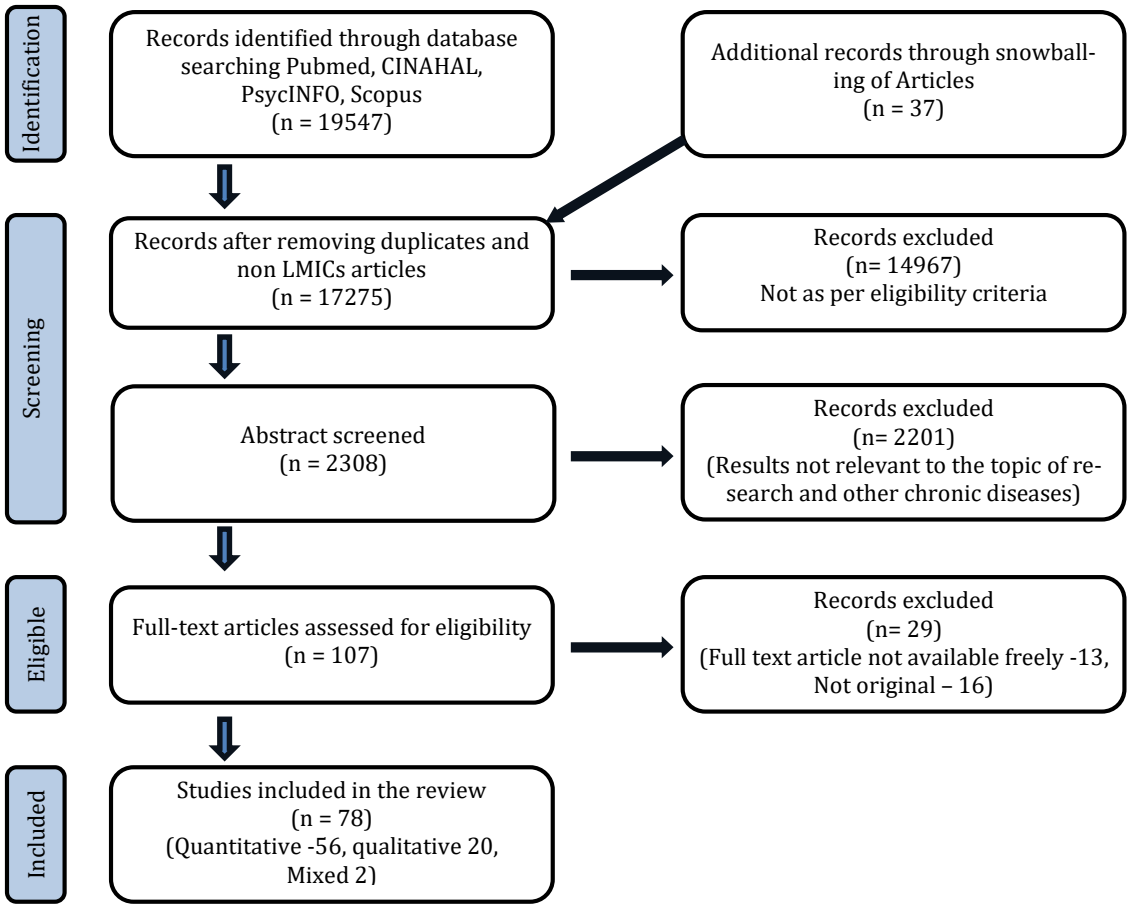

Figure 1: Search and Screening procedure following PRISMA Framework 2009

RESULTS

Out of the 78 articles reviewed, 56 were quantitative studies, all employing a cross-sectional design Additionally, 20 studies were qualitative descriptive in nature, and only 2 employed a mixed-methods approach (Table numbers: 1-6).[19-96] The studies were sourced from 19 LMICs as classified by the World Bank. The majority of research was conducted in India, with a total of 26 studies (20 quantitative and 6 qualitative), followed by Pakistan with 9 studies (5 quantitative and 4 qualitative). Nepal and Bangladesh had 7 and 6 studies, respectively. In the remaining countries, only 1 to 3 studies were identified.

The research predominantly focused on participants with type 2 diabetes mellitus (28 quantitative, 13 qualitative, 2 mixed-methods), followed by hypertension (20 quantitative and 3 qualitative). Studies involving asthma and COPD totalled 8, while research on both diabetes mellitus and hypertension was limited to 2 studies. Only one study addressed stroke, and one qualitative study (Rawal LB, 2019) specifically explored the perspectives of healthcare professionals on the challenges of self-management of NCDs.

Results from reviewed quantitative studies: A total of 31 factors influencing self-management were identified, categorized into five primary determinants: **Socio-Demographic Determinants:** These contained age (n=18), education (n=13), gender (n=12), income (n=12), marital status (n=2), family type (n=2), occupation and work-related factors (n=4), and urban or rural setting (n=3). **Psychosocial Determinants:** Factors in this category comprised concerns about side effects (n=10), forgetfulness (n=9), health-related knowledge (n=9), attitudes and beliefs (n=7), social support (n=6), motivation and coping skills (n=4), and the perception that absence of symptoms equates to no disease (n=3). **Behavioural and Biological Determinants:** This group included substance abuse such as alcohol or smoking (n=4), co-morbidities (n=6), and disease-related factors, including the duration of illness and complications (n=14). **Resource-Related Determinants:** Factors under this category involved the cost and availability of medication (n=12), medical devices (n=2), and insurance coverage (n=2). **Health-System-Related Determinants:** This encompassed relationships with healthcare providers, and their qualifications (n=11), and preferences for alternative medicine (n=3), access to healthcare services (n=1).

Socio-Demographic Determinants: An increased age was positively correlated with higher self-management compliance, as evidenced by 14 studies. In contrast, only five studies indicated that younger individuals with formal training demonstrated superior self-management. Education generally had a favourable impact on self-management, with nine

studies affirming this association; however, one study reported no effect,[26] and three studies found a negative correlation with self-management.[36,62,73] Additionally, education was linked to improved dietary control.[23,34]

Regarding gender, among the 12 studies reviewed, six reported higher compliance among females, while six studies indicated greater compliance among males. Notably, two studies found that men engaged in more exercise behavior.[23,27] The influence of marital status and family structure on dietary compliance and self-management was highlighted in four studies, which indicated that being married, widowed, or part of a joint family affects compliance especially dietary.[34,36,53,71] Urban residents, as reported by three studies, exhibited better self-management. [45,49,57] Government employment[69] and non-smoking requirements in the workplace[26] were associated with better self-management, while high job demands were linked to poorer compliance.[25,52]

Psychosocial Determinants: Fear of side effects was cited as a reason for non-compliance by participants in eight studies, while one study attributed non-compliance to previous side effects.[54] Similarly, one study revealed that lack of side effects led to increased compliance.[55] Forgetfulness emerged as a significant factor contributing to poor self-management, as highlighted by nine studies. Additionally, nine studies demonstrated a positive correlation between knowledge about diseases, including health education and training, and improved self-management. Two studies noted that religious beliefs positively influenced compliance by promoting non-smoking and reduced alcohol consumption.[26,39]

Conversely, four studies reported that misconceptions about disease severity, self-perceived health-status, & false sense of well-being control negatively impacted compliance.[46, 36,45,19] A careless attitude also contributed to poor self-management, according to one study.[40] Four studies identified a lack of motivation, low self-efficacy, diminished control over one's locus of control, and perceived barriers as factors affecting self-management adversely.[51,71,67,63] Family support was positively associated with better compliance, as reported by six studies. The belief that the presence of no symptoms signifies the absence of disease was associated with reduced compliance.[24,50,51]

Behavioural and Biological Determinants: Four studies indicated that participants who were alcoholics or smokers exhibited poorer self-management.[50,56,57,70] Findings from six studies revealed that the presence of co-morbidities and increased severity were associated with reduced compliance. The impact of disease duration on compliance yielded mixed results: four studies demonstrated that longer duration correlated with improved compliance,[40,42,60,64] while four studies found the opposite.[28,49,53,63]

One study found that shorter disease duration was linked to lower compliance,[27] and another study reported that shorter duration corresponded with higher compliace.[64] Additionally, four studies noted that disease complications, which often require additional medication, were associated with poorer compliance.[48,49,58,70.]

Resource-Related Determinants: Eight studies identified that the cost of medications was associated with poor compliance. In addition, Three studies highlighted that the unavailability of drugs contributed to poor self-management.[54,58,64] Conversely, one study found that access to free medications improved compliance,[40] although two studies reported the opposite effect.[70,74] Availability of medical devices at home, such as glucometers, was associated with better compliance according to two studies.[39,69] Additionally, a lack of health insurance was linked to poorer compliance in two studies.[52,53]

Health-System-Related Determinants: The quality of the relationship with healthcare providers significantly influenced compliance. Enhanced compliance was observed among patients who were treated by more competent and qualified allopathic doctors, and those who expressed higher satisfaction with private physicians, as indicated by six studies.[28,34,47,49,55,57] Conversely, poor communication and dissatisfaction with healthcare providers were associated with reduced compliance, according to four studies.[45,58,62,68] However, one study noted that positive relationships with healthcare providers were linked to better self-management. [43] Additionally, three studies reported that participants turned to alternative medicine due to factors such as availability and cost.[52,54,68] In one of these studies, participants mentioned that transportation costs for obtaining medications were a significant burden.[59]

Results derived from qualitative review: The qualitative review yielded 21 sub-themes, which were extracted from the primary studies and supported by illustrative quotes (Table 7). These sub-themes were organized into five overarching themes.

Personal Challenges to Effective Self-Management and Adherence. Personal barriers to managing health conditions effectively are diverse and interconnected. This theme highlights several key challenges that individuals face, each contributing to difficulties in adhering to self-management practices. A significant challenge is the limited knowledge many patients possess about the implications of diet and physical activity on their health. Many patients demonstrate a lack of understanding about how lifestyle changes impact disease control and may overly rely on medication without grasping the full scope of their condition's management. Additionally, patients often express confusion between the concepts of exercise and physical activity. For instance, some may believe that working long hours at a job is sufficient for physical activity, not realizing that dedicated physical exercise is still necessary for optimal health.[5-78,80-84,87,90,91,92] **(quotes: 1.1a,1.1b)**

Forgetfulness further complicates adherence. Without regular reminders or support from family members, patients often struggle to remember and implement self-management strategies.[77-80,83,88] **(quotes: 1.2a, 1.2b).** This issue is compounded by low motivation and self-efficacy, where patients may become discouraged and abandon efforts if they do not see immediate benefits or if their attempts feel ineffective.[82,83,87,92] **(quote: 1.3).** Time constraints also play a crucial role in hindering adherence. Patients frequently face difficulties balancing their daily responsibilities such as work and household chores with the time required for health management activities like meal preparation and exercise. **(quote: 1.4a,1.4b,1.4c).** This struggle to find time for self-care can lead to prioritizing other tasks over health-related activities.[75-78,82-84,88,95]

Denial of the disease presents another significant barrier. Patients who have trouble accepting their condition may be less likely to engage with and adhere to prescribed management plans.[75] **(quote: 1.5).** This denial can be closely related to issues of disinhibition, where individuals may succumb to cravings for unhealthy foods despite knowing the potential risks involved. [75,88] **(quotes: 1.6a, 1.6b).** Physical limitations due to co-morbidities, such as arthritis or hypertension, also present considerable challenges. These physical constraints can restrict patients' ability to participate in recommended physical activities and contribute to non-compliance with exercise regimens and other self-management strategies.[75,78,84,88] **(quotes: 1.7a,1.7b).** The interplay of these physical and psychological barriers highlights the multifaceted nature of the challenges patients face in managing their health effectively.

Financial Barriers: Financial constraints significantly obstruct the effective self-management of NCDs. Limited household budgets, lack of financial independence, and domestic expenses exacerbate the difficulty of affording essential medical devices, medications, and nutritious foods.[77,82,83,86,88,94] **(quotes: 2.1,2.2,)** The additional cost of traveling to healthcare facilities further compounds these challenges. Many patients avoid regular doctor visits to prevent loss of income or due to consultation fees, often seeking medical care only in emergencies or to obtain free medications.[77,94] **(quote:2.4).**These financial barriers not only restrict access to necessary resources and comprehensive care but also frequently lead to delays in purchasing medications.[80,90-92,95] **(quote: 2.3)** The overall impact of economic limitations highlights the substantial difficulties individuals face in managing NCDs effectively and adhering to self-care practices.

Environmental Barriers to Self-Management of NCDs: Environmental factors create significant challenges for NCDs. Work conditions often disrupt self-management routines, with long hours leading individuals to forget meals and struggle to eat small, frequent portions as required.[76,83,84] **(quotes: 3.1a, 3.1b).** Extreme weather conditions further complicate matters, as both very hot and very cold temperatures can reduce physical activity, while pollution deters outdoor exercise.[75,82,88] **(quotes: 3.2a,3.2b).** Family support is pivotal, with the absence of shared dietary needs and habits making, presents challenges to individuals to adhere to prescribed diets. [76,78,79,81,86,89] **(quotes: 3.3a,3.3b,3.3c).** Additionally, community, cultural and religious factors impact self-management. For instance, community dynamics can influence individual behaviour, as neighbours may affect one another's health choices. **(quote: 3.4c),** Cultural practices, such as bringing rich foods to gatherings, neglecting screening test can undermine dietary efforts, **(quotes: 3.4a, 3.4b, 3.4e, 3.4f)**. While some religious beliefs may lead individuals to view their conditions as divinely ordained **(quote: 3.4d),** religion can also promote self-care and encourage abstinence from alcohol and smoking **(quote: 3.4g).** These environmental factors collectively highlight the complex interplay of external conditions and personal health management. [81,82,84,86,91,94,96]

Social Barriers to Self-Management of NCDs: Social barriers significantly affect the self-management of NCDs. Social stigma and interactions in gatherings often create obstacles. Individuals may feel uncomfortable disclosing their condition due to fear of judgment or unwanted scrutiny, as seen when people hesitate to explain their dietary restrictions or the need for lifestyle changes. The pressure to conform to social norms during social events, such as avoiding sweets or specific foods, can be challenging and may lead to reluctance in managing their condition openly **(quotes: 4.1b,4.1d)**. Public perception also affects self-management. Many individuals feel self-conscious about exercising in public places, fearing judgment or unwanted attention **(quotes: 4.1a,4.1c)**. This discomfort can lead them to choose home-based exercises instead, limiting their physical activity opportunities. [75,76,84,87-89,92]

Additionally, the dynamics of joint family setups can complicate meal preparation for diabetes management, a food decision may be governed by family members. Lack of infrastructure and safety concerns further impede effective self-management. The absence of safe, accessible spaces for exercise **(quotes: 4.2a,4.2b)** and concerns about personal safety, particularly in the early morning or in areas with high traffic or recent criminal activity, restrict physical activity options.[75,82,84] **(quote: 4.2c)**

Gender roles also play a crucial role. Women, particularly in rural or traditional settings, often face greater challenges in managing their condition due to their multiple responsibilities at home and limited control over dietary choices. The additional burden of balancing professional and domestic roles can leave little time for self-care. [75,82,86] **(quotes: 4.3a,4.3b, 4.3c)** Finally, the influence of gadgets and media presents both challenges and opportunities. While excessive use of devices like TVs, computers, and smartphones can contribute to sedentary behav-

iour, media can also offer valuable health information and motivation for self-management. [75,89] **(quote: 4.4)**. Overall, these social factors highlight the complex interplay between societal expectations, infrastructure, and personal responsibilities in managing NCDs effectively.

Health Provider Barriers: Barriers related to health providers significantly impact the management of NCDs. Access issues, including transportation problems, pose challenges for patients who need to periodically visit medical centres for glucose monitoring. Those living in distant locations may have to undertake long journeys, often on foot, to reach the nearest primary health center.[77,81-83,92,93,95]**(quote: 5.1)**

A lack of trust between patients and healthcare providers also affects care. In some instances, patients rely on intermediaries, such as family members, to communicate their concerns to doctors, which can undermine direct patient-provider interaction. Moreover, patients using traditional medicines sometimes face adverse effects and may unfairly blame general practitioners for not adequately addressing their health needs.[81,86,91,93] **(quotes: 5.2a,5.2b,5.3c)**

Dissatisfaction with healthcare services is another concern. Many patients report long wait times, brief consultations, and a lack of thorough responses to their questions. There are also frustrations with the lack of personalized guidance on diet and medication routines, leaving patients feeling unsupported in their treatment **(quotes: 5.3a, 5.3b, 5.3c).** Complex medication regimens add to the difficulties, particularly for those managing multiple conditions. Patients find it challenging to adhere to complicated schedules and are often worried about managing several medications simultaneously.[75,77,81,88] **(quotes: 5.4)** Finally, some patients turn to alternative medicines due to their availability and affordability. They may abandon conventional treatments in favour of herbal remedies, sometimes under the influence of practitioners who promise cures and discourage the use of prescribed medications.[77,79,81,91,94] **(quotes: 5.5a, 5.5b)**

Discussion

The landscape of NCDs' self-management in LMICs is marked by a complex interplay of barriers and facilitators, as highlighted by both quantitative and qualitative findings. (Fig2: Conceptual Map of factors influencing SM). Understanding these dynamics is crucial for developing effective interventions to enhance self-management practices. The results shown here resonate with findings of qualitative meta-synthesis of studies primarily conducted in higher-income settings, which highlighted that self-management is affected by a range of personal & lifestyle elements, health status, economic & social aspects , surround ing environment, and health service system. [97,98]

Behavioural factors like substance abuse significantly hinder self-management, with smokers and heavy drinkers showing lower adherence. Comorbidities further complicate compliance. The link between illness duration and adherence varies; longer durations may enhance compliance, but chronic conditions can lead to fatigue. Additionally, motivation and coping skills are vital, while psychological factors like denial, forgetfulness can impede progress. Social support is also crucial, as it correlates with better self-management outcomes, emphasizing the need for a nurturing environment. These aspects in harmony with the Health Belief Model, indicating individuals are more likely to engage in preventive measures for NCDs based on their perceptions of vulnerability, seriousness, rewards, hindrances, self-efficacy, & motivational prompts.[16] Thus, perceived severity, barriers, and self-efficacy significantly influence preventive behaviours, highlighting the interconnectedness of these factors in promoting better health management.[99] Furthermore, Physical limitations from coexisting health issues can hinder activity, a crucial aspect of self-management, also mentioned in other studies.[100] Financial constraints significantly affect dietary choices and medication adherence, as individuals often prioritize other expenses over health needs. Limited resources may prevent the consumption of the WHO-recommended five servings of fruits & vegetables, and insufficient insurance further restricts access to essential care. LMICs, ongoing poverty and inequality impact timely care access, highlighting socio-economic disparities in health outcomes. Additional factors influencing dietary compliance include time constraints, perceived difficulty of guidelines, the availability of alternative food options, and limited fresh produce access.[101]

Environmental factors, including work conditions and extreme weather, significantly hinder effective self-management. Long working hours can disrupt meal routines and physical activity, while extreme temperatures limit outdoor exercise opportunities. Community dynamics and cultural practices also influence adherence; social stigma may deter individuals from openly managing their conditions, with fear of judgment impacting their willingness to follow dietary restrictions. Research in developed countries highlights social pressures and negative perceptions surrounding NCDs, which complicate adherence to medicine, dietary practice and physical exercise. Engaging community and religious leaders, along with culturally sensitive interventions and monitoring in workplaces, can help mitigate these challenges.[102-104]

Knowledge and awareness of health conditions are vital, as fear of medication side effects, lack of reminders, and confusion over exercise and dietary choices can hinder adherence. Studies show a strong correlation between health literacy and improved outcomes, stressing the immediate requirement of better education and awareness.

Table 1: Characteristics of Quantitative Studies - Study design: Quantitative: cross sectional

S.No	Author & year	State/city	Urban/rural/ trial/slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
Country—India							
1.	Aggarwal D , 2017	North India, Chandigarh	Urban	103	Asthma	27.2% of patients were non-adherent to ICS, as shown by objective assessments, while 24.2% were non-adherent based on subjective assessments.	Main barriers include concerns about side effects, a sense of well-being, and forgetfulness (p = 0.04, 0.01, and 0.04, respectively)
2.	Gupta RK, 2015	North India, J & K	Rural	230	T2DM	Non -compliance with medicine – 88.69%	* Most diabetic patients acquainted with about causes, symptoms, and proper monitoring (90%), but less about urine glucose testing (38.26%) and untreated disease consequences (48.69%). *Regular exercise was done by 33.91%, diet control by 53.91%. *Despite this, 80% agreed on staying in touch with their physician, though only 47.82% had regular blood pressure checks
3.	Arulmozhi S, 2014	South India, Puducherry	Hospital	150	T2DM	49.3%	* Low family support is significantly linked to poor medication adherence (p < 0.009). * Fewer than 25% of diabetics follow self-care activities like regular exercise and footcare
4.	Ravi S, 2018	South India, Chennai	Hospital (Urban)	200	T2DM	-	* Family support is strongly positively linked to diabetes self-management (p < 0.001). * There is weak negative correlation in diabetes self-management and mean plasma glucose (p = 0.082).
5.	**Chandrika K, 2020**	South, India	Slum (Urban)	200	T2DM	Good exercise behaviour was 29.8%, good monitoring behaviour was 30.3%, and drug adherence was 56.3%	* Good dietary behaviour is linked to secondary education or higher (OR 3.001). * Men exhibit better exercise behaviour (OR 3.691). * Good monitoring is related to higher socioeconomic status (OR 4.540). * Drug adherence is higher in those aged 50 and above (OR 3.4).
6.	Rao CR, 2014	South India, Karnataka		426 , 287 and 139 hypertensive and diabetic patients respectively.	HT & T2DM	Compliance rates were 82.2% for hypertension treatment and 83.6% for type 2 diabetes mellitus medication	*Females showed better adherence to treatment than males. *Literacy and socio-economic status did not impact treatment compliance. *The main reasons for not taking medication regularly were the high cost of treatment (39.3% for hypertension, 30.4% for diabetes) and the asymptomatic nature of the diseases. * old Age also negatively influenced treatment compliance
7.	**Kotian SP[1], 2019**	South India, new Mum-	Urban	208 : 164 with hypertension	HT & T2DM	-	*All patients had periods where they stopped their medication since diagnosis.

S.No	Author & year	State/city	Urban/rural/ trial/slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
		bai		and 85 with diabetes.			*The main reasons for noncompliance were financial issues (50.58% for diabetes patients, 73.78% for hypertension patients) and forgetfulness or work-related difficulties (49.41% for diabetes patients, 26.21% for hypertension patients). *Only 56.5%, diabetic patients & 64.6% hypertensive patients were aware that stopping treatment could lead to complications. *However, 95.3% of diabetes patients and 99.4% of hypertension patients found it challenging to remember their medication while at work
8.	Dasappa H, 2017	Bengaluru	Slum	163	T2DM	Adherence - blood sugar testing- 77.91%, medication- 60.73%, foot care 48.46%, diet- 12.26%, exercise - 30.67%	Facilitators- Good self-care practices are linked to factors such as younger age, formal education, gender occupation, & religion. Better medication adherence is related to improved blood sugar control
9.	Nelson V, 2016	Kerala	Rural	253	T2DM	Compliance rates were 66% for drugs, 24.1% for exercise, 21.3% for foot care, and 51.4% for diet	*Multivariate analysis showed that poor exercise compliance was linked to being female (OR 4.34) *not receiving dietary advice from a doctor was related to poor diet compliance (OR 1.16). *Poor drug compliance was related to being under 50 years old (OR 2.55) *Shorter diabetes duration (OR 1.05), not being guided by doctor about compliance (OR 1.95)
10.	Dinesh PV, 2026	Karnataka	Rural	400	T2DM	-	*Only 24.25% had good knowledge., foot care was the most neglected area. * Visiting modern medicine providers (allopathic) was significantly associated with higher knowledge ($\chi 2 = 12$, P = 0.001) compared to AYUSH practitioners. * Those attending private treatment facilities were more knowledgeable than those using government services ($\chi 2 = 9.09$, P = 0.003)
11.	Rajasekharan D, 2015	Karnataka	Hospital	264	T2DM	Medication adherence was 60.5%, and insulin adherence was 66.9%.	*Daily healthy eating was 45.9%, followed b 30-minute exercises -43.4%, blood sugar ckecking -76.6%. *Overall, self-care practices were generally unsatisfactory
12.	Santhanakrishnan I, 2014	Puducherry	Urban	135	T2DM	Compliance to oral hypoglycemic agents was 76%.	*Diet modifications - 81.4%, while 37% engaged in exercise. *Yearly eye-check-ups - 43.7%, kidney function tests - 46.6%, care of feet-54%. *Knowledge of risk determinants - 66%, complications was 79%, both higher than knowledge related to self-care
13.	Mukherjee S, 2013	Kolkata	Urban	470	T2DM	Anti-diabetic drug compliance was 57.7%.	*It decreased with age, was lower in males, illiterates, those with low income, and those with longer diabetes duration. *Compliance was lowest where combination of oral & insulin was used (43.4%).

S.No	Author & year	State/city	Urban/rural/ trial/slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
							*Lack of knowledge about diabetes complications was linked to lower compliance. *Forgetfulness (44.7%) followed by financial constraints (32.7%) were common reasons for non-compliance.
14.	Chavan GM, 2015	Maharashtra	Rura l	307	T2DM	-	Only 23.8% - good diabetes knowledge, while 19.2% - poor knowledge. Better knowledge was linked to improved compliance with both pharmacological and non-pharmacological management
15.	Raithatha SJ, 2014	Gujrat	Urban	100	T2DM	Medicine compliance - 88.1%	The worst score was in "problem solving" (11.0%). "Psychosocial adjustment" - satisfactory (82.5%). Males outperformed in physical activity, dietary practices,& problem solving
16.	**Joshi j, 2022**	Gujrat	Rural	178	T2DM	Medication adherence (89.3%), monitoring of blood glucose (65.2%)	*Dietary adherence was linked to secondary education or higher (OR = 22.1), *Treatment by physician (OR = 3.36) *Living in a joint (OR = 3.32), socioeconomic status (OR = 2.5). *Good glycemic control was significantly related to adherence to diet (OR = 6.81), medication (OR = 4.59), exercise (OR = 3.65)
17.	Shani SD, 2021	-	Hospital	240	Stroke (6.7 months post-stroke)	Overall medication adherence was 43.8%, with 34.3% for antidiabetics, 52.6% for antihypertensives, and 56.7% for statins	*Facilitators-- Better adherence was linked to risk factor control, daily routines, perceived need for medication, and poor health. * Barriers- included memory issues, side effects, and financial constraints
18.	Dasgupta R, 2018	West Bengal	Rural	124	HT	62.9% of hypertensive participants had poor self-care practices.	Barriers- Significant factors included being over 60,; having only primary education, poor socio-economic status; being widowed/separated , self-perception of poor health Age ,OR-2.3, (barrier) &b education, OR 3.8, (facilitator) were key predictors even after adjusting for other variables
19.	Gupta S, 2016	Delhi	Urban	80	HT	-	* Males scored higher on smoking and alcohol consumption ($p \leq 0.001$), indicating greater hypertension risk, while having better hypertension knowledge. * Females exhibited slightly better self-care practices
20.	Vanitha D, 2015	Chennai	Urban	100 (male)	HT	89% exercised enough, 72% avoided alcohol 89% didn't smoke, but 25% added extra salt and none increased fibre.	*Awareness of dietary factors for hypertension was low, though 70% knew over 30 minutes of daily exercise is needed * Dietary changes were minimal

Table 2: Characteristics of Quantitative Studies

S. No	Author & year	State/city	Urban/rural/trial/ slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
Pakistan							
21.	Ajani K, 2021	Karachi	Urban	402	HT	Self-care adherence was highest for alcohol abstinence (100%); smoking cessation (83.33%); medication (71.89%),	*Only 4.47% of participants knew about hypertension. *Self-care adherence - diet (27.11%) ; exercise (24.88%). *Facilitators- Key predictors for self-care included age; male-gender; home blood pressure monitoring; education level; religious beliefs.
22.	Mahmood S, 2020	Islamabad	Hospital	776	HT	38.3% had high adherence to antihypertensive therapy; 24% - moderate adherence; 37.7% were non-adherent	Facilitators- Factors linked to good adherence and associated with controlled BP included older age, education, free provision of medical care, longer duration of treatment, more number of medications, comorbidities. Barriers- for non-adherence were not feeling a need for the medication (24.7%), carelessness (13.4%), and adverse effects (11.2%)
23.	Saqlain M, 2019	Islamabad	Hospital	262	HT	61.1% were non-adherent.	Facilitators- adequate health literacy (OR = 3.369) & independence in daily activities (OR = 2.968) predicted better medication adherence in older hypertensive patients
24.	Mahmood S, 2020	Islamabad	Hospital	662	HT	Only 41% attended follow-up regularly.	Facilitators- Male, age above 60 , education, free medical care, number of medications, treatment duration, comorbidities, and medication adherence
25.	Almas A, 2014	Karchi	Hospital	447	HT	Hypertension was controlled in 72.3% of patients	Facilitators-- Positive patient-physician interactions are key to better adherence and hypertension control.
Palestine							
26.	Sweileh WM, 2014	Nabulus	Primary Health care clinic	405	T2DM	42.7% of participants were non-adherent.	Barrier- Non-adherence was significantly linked to knowledge of the disease, beliefs about the necessity of anti-diabetic medications, and concerns for side effects
27.	Al-Ramahi R, 2015	West Bank	Government and private clinic	244	HT	Low medication adherence was found in 54.2%	Barriers- Significant factors included younger age, rural living, self-rated health status, forgetfulness, medication concerns, side effects, and treatment dissatisfaction
28.	Elsous A, 2017	Gaza	Primary Health care clinic	369	T2DM	58% had good adherence.	* Facilitators-- linked to better compliance included being female (OR: 1.657) and perceiving the disease as severe (OR: 1.510). * Age and longer diabetes duration predicted adherence but were not statistically significant ($p > 0.05$)
Bangladesh							
29.	Khanam MA, 2014	Matlab, Abhoynagar, and Mirsarai.	Rural	29,960	HT	26% of those treated by village doctor stopped taking medication.	*Non-adherence was linked to young age , male , less education, wealth, and provider type. *Men and those diagnosed by unqualified providers had higher non-adherence.

S. No	Author & year	State/city	Urban/rural/trial/ slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
							* Facilitators - Older age, higher education, and cardiovascular comorbidities were associated with better adherence
30.	Mannan A, 2021	Chittagong	Urban	2070	T2DM	Low medication adherence was 46.3%.	Barriers- linked to low adherence included being male, having income below $233, & having diabetic ulcer
31.	Roka T, 2020	Rajshahi	Hospital	357	Asthma	86% - non-adherent to inhaler medication.	Barriers- Non-adherence was linked to younger age, rural residence, less education, middle income, comorbidities, long-term inhaler use, and consulting non-qualified practitioners
Cameroon							
32.	Aminde LN, 2019	Limbe and Bamenda	Hospital	135	T2DM	Non-adherence to medication was 54.4%	*Barriers - linked to non-adherence included age less than 60 , alcohol use and insulin-only therapy *Patients cited forgetfulness (55.6%), financial issues (38.2%), and symptom disappearance (14.2%) as reasons for non-adherence
33.	Akoko BM, 2017	Bamenda	Hospital	221	HT	Antihypertensive adherence rate was 43.9%.	Barriers- Forgetfulness (OR = 0.011), lack of motivation (OR = 0.068), and absence of symptoms were key predictors of non-compliance.

Table 3: Characteristics of Quantitative Studies

S. No	Author & year	State/city	Urban/rural/trial/ slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
Tanazia							
34.	Shayo GA, 2022	Dar-es-salaam	Hospital	385	Asthma	60.3% of females - non-adherent to medications; 73.5% had poorly controlled asthma.	Barriers—non-adherence was significantly linked to lack of insurance, fear of side effects, busy schedules, alternative treatments; improper inhaler use ($p < 0.05$)
35.	Kamuhabwa AR, 2014	Dar-es-salaam	Diabetic Clinic	469	T2DM	Poor glycemic control – 69.7%	Barriers- increased age and disease duration over 20 years. *Factors linked to poor control included no health insurance, using multiple oral hypoglycemics, normal BMI, obesity, and non-adherence to medications
Republic of Congu							
36.	Lulebo AM, 2015	Kinshassa	Primary Health Clinic	395	HT	54.2% - non-adherent to antihypertensive medication, and 15.6% had uncontrolled blood pressure.	Barriers--Non-adherence was linked to poor knowledge of hypertension complications, unavailability of drugs, lack of patient education, prior side effects, uncontrolled blood pressure, and use of non-prescribed medications
Rwanda							
37.	Sibomana JP, 2019	Gitwe, Kabutare, Kabgayi,	Rural District Hospital	112	HT	Adherence was 77%	Facilitators- Adherence significantly linked to factors such as literacy; absence of side effects; specific hospital & pharmacy visit-

S. No	Author & year	State/city	Urban/rural/trial/ slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
		Ruhango					ed (all p < 0.05
38.	Mirahmadizadeh A, 2020	Shiraz	Diabetic Clinic	500	T2DM	Low adherence rates were 27.2% for medication, 5.4% for Mediterranean diet, and 21% for physical activity.	Barriers: Factors like age (over 65), weight, marital status, and smoking significantly influenced these low adherence levels.
Egypt							
39.	Galal IH, 2018			474-Asthma 509-COPD	COPD & Asthma	adherence: asthma -71.7% COPD- 79.4%,	Facilitators- COPD adherence was good in male with a less smoking index, urban residents, in those who had severe obstruction, and those treated by pulmonologists. In asthma, adherence & treatment satisfaction was found to be highly linked
Kenya							
40.	Waari G, 2018	Kenyyatta	Hospital	290	T2DM	Low medication adherence- 28.3%	Barriers: were dissatisfaction with family support (OR = 2.99), a disease duration of 2-10 years (OR = 2.07), past diabetes mellitus admissions (OR = 2.94), difficulties in drug access (OR = 1.76), and dissatisfaction with clinicians (OR = 3.58)
41.	Gala P, 2023	Western Kenya	Hospitals	1496	HT	71.2% - showed poor medication adherence.	Economic factors influenced adherence, with transportation costs particularly linked to lower adherence
Nigeria							
42.	Olwookere AJ, 2015	Ibadan	Family Medicine clinic	390	HT	Medication adherence was 42.6%,	Facilitators: with better adherence seen in those with strong family support (97%); older age (55.6%); disease duration over 10 years (54.4%).
43.	Odume BB, 2015	Abuja	Family medicine clinic	145	T2DM	-	Facilitators- Family functional status and social support significantly impacted glycemic control, with a p-value < 0.000
44.	Jackson IL, 2015	Cross River, Akwa Ibom	Hospital	303	T2DM	Low adherence level- 50.2%,	Barriers- low literacy; forgetfulness; high cost of medicines; access to care limited; complex- regimens; poor patient-provider communication; lack of trust, and depression
Myanmar							
45.	Han WP, 2015	Yangon	Hospital	216	HT	Only 50% of hypertensive patients had good medication adherence	Barrier- Poor adherence was linked to younger age, being male, low income, longer hypertension duration, and high perceived barriers
Uganda							
46.	Bagonza J, 2015	Iganga, Bugiri	Hospital	512	T2DM	Adherence to anti-diabetic medication - 83.3%.	Facilitators-- Factors independently related to adherence- being on medication for at least three years; availability of drugs; receiving diabetic health education
Bhutan							
47.	Yangdon k, 2021	Thimpu	Hospital	105	T2DM	Mean Score of SM was 7.76.	Facilitator: Self-efficacy significantly predicted SM behaviour in Diabetic patients

Table 4: Characteristics of Quantitative Studies

S. No	Author & year	State/city	Urban/rural/trial/ slum	Sample size	Type of NCDs	% of non- adherence	Major Facilitators or Barriers for non-adherence/ significant findings
Vietnam							
48.	Dao-Tran TH, 2018	South of Vietnam	Hospital	198	T2DM	-	Facilitators: self-efficacy, friend's support. Family support and knowledge about DM
Ghana							
49.	Kretchy AI, 2014	-	Hospital	400	HT	93.3%- poorly adhered to antihypertensive medications	Barriers- with non-adherence linked to low internal locus of control, medication side effects, and their interaction with external locus of control
Ethiopia							
50.	Abebe SM, 2014	Gonder	Hospital	391	T2DM	25.4% had low, 28.7% medium, and 45.9% high self-reported adherence to diabetic medication.	Barriers- Poor wealth status, traditional treatment use, and service dissatisfaction were significantly linked to low medication adherence
51.	Agidew E, 2021	Gamo Gofa Zone	Hospital	635	T2DM	Good adherence to diabetes self-care was 53.7%.	Facilitators- Key factors linked to better adherence included being a government worker, receiving diabetes self-care training, having a personal glucometer, being a member of a diabetes association, having diabetes for over 10 years, and not having complications
52.	Asgedom SW, 2018	Jimma	Hospital	280	HT	61.8% - adherent to medication.	Barriers- Poor adherence was linked to co-morbidity, alcohol use, free medication access, and use of multiple antihypertensive drugs
Nepal							
53.	Ghimire S, 2018	Kathmandu	Hospital	180	HT	53.3 % were non-compliant	Barriers: low self-efficacy, lack of taste, and poor family support. Men struggled with remembering to eat low salt, while women faced challenges with social acceptability, joint family living, and the presence of a son or husband
54.	Kandel S, 2022	Kathmandu	Hospital	411	T2DM	-	High Family supportive behavior was linked to better Self-monitoring blood glucose compliance, while high planning behavior was tied to better foot care adherence.
55.	Yadav UN, 2020	Sunsari	Rural	238	COPD	Self-management was low, with an average score of 45.31	Barriers- Lower scores were linked to being uneducated, having a low income, and more co-morbidities
56.	Roka T,2020	Kathmandu	Hospital	216	HT	72% had low adherence to antihypertensive medication (especially in females)	Barriers: Co-morbidity and free medication were linked to higher odds of low adherence

"HT- Hypertension", "T2DM- Type 2 Diabetes mellitus", "COPD- Chronic Obstructive Pulmonary Disease"

Table 5: Attributes of Primary Qualitative Studies Featured in the Review

S. No	Author, year	Country	Methods	Sample	Type of NCD	Barriers & Facilitators of self-management

S. No	Author, year	Country	Methods	Sample	Type of NCD	Barriers & Facilitators of self-management
1.	Tripathi D, 2023	India	2 FGDs	Patiets-12 HCPs- 15	T2DM	*Key facilitators were patient education, ongoing counselling, family and peer support, and recreational activities *Major barriers included illness denial, lack of disease knowledge, gadget overuse, poor infrastructure, gender issues, and time constraints.
2.	Matpady P,2020		IDIs	20-Male 15-Female	T2DM	* Intrinsic factors like knowledge and behaviour *Extrinsic factors such as social support and food environment *Intermediate factors like communication and finances
3.	Gupta S, 2018		IDIs	30 (Females)	HT	Barriers: 1. Socioeconomic: Most women were from low-income backgrounds and lacked education. 2. Limited Health Awareness: Poor knowledge of hypertension, smoking cessation, and dietary management. *Inadequate Health Resources- Absence of local follow-up, reliance on alternative medicine, no health insurance, and out-of-pocket expense
4.	Anitha Rani M,		FGDs	50	T2DM	Barriers: 1. Lack of Awareness: Uncertainty about diabetes targets and complications. 2. Confusing Information: Dietary guidance was unclear. 3. Physical Limitations: Difficulties with outdoor exercise. 4. Neglected Care: No information on foot care.
5.	Chittem M,2021		Semi- strucured interviews	50- patients 38- primary caregivers 25-physicians	T2DM	Barriers: 1. Complex Medication Regimen: Confusion, forgetfulness, and decreased motivation. 2. Family Influence: Preference for alternative therapies due to stigma and intrusiveness. 3. Cost of Illness: Prioritizing spending on medication only
6.	Basu S, 2022		IDIs	30 patients	HT	Barriers: varied restricted salt , fruits and vegetables consumption due to cost, confusion exercise with physical activity, poor medication adherence due to forgetfulness and stock issues
7.	Yadav UN, 2020	Nepal	IDIs	10- patients, 4- HCPs	COPD	1.Patient and Family Issues; Limited COPD knowledge, insufficient family support, poor emotional health. 2. Community Factors: Preference for alternative treatments over western medicine, driven by social networks. 3. Service Provider Challenges: Trust issues, communication barriers, doctor expertise, and resource constraints etc
8.	Adhikari M, 2021		4 FGDs, 16 IDIs	26- patients, 5- caregivers, 7- HCPs 3- Health Managers	T2DM	Facilitators: Motivation, support from , peers, family ,doctors, and community resources Barriers: Knowledge gaps, cultural practices, lack of guidelines, insufficient counselling and financial issues.
9.	Islam SM, 2017	Bangladesh	IDIs	12	T2DM	Barriers: 1.Knowledge Gaps: many misconceptions about diabetes and poor knowledge of medications. 2. Adherence Issues: Non-compliance with dietary and activity advice, high medication costs, side effects, and forgetfulness. 3. Psychological Impact: Concerns about diabetes-induced stress
10.	Rawal LB, 2019		IDIs	4- Family planning	All NCDs	Challenges in Delivering NCD Care - Absence of guidelines and procedures; Insufficient trained staff;

S. No	Author, year	Country	Methods	Sample	Type of NCD	Barriers & Facilitators of self-management
				officers, 6- resident medical officers 4- medical doctors 1-civil surgeon		Inadequate lab facilities; Poor recording and reporting systems; logistics & medications
11.	Amin M, 2023	Ghana	Semi-structured interview	13	T2DM	Facilitators: Motivation from understanding health benefits, and support from healthcare professionals Barriers: Personal & Socio-Structural Factors: Limited awareness of Physical activity guidelines, chronic illness impact, confusion in physical activity & exercise, social ridicule, safety concerns, lack of culturally appropriate facilities.
12.	Ansari RM, 2021	Pakistan	IDIs	20 (10- HCPs, 10 Nurses)	T2DM	Barriers: 1. Patient-Doctor Relationship: ** Impact of interactions and conflicts. 2. Non-Adherence: Issues with diet, exercise, and low self-efficacy. 3. Cultural Influence: Effects on self-management. 4. Support Gaps: Lack of support from healthcare providers, patients, and families.
13.	Ansari RM, 2022		2- FGDs	20 (10 in each FGD)	T2DM	Barriers: 1. Challenge of Diabetes: Emotional, physical, and social toll. 2. Understanding Diabetes: Awareness of its difficulties. 3. Self-Management: Adherence to management practices
14.	Bukhsh A, 2020		IDIs	37	TYDM	Facilitators: Counseling from healthcare providers; family support, & concern about diabetes complications. Barriers: Financial constraints; physical limitations; adverse weather; social events; needle anxiety; strong food preferences; forgetfulness; busy schedule
15.	Ansari RM, 2019		IDIs	30	T2DM	Barriers: 1. Disease Stigma: Men hesitated to disclose diabetes due to stigma. 2. Self-Management Context: Women adapted and used interactive resources; men preferred self-learning and professional guidance. 3. Patient-Doctor Relationship: Poor support from healthcare providers. 4. Diet and Exercise Adherence: Issues with compliance. 5. Access to Resources: Women used online and educational tools; men relied on self-learning. 6. Social Support: Both reported inadequate support from healthcare and family.
16.	Ogunrinu T, 2017	Malawi	4- key informant interviews 3 FGDs	16	T2DM	Facilitators: diabetes education classes; Satisfactory health literacy; ability to integrate education into daily life. Barriers: - Financial constraints affecting medication adherence and adoption of healthier diets. - Limited knowledge of managing diabetes complications despite effective blood sugar control
17.	Edward A, 2021	Tanazania	Key Informant Interview (KII)	34	HT	Facilitators: -Fee subsidies, health insurance, community-based refill distribution, SMS reminders, and family support. - Patient education and quality physician counselling. Barriers: - Affordability and access to antihypertensive medication. - Lack of awareness about hypertension, preference for herbal remedies. - Reliance on religious leaders over healthcare providers for adherence

S. No	Author, year	Country	Methods	Sample	Type of NCD	Barriers & Facilitators of self-management
18.	Rafii F, 2024	Iran	Interviews (15)	9- patients 3- family members 3- pulmonologist	COPD	Facilitators: Knowledge; education; experience; family involvement; financial support. Barriers: Lack of education and treatment support; difficulty obtaining medication; disease-specific challenges; co morbidities; false beliefs; poor self-efficacy, shame
19.	Sami R, 2023		In depth dicussion	20 - patients 15 - caregivers 14 - HCPs	COPD	Barriers: Patient-related issues, Caregiver burden, Limited patient support, Inadequate provider competence, Ineffective rehabilitation planning
20.	Rutebemberwa E, 2013	Uganda	4- FGDs 13- KII	16- Patients, HCPs & Herbalist (number not povided)	T2DM	Factors leading to use of Herbs: - *Difficulty accessing hospitals - Drug shortages, Large quantities and affordability of Traditional medicine *Payment flexibility for traditional medicine *Convenience and aggressive marketing of traditional medicine *Influence of family, friends & traditional healers

"HT- Hypertension", "T2DM- Type 2 Diabetes mellitus", "COPD- Chronic Obstructive Pulmonary Disease"

Table 6: Characteristics of Mixed Method Studies

S.No	Author, year	Country	Methods	Sample	Type of NCD	Barriers & Facilitators of self-management
1.	Jennings H, 2021	Bangladesh	Quantitative: Survey Qualitative: IDIs, FGDs	Quantitative: 231 Qualitative: 36 (6 Patients- IDI, 25 Patients – FGDs, Local health workers- 5 IDI)	T2DM	Barriers: 1.Access Challenges: Costs, time constraints, crowded conditions, and distance limit access to specialist diabetes care. 2. Local Service Limitations: are more accessible but lack infrastructure and expertise. 3. Gender and Adherence Issues: Women are less diagnosed and less likely to use specialist services; costs and dissatisfaction affect medication adherence
2.	Bhandari P, 2016	Nepal	Quantitative: Survey Qualitative: semi-structured interview	Quantitative: 230 Qualitative: 13	T2DM	1. Facilitators: self-efficacy, perceived social support, and educational status 1. Cultural Factors: Nepalese cultural and religious beliefs, such as family responsibilities and faith, facilitated self-care, with variations by age, gender, and literacy.

"HT- Hypertension", "T2DM- Type 2 Diabetes mellitus", "COPD- Chronic Obstructive Pulmonary Disease"

Table 7. Summary of descriptive themes, sub-themes, and individual quotes derived from the qualitative thematic analysis

S.No	Themes	Sub-themes	Representative quotes from studies along with quotes numbers
1	Personal Barriers	Lack of Knowledge	***1.1a*** *"Lot of patients don't know much about diet or physical activity management; they just ask for medicines they are not aware of the complications and why it is important to control the disease"* [75] ***1b*** *"Still I have confusions over sugar-free sugar, zero sugar coke, sugar-free biscuits. I don't eat, but I am curious to know about the oducts available in the market. I think sugar is sugar, isn't it? Any type of sweet is not good for health" Group "B" Male Participant 2."* [76] This lack of knowledge is a recurring issue, as supported by additional studies [77, 78, 80, 81, 82, 83, 84, 87, 90, 91, 92]
		Forgetfulness	***1.2a*** *" One widower mentioned, "My wife used to remind me when she was alive. Now, how can I expect that from my son or daughter-in-law?"* [78] ***1.2b*** *"I forget to take medicines sometimes and don't take when medicine stock is finished at home." (P14; Female)*[88] This issue of forgetfulness and its impact on self-management is consistently observed across various studies [77, 78, 79, 80, 83]
		Lack of Motivation/low -self efficacy	***1.3*** *."I tried walking every day for three months, but it did not help to control my disease and weight. Now, I have stopped walking and do little exercise at home (F2_38 years)."* [83] Similar patterns of low motivation or self-efficacy are observed in other studies [82, 87, 92]
		Lack of time	***1.4a*** *"Doctors ask for walking and suggest eating small frequent meals, when will I work if I invest all the time in eating and walking" (Male, 49 years)"* [75] ***1.4b*** *"These days I am trying to eat millets, but it takes much time to cook and not that tasty" Group "B" Female Participant 8."*[76] ***1.4c*** *"Lack of time lead to non-compliance likewise in other studies too."*[77.] This issue of time constraints affecting self-management is supported by additional studies [78, 82, 83, 84, 88, 95]
		Denial of disease	**1.5** "*The most important part is accepting the disease, if they find it difficult to accept their diabetes then it is very difficult for them to begin the new regime" (HCP - 1)"*[75]
		Disinhibition	***1.6a .*** *"I try to avoid foods having excess sugar but in winters I cannot resist jaggery, in summer I cannot resist cold-drink and ice creams. When I go out with my family, I eat ice cream" (Female, 58 years old)"*[75] ***1.6b*** *"Sometimes I do take sweets, for example, I am fond of a traditional sweet 'Halwa,' and I eat it despite knowing the fact that it is full of sugar."* [88]
		Physical restriction	***1.7a***. *"I can't exercise like the strong guys [healthy people]. At my age, my hypertension doesn't allow me to exercise. My heart beats too fast . . . my knee [arthritis] doesn't allow me [hurts when I exercise].—CON012, female, 69 year"*[84] ***1.7b***. *"I have been doing a walk regularly. But for the last 6 months, I am not doing a regular walk, because of pain in my legs." (P11; Male)"* [88] This issue of physical limitations affecting exercise is also highlighted in other studies[75, 78]
2	Financial Barriers		***2.1*** *"Unavailability of healthy food choices in the community is one barrier. The capacity to buy healthy food is the underlying factor for people to afford healthy food available in the markets." (Medical doctor, male)"* [82] ***2.2*** *"The biggest problem is money. If I don't have money, how can I buy medicine? How can I arrange for healthy foods? And how can I go to health facility, and do blood glucose monitoring?". - (female with Type 2 diabetes)*[82] ***2.3*** *"Everyone wants treatment, everyone wants good health, however not everyone can afford it" (FGD 8, P1).* [91] ***2.4.*** *"Without any medical issue, I never visit my doctor. Today I am visiting my doctor after about 6 months. As I believe if I am taking my medicines regularly and without any emergency condition, there is no need to visit my doctor." (P19; Female)*[88] This issue of financial constraints is consistently noted in other studies [77, 78, 79, 80, 83, 90, 92, 95]
3	Environmental	Work	***3.1a*** *"I used to do business with friends, my brother's shop was there, I used to work for 18e20 h. I used to forget to eat food, even after-noon lunch used to forget." (Group "B" - Male Participant- 7)* [76] ***3.1b*** *"I need to eat small amounts of food frequently, but in a work place who will provide food so frequently? (M2_48 years)."* [83,]

S.No	Themes	Sub-themes	Representative quotes from studies along with quotes numbers
			These work-related challenges are also highlighted in additional studies [84]
		Weather	***3.2a*** *"The kind of weather we have, extremely Hot and Cold, people stop their physical activity, that time their blood glucose goes up."*[75]
			3.2b *"Diabetes patients stay at home and do less exercise because of pollution they face while walking on road."- (Public health officer-male)"* [82]
			These weather-related challenges are also noted in other studies [87]
		Family	***3.3a*** *"It is tough to follow the diet because in my house no one else has diabetes, so I eat what is prepared for them." Group "A" Female Participant 3.*[76]
			3.3b *"I try to avoid foods having excess sugar but in winters I cannot resist jaggery, in summer I cannot resist cold-drink and ice creams. When I go out with my family, I eat ice cream" (Female, 58 years)"* [76]
			3.3c*."If I fall who is there for me to support ."*[78].
			These issues related to family support are also reflected in other studies [79, 81, 86, 89]
		Community /cultural/religious	***3.4a****"Leave about the uneducated one, most educated people are unaware of this disease and its risk factor". (IDI: F40-45*)"[81]
			3.4b *"In our culture (Tharu and Madhesi community), particularly daughters visit their parents with sweets, curds, bananas, meat items. Factually, they (daughters) don't care about the conditions of parents. I think there is a need for education about the foods for the patients of this disease, which is not happening at all". (IDI: F40-45*)"[81]
			3.4c *"There is an influence of neighbours ... They tell diabetes patients that once you start taking your medicines you cannot discontinue it ... patients trust on their words and they do not want to take medicine."- (Medical doctor, male)"*[82]
			3.4d *"Religious belief plays an important role in this population. Some patients considered that this disease came from "Allah" (God), so Allah will cure that as well so no need to make efforts on self-management activities." (GP-10)"* [86]
			3.4e *"In most cases, it is not until people go to the hospital or get sick, then they get to know that they are hypertensive, otherwise it hard to know, because we do not have a culture of doing health screening regularly" (FGD 7, P1)."*[91]
			3.5f *"With herbs, I was told by the people who went to the herbalist . . ., I started on their treatment and I kept on taking jerry cans and jerry cans . . .." (FGD diabetic women)"*[94]
			3.5*g*: *"I have a father-in-law who is 106 years old, I take care of him as there is no one else…and I feel good about it…I feel that service is my duty, my religion. (P)"*[96]
			These cultural and religious factors impact health management in ways also reflected in other studies[84]
4	Social Barriers	Social stigma/ social gather-ings	***4.1a*** *"I cannot tell anyone in my office, I am just 42 and I am diabetic, I cannot stop eating everything I like, they (healthcare providers) restrict everything" (Male, 42 years)"* [75]
			4.2 b *"in functions, if we do not eat sweets and meat people think something else. If I say no to it, they start asking why ... then I have to explain I have diabetes etc., big story, I do not like to tell it to others. Simply they talk." (Group "B" Male Participant 7)*[76]
			4.3 c *"For me, I feel shy to exercise in public places . . . as if the whole world is watching me. . ..my body, people will be standing and staring at me . . . I would rather exercise at home.—CON003, female, 41 years"* [84]
			4.4 d *"It is always difficult to cook the diabetic friendly food in a joint family set up. The food choices are very much dictated by the males living in the joint family."* [87]
			These issues are consistent with findings from other studies [88, 89, 92]
		Lack of infrastructure/safety concerns	***4.2a*** *"There are no parks in my area and fast-moving cars start passing early in the morning in my area, I am afraid of accidents" (Male, 64 years)"*[75]
			4.2b *"We have lack of open space or other options for exercise."- (Medical doctor, male)"* [82]
			4.3c *"It is not safe to exercise outside [especially] at dawn. The recent [serial] killings of women makes me fear going out early in the*

S.No	Themes	Sub-themes	Representative quotes from studies along with quotes numbers
			morning to exercise.—CON006, female, 46 years" [84]
		Gender Issues	***4.3a*** *"These days more and more females are working, so if a male has diabetes, he has his wife to take care but if the female, who is taking care of the house, is also working professionally then she doesn't get time to take care of herself" (HCP 10)"* [75] ***4.3b*** *"Women in this rural area of Pakistan had a difficult time in managing their diabetes as compared to men. In this society, women cook the food according to the choices of the family–women don't have much to say on the choice of the food, so they have no idea how to manage their diabetes in the environment they live and in relation to the healthy food choices."* [86] ***4.3c*** *"A family is a barrier for regular physical exercise ... particularly to the female diabetes patients. Even though she has the motivation to do physical exercise, she can't do it as she has to look after children, prepare meals ... when will she get time for physical exercise?" – (Caregiver, female)"*[82]
		Gadgets and Media	***4.4*** *"There are so many distractions these days, TV, computer and mobile phones. They sit with these gadgets for the whole day. Patients should be encouraged to do outdoor activities." (HCP 3)"*[75] However, media can also be beneficial, as some females have gained useful health insights from it [89]
5	Health Provider Barriers	Access / lack of resources/ Lack of trained Staff	***5.1*** *"Transportation issue is another concern for patients living with diabetes to regularly visit health facilities to do blood glucose monitoring. Patients from remote areas have to walk whole day to go to primary health centre just to check blood glucose level." – (Medical doctor, male)"*[82] These challenges are also highlighted in other studies [77, 81, 83, 92, 93, 95]
		Lack of trust between patient and doctor	**5.2a** "*I visited the doctor with my son, and he speaks to the doctor in the language that doctors used (Nepali*). *He (son) reflected my concerns to the doctor". (IDI: F50-55Y)"*[81] ***5.2b*** *"Many patients in Pakistan are using traditional medicines and sometime their side effects make them more sick blaming the general practitioners for not looking after their health well."* (GP-7)"[86] **5.2c** "*Doctor wrote for me clearly and in bold on medicine pack and blisters, and my children can read that easily."*[88] These issues are consistent with findings in other studies [91, 93]
		Patient dissatisfaction over doctor	***5.3 a*** *"Patient dissatisfaction over "I sit there for hours waiting for my turn and they just write a few lines in my card and send me out. I don't get a consultation[b] satisfactory answer, but what to do?" (Female, 46 years)"* [75] ***5.3 b*** *"Doctor does not pay attention to our voice at all. They (doctors) just pretend to listen but they do not. Because the doctor whom I visit never respond to my query. He just say...Yes...Yes...all will be fine...and.....That's it all". (IDI: M75-80)"*[81] ***5.3c*** *"Doctor never asked me about my diet and medicine routine. I want my doctor to guide me about my diet plan." (P22; Female)"* [88] Similar issues are reflected in other studies [77]
		Complex medicine regime	***5.4a*** *"I have three diseases (COPD, Hypertension, and Diabetes) but, I do not know either I should take medicine for all disease on a daily basis. To have all the medicines at the same time is really worrisome for me". (IDI: M50-55Y)"* [81] This difficulty in adhering to a complex medication schedule is also noted in other studies [79, 83]
		Opting alternative medicines	***5.5a*** *"I often use these medicines (Basil leaf and turmeric powder) for improving my conditions because it is easily available. Sometimes it works for decreasing cough but not always". (IDI: F60-65Y)"*[81] ***5.5b*** *"I absconded from hospital medicine and went for herbs. The worst situation is that the herbalist stops you from taking hospital medicine and gives you hope that herbs cure diabetes. (FGD men)"*[94] These experiences reflect broader trends in alternative medicine usage noted in other studies [77, 79, 91]

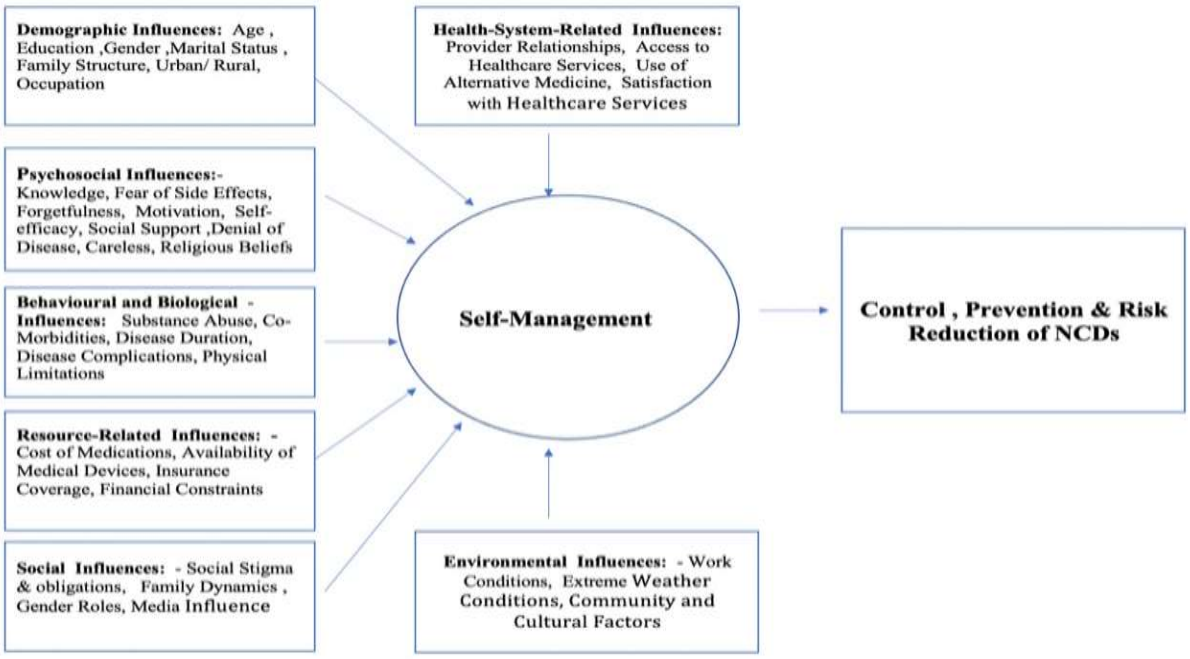

Figure 2: A conceptual map illustrating the factors influencing self-management to combat & manage NCDs in LMICs

The quality of relationships with healthcare providers is essential for compliance. Positive interactions enhance adherence, while dissatisfaction diminishes it, highlighting the need for effective communication. Access to healthcare and reliance on alternative medicine complicate management, as some patients turn to alternatives due to dissatisfaction with conventional care.[17,105] In developing countries like India, high patient loads limit personalized counselling on NCD risk factors. Recent research shows that integrating non-physician health workers into NCD management can be effective.[106] A community approach in North India demonstrated how involving health workers significantly reduced systolic blood pressure and improved adherence to antihypertensive medication.[107] Furthermore, the World Health Organization's Package of Essential NCD (WHO PEN) interventions outlines strategies to combat NCDs, implementable by both physicians & health care support staff. Countries like India, Bhutan, and the Democratic Republic of Korea have adopted these protocols, resulting in significant improvements in blood pressure, glucose levels, & management of behavioural risk factors. Moreover, nurse-led clinics are making a valuable impact in managing chronic diseases.[108-112]

Limitations

A key limitation is the lack of a quality assessment for the included studies, which means some studies can be of poor quality, potentially affecting the robustness of findings. Additionally, only open-access articles were reviewed, as studies behind paywalls (such as those on ScienceDirect) which may limit comprehensiveness of the results.

Conclusion

The multifaceted barriers to NCD self-management in LMICs emphasize the importance of holistic approach that considers demographic, psychosocial, resource-related, health-system-related, environmental, and social factors. By addressing these interconnected components through targeted interventions, stakeholders can enhance self-management practices and ultimately improve well-being outcomes. Subsequent research should focus on investigating these forces to guide the formulation of impactful, culturally sensitive and tailored strategies that empower individuals and communities in managing NCDs.

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