Treatment Adherence in Diabetic Individuals in Rural India and Variables Influencing It: A Review of Studies Conducted in India and Recommendations for Future Research

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ABSTRACT

Diabetes is one of the leading causes of morbidity and mortality in the world and India accommodates one in seven adults living with diabetes. Poor adherence to prescribed therapy is a growing concern among diabetics where they skip, adjust, or miss medication doses or refuse treatment entirely, subverting the benefits of medical care.The objectives were to review the prevalence of diabetes in India and LMICs, treatment adherence among diabetics in India and factors that contribute to non-adherence to treatment for diabetes in adults. The narrative review includes 56 articles published through PubMed, ResearchGate and Google Scholar during the period 2011-2022, and has been analysed to meet the research objectives. An increasing and alarming trend of diabetes prevalence is seen in India with diabetes control among patients far from ideal. The studies indicate low to moderate treatment adherence among diabetics in India. Treatment adherence was reported to be lower in rural areas as compared to urban areas and lesser in illiterates as compared to literates. The factors influencing adherence to prescribed diabetes management regimen can be attributed to various socio-demographic variables, health system factors, nature of the condition and treatment, associated distress and quality of life. Early detection and treatment with a continuum of care is critical in reducing the burden of diabetes. The need of the hour is a strengthened and resilient capacity at state, district, and subdistrict levels, with an emphasis on promotive and preventive care and its two-way continuity with curative care.

Keywords: Treatment adherence, diabetes, compliance, Type 2 diabetes, diabetic complications, adherence scale, prevalence of diabetes

Introduction

Diabetes is one of the leading causes of morbidity and mortality in the world and with more than half a billion people living with diabetes today, it has proven to be an alarming and rapidly growing public health emergency of the 21st century.[1,2] The estimated number of diabetics in 2021 is 537 million adults (20-79-year age group) with a global age-adjusted comparative prevalence of 9.8%.[2] The estimated diabetes-

related death in the age group 20-79 years in 2021 is 6.7 million. Diabetes prevalence is expected to touch 643 million by 2030 and 783 million by 2045, as indicated by projections.[2]

Globally, India accommodates one in seven adults living with diabetes. India holds second position, after China, in the estimated prevalence (74.2 million), diabetes-related mortality (0.6 million) as well as undiagnosed cases (39.4 million). India currently has nearly 8.3% prevalence in the South East Asian (SEA) region.[2]

A majority of individuals incur a substantial burden of cost through out-of-pocket payments (OOP) owing to the progressive and chronic nature of diabetes.[3,4] The estimated country-level healthcare expenditure on diabetes mellitus in India was 31 billion USD in 2017, placing India in fourth place globally for the same. India exhausts approximately 5-25% share of the average Indian household income on the treatment of diabetes.[3,5]

The chronic nature of diabetes calls for adequate support for its patients to follow the prescribed treatment regimen. Various international bodies like the American Diabetes Association (ADA), World Health Organization (WHO) and the National Institute for Health and Care Excellence (NICE), have made specific recommendations about interventions to help people with T2DM change their behaviour and improve their overall well-being.[6,7] Several global initiatives are being introduced to address the diabetes burden, like Global Diabetes Compact, HEARTS Technical Package and Diabetes Compass.[8–10] In India, to address the rising burden of non-communicable diseases (NCDs), the National Programme for Prevention and Control of Cancers, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) was launched in 2010 by the Government of India, to provide preventive, promotive, curative and supportive care for NCDs through the public health care system.[11] However, there is still a rising burden of diabetes in the country also owing to non-compliance seen amongst the diabetics.

Patients have an active role in the management of chronic conditions such as diabetes. The commonly discussed tasks include compliance with medication, sustained dietary modulation, physical activity, glycaemic control, awareness about complications and promotive and preventive care. But the added responsibilities of the patients seldom discussed include identifying a facility to seek care, understanding their diagnosis and illness, negotiating social relations, managing associated costs and transportation, and navigating through services including follow-ups and referrals.[12,13]

Poor adherence to prescribed therapy is a growing concern among patients with chronic conditions where they skip, adjust or miss medication doses or refuse treatment entirely, subverting the benefits of current medical care.[14] Low adherence to prescribed medications accounts for 30-50% of treatment failures leading to sub-optimal treatment outcomes.[5] Non-adherence to treatment, including medications, may result in diabetes-related complications, [15] also contributing to impoverishment and catastrophic expenditure.

This review aimed to identify, select, and synthesise findings from reports and studies, to assess the prevalence of Type 2 Diabetes Mellitus (T2DM) in India and the factors that influence treatment adherence in diabetic individuals. The objectives were to review the prevalence of diabetes in India and LMICs, treatment adherence among diabetics in India and factors that contribute to non-adherence to treatment for diabetes in adults.

Methods

This scoping review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guidelines.

Study selection: Two independent reviewers (AG and NB) selected the studies based on a set of inclusion and exclusion criteria. Both reviewers agreed with the selection of articles and were supervised by ND and final review was done by AK

Search strategy: A total of 285 relevant abstracts were obtained from the initial search, from which 120 full-text articles were selected for an in-depth review after screening the search result in three stages: a) by scanning their titles; b) abstract screening; and c) full-text screening. For our final analysis, 56 original research and review articles published between 2011 and 2022 were included. The search terms included 'diabetes' AND 'prevalence of diabetes' AND 'diabetes treatment' AND 'treatment adherence' AND 'adherence scales' AND 'adherence factors' AND 'region (India and LMICs)'. This search strategy was used to identify published papers in PubMed, ResearchGate and Google Scholar. The detailed search strategy has been provided as a Supplementary File.

Results

The Diabetes Epidemic in India

The global burden of age-standardised disability-adjusted life years (DALYs) increased by 27.6% since 1990 to 801.5 DALYs per 100,000 population in 2019.[16] There is a substantial variation in both the trend and magnitude of burden due to diabetes-related diseases across regions and countries.[17] However, of the estimated adults with diabetes globally, 80% live in LMICs.[18] In a pooled sample of individual-level, nationally representative data from 55 LMICs, the diabetes prevalence (using equal weights for each country) was found to be 9.0% (95% CI 8.7-9.4) where only 43.95% reported a previous diabetes diagnosis. It was also found that coverage varied by treatment and there were substantial differences by country stratifications of geographical region and income.[18]

When comparing T2DM prevalence in India between 1990 and 2019 with the World Bank classification of countries, there is a steadily rising prevalence (2.47% in 1990 to 6.03% in 2019), but the incidence has recently surpassed that of upper-middle-income countries.[19,20] This points to a pattern of an accelerating epidemic of diabetes in India, while growth in other countries remains stable or plateaus.[20]

The first multicentric study on diabetes mellitus in India was launched by the Indian Council of Medical Research (ICMR) in 1971 and its prevalence was estimated in six Indian cities (Ahmedabad, Kolkata, Cuttack, Delhi, Pune and Thiruvananthapuram) and surrounding villages. The condition was found to be prevalent in 2.1% of urban areas and 1.5% of rural areas.[21] More than two decades later, the National Urban Diabetes Study sampled people from six major Indian cities (Chennai, Hyderabad, Mumbai, Calcutta, Bangalore, and New Delhi) and found prevalence ranging from 9.3% (95% CI 7.7-10.1) in Mumbai to 16.6% (95% CI 14.6-18.6) in Hyderabad.[21] Over the last five decades, the prevalence of diabetes in rural and urban India has increased from 2.4% and 3.3%, respectively, in 1972 to 15% (95% CI 9-21) and 19% (95% CI 16-22), respectively, in 2015–2019; which is higher than the global rural (7.2%) and urban (10.8%) prevalence of diabetes.[22]

In a cross-sectional, population-based study done in rural Tamil Nadu and urban Delhi, the urban population were found to have a higher rate of diabetes (p=0.002).[23] Among the urban population, 13.6% had T2DM and one-fifth (17.4%) of them were unaware of their condition. Among the rural population, 8.4% had T2DM and one-fourth (25.0%) were unaware of their condition. Although the prevalence of diabetes was higher in the urban population, mean HbA1c was found significantly higher among rural patients than urban patients. A recent study conducted in rural Andhra Pradesh reported the prevalence of

known diabetes (self-reported) to be 6.04% and the overall prevalence to be 9.77% (95% CI 9.31-10.24).[24]

Measuring Treatment Adherence in Diabetes Patients

The extent to which a person's behaviour corresponds to health-related advice is defined as patient compliance or adherence.[25] The gold standard for assessing adherence to medication is the use of electronic adherence monitoring or direct observation therapy. However, these are resource intensive and therefore impractical in certain settings.[26] Therefore, self-reporting questionnaires are more commonly used for measuring treatment compliance in diabetics (e.g., MMAS, MARS, MED or BAR scales). A brief on MMAS and MARS scales has been provided in the Supplementary File for reference as these are the two commonly used scales in the studies included in this review paper.

While the self-reporting questionnaires are simple, cost-effective and provide real-time feedback relating to adherence behaviour and its associated factors, their limitations include recall bias, eliciting socially acceptable responses and overestimating adherence behaviour.[27] It is also important to note that while the validity of self-reporting measures has been supported by some diabetes-specific research, a review of studies for diabetes treatment adherence showed that only less than half (42.9%, 6 out of 14) of the studies had a statistically significant relationship between self-reporting measures and HbA1c levels.[28] Therefore, it is of utmost importance to strengthen the validity and precision of these measures and scales, by defining the specific adherence constructs studied, optimising question response formats and recall period, addressing social desirability concerns and managing the qualitative nature of components.[28]

Treatment adherence amongst diabetic individuals in India

Treatment adherence, in the context of diabetes, covers an array of self-care behaviours constituting home glucose monitoring, adjustment of food intake, administration of medications, regular physical activity, foot care and regular medical visits.[29] Diabetes is complicated by a multitude of factors, such as the *chronic* nature of the disease, the lifelong requirement for medications and lifestyle changes, and the need to cope with social, cultural and psychological distress that may occur with the disease. Amidst these complexities, adhering to treatment recommendations is reported to be a challenge.[29]

All the studies discussed in this section are of cross-sectional design and have been conducted in either a community or hospital setting across various regions (South, North and Central) of India. The review lacks representation from the North-Eastern States due to the dearth of literature from the region. The studies reviewed mostly indicate low to moderate adherence [30–40] among the Indian population. However, one community-based survey conducted among NCD patients reported good adherence among diabetics with 83.6% on regular medication [41] and a hospital-based survey found 82.1% of diabetics to be adherent to treatment.[42]

Among the three studies conducted in a hospital setting that used the MMAS-8 scale to measure treatment adherence, there was considerable variation in the adherence rates. Low adherence rates varied from 33% in a study from Delhi,[37] to 43.5% in a study from Karnataka,[33] to 62% in a study from Odisha.[35] Poor adherence rate (MMAS-8 score <6) of 74% (95% CI= 69.2-78.3) was reported by a study conducted in a rural community setting in Kerala.[40]

When comparing urban and rural populations, a community-based study from Karnataka done in 2018 reported the adherence rate to be more in the urban population (60%) as compared to the rural population (40%); and the overall adherence to anti-diabetic medication was found to be 62%.[38] Among the two

hospital-based studies using the MARS-10 questionnaire to measure treatment adherence, the study from Uttarakhand found a good adherence score of 44%,[39] and the study from Karnataka found that 82.1% were adherent to their medications.[42]

A study set at a tertiary care hospital in Puducherry reported that one-third, 39% (95% CI 36.5–42.6) of patients with diabetes did not adhere to medications and three-fourth had unsatisfactory glycaemic control.[31] Another study in a similar setting from Andhra Pradesh found the overall adherence rate for medication to be 47.85%.[30] A community-based study from rural Tamil Nadu reported low adherence in 45.4% of diabetics.[34] Additionally, a community-based study from urban slums of Maharashtra found that 96.5% of diabetics had missed taking medicines on any two days in the past two weeks and 41.2% of patients had taken all their medicines the previous day.[36]

Factors associated with non-adherence to diabetes treatment

Socio-demographic factors. The most common factor reported for non-adherence to diabetes treatment in the reviewed studies was cost-related; high treatment cost of diabetes,[32,41] cost of medicines in private facilities,[34] and financial constraints of the patient [30,36]. Patients with lower monthly per capita expenditure were found to be less adherent.[40]

Gender and age were found to have a relation to adherence behaviour, but varied across studies. One study reported higher adherence among females [41] whereas others reported low adherence among females [31,35] compared to males. The same pattern was seen with age where non-adherence was associated with younger age (<40 years) by one study,[37] whereas another study reported older age (>60 years) to be associated with non-adherence to treatment.[38]

Literacy, occupation and educational status of patients were found to be related to adherence where higher adherence was reported in literates compared to illiterates,[34,35,38] higher education status compared to lower education status,[37,42] graduates compared to those who completed higher secondary education[35] and homemakers compared to daily wage workers.[31] Personal habit was cited in a study where low adherence was reported in tobacco users compared to non-tobacco users.[31] Obesity was another factor reported to be associated with non-adherence.[38] Patients often reported that they missed a dose or medication due to forgetfulness or a busy schedule owing to work.[30,36,38] Lack of family support was another reported barrier.[32,40]

Nature of the condition. The asymptomatic nature of the condition was a factor reported for non-adherence.[41] It was also noted that patients with reported diabetes-related complications had a higher adherence rate compared to those with no reported complications.[35] The duration for which the patient has been living with diabetes is another factor where lesser duration was found to be related to non-adherence.[34,37]

Multiple doses and frequency of medication,[30,38] insufficient symptom relief,[32] absence of a comorbid condition [34] and not having a glucometer [37] were also reported causes for non-adherence. The patients using oral hypoglycaemic agents, monitoring blood sugar levels irregularly, and those resorting to symptomatic management were found less adherent to medications.[40]

Health-system factors. Low quality of doctor-patient relationship (OR= 3.3, CI- 1.3-8.3), seeking treatment from a private facility (OR= 0.54, CI- 0.34-0.87),[34] and limited counselling from providers were found to be barriers to medication adherence.[40] Additionally, factors like distance and transportation

to the health facility,[31,32,34] timing of facilities,[34] non-accessibility to diabetes medication,[30] and diabetes diet [32] were also reported causes for non-adherence. Other factors include perceived side effects of drugs,[30,34] and lack of knowledge about the condition and the effects of missing medication or doses.[34]

Associated Distress and Quality of Life. A study that assessed the effect of distress on adherence to medicines using the Diabetes Distress Scale and MMAS-8 found an association between distress and adherence. Univariate analysis indicated good adherence to antidiabetic medication among participants with low regimen distress (OR 4.25, CI 1.94–9.30), low physician distress (OR 5.71; CI 1.50–21.66) and low interpersonal distress (OR 2.62; CI 1.13–6.05). The multivariate analysis found a significant association only between low regimen distress (OR 2.94; CI 1.25–6.92) and good adherence to medication among participants.*[33]* A study that assessed adherence to medication and quality of life (QoL) using MARS-10 and WHO QoL BREF scales found that patients with good adherence scores had significantly higher mean overall perception of QoL and health scores compared to patients with low adherence scores.*[39]*

Discussion

India, over the last decade, has seen concerted efforts in developing an integrative and collaborative approach to tackling NCDs. In 2015-16, approximately 1.29 crore people were screened at NCD Clinics as part of NPCDCS, where 8% were found to be diabetic.[11] The National NCD Monitoring Framework has 21 indicators and 10 targets to drive progress in the prevention and control of NCDs by 2025.[43,44] To ensure effective implementation and integration of programs across sectors, India developed a National Multisectoral Action Plan for the prevention and control of common NCDs for 2017-2022 using a "Whole of Government" approach.[43] National health information systems have also improved over the last decade. In mobile technology, the mDiabetes application has been launched to create awareness, in collaboration with WHO.[45] The frontline workers, ASHAs, delivering free-of-cost NCD drugs at the beneficiary's doorstep during the peak of the COVID-19 pandemic was a commendable initiative in ensuring adherence to medication during the pandemic.[46] However, the implementation of NPCDCS across all levels and regions is not uniform and remains a challenge we need to overcome. [43,47]

With LMICs struggling with the double burden of diabetes and global infection, we need greater knowledge on how the management of diabetes can impact its risk for infection [48] and act towards synergy. India has taken a step through National Framework for Joint TB-Diabetes Collaborative Activities, coordinating the Revised National Tuberculosis Control Programme (RNTCP) and NPCDCS to reduce TB and diabetes co-morbidity.[49]

An increasing and alarming trend of diabetes prevalence is seen in India with diabetes control among patients far from ideal. Several studies discussed in this review have confirmed the inadequate glycaemic control, delay in initiation of treatment and non-compliance issues with T2DM in India. Treatment adherence was reported to be much lower in rural areas as compared to urban areas and much less in illiterates as compared to literates.

The factor most commonly associated with non-adherence to diabetes treatment is the cost of treatment. This includes the direct costs of treatment and recommended diet, and the indirect costs of transportation and associated loss of wages. Contrastingly, low adherence to treatment regimen leads to suboptimal treatment benefits or even treatment failure, adding subsequent negative financial impact on the patient, their family and society at large. It was estimated in a longitudinal cohort study done in the US in 2003

that each 10% increase in adherence to medication can lead to a mean decrease in 6.6% of all-cause hospitalisations.[50] This bidirectional influence of finance in diabetes care calls for costing studies set in various and relevant Indian contexts.

Literature suggests that poor provider-patient communication, not being convinced of the need for treatment, inadequate knowledge of medications, fear of adverse effects of the drug, long-term and complex regimens requiring numerous medications with varying dosing schedules, cost and inaccessibility hinder effective use of medicines.[15] The same has been reflected and pronounced through this review. Although the government primary care facilities are being strengthened to ensure accessible and affordable care for diabetes, various health system-related factors contribute to patients incurring high out-of-pocket expenditure, self-adjusting medications and doses, switching between providers or even opting out of diabetes care.

The guidelines developed by NICE to help diabetics adhere to their treatment have four main components- patient involvement in medication decisions, supporting and assessing adherence, reviewing medicines, and communication between healthcare professionals.[6] The WHO guidelines for assisting adults with diabetes also encourage interventions to remove barriers to adherence and increase awareness of the condition and treatment.[7] Patient education and support, for example, are highly recommended. This includes facilitating psychosocial support, providing medical nutrition therapy, promoting physical activity, and tobacco cessation counselling. Diabetes education and care specialists play an important role in assisting diabetics to follow the prescribed treatment regimen.[51] Furthermore, prioritisation of patient-centred care and the patient-provider relationship is recommended measures to improve the overall health of diabetics.[52]

Although these recommendations appear to be comprehensive and practical, they are not tailored to address the numerous and complex factors pertaining to treatment non-adherence.[51] Therefore, to promote adherence, healthcare providers must first understand the patient's reasons for not following the prescribed treatment. This would also entail studies to explore the health system factors influencing treatment adherence. Raising awareness among policymakers and engaging health economists, social scientists and the pharmaceutical industry in strategy development is also crucial. It is an urgent global diabetes priority to scale up the health system's capacity in providing treatment not only to lower blood glucose levels but also to address the risk factors for cardiovascular diseases like hypertension and high cholesterol.[18] The current scenario of the COVID-19 pandemic challenging our health systems also calls for a demonstration of the same.

Conclusion

The rising prevalence of diabetes coupled with half the cases going undetected, not only contributes to diabetes-related mortality and morbidity but also acts as an intermediate risk factor for major NCDs. Delayed treatment initiation, non-adherence to treatment protocol and care discontinuation is associated with poor clinical outcomes and potential complications.[53–55] Thus, early detection and treatment with a continuum of care are critical in reducing the burden of diabetes.

Evidence suggests that the prevalence of diabetes is higher in urban regions compared to rural, however, treatment adherence was found to be lower in rural areas. This calls for equal focus on both urban and rural regions of India with a context-specific approach. With the strong influence of social determinants on health long recognised and also reflected through the factors highlighted in this review, there is a felt

need for a comprehensive approach, as the challenges posed by diabetes can neither be addressed through a generalised intervention strategy nor a unilateral policy.

To ensure the continuum of care, it is of paramount importance that we have an efficient, resilient and equitable health system in place for its people. This involves improved governance of the health sector, partnering across sectors, laying platforms for delivering care through workforce, skills, resources, tools, and medicines and also measuring and using data for assessments.[56] High-quality primary care can essentially avert the complications of diabetes like kidney failure, blindness and lower limb amputation. Recognising the need to halt and reverse the growing incidence of NCDs, the National Health Policy 2017 has recommended an integrated approach with a focus on diabetes and hypertension, to ensure the reduction of morbidity and preventable mortality.

The government of India has taken several initiatives through National Health Mission to prioritise NCDs, focusing on diabetes as an important component. Universal screening of common NCDs as part of Comprehensive Primary Healthcare (CPHC) was a first step to ensuring population-based screening and establishing a mechanism for the early detection of diabetes, with an inbuilt follow-up process, facilitating treatment and adherence amongst NCD patients. The need of the hour is a strengthened and resilient capacity at state, district, and subdistrict levels, with an emphasis on promotive and preventive care and its two-way continuity with curative care.

Declarations
Consent for publication: YES

Ethical Consideration: No ethical consideration was done for this scoping review as no human subjects were a part of the study

Availability of data and materials: NA

Competing interests: The authors declare no conflict of interest.

Funding: No funding was received to assist with the preparation of this manuscript

The authors have no financial or proprietary interests in any material discussed in this article.

Author's contributions and NM prepared the first draft of the manuscript. ND reviewed the different versions of the manuscript and provided suggestions on improving the draft. AK critically reviewed and contributed to writing the discussion and conclusions section. All the authors approved the submitted version of the manuscript.

Acknowledgements: NA

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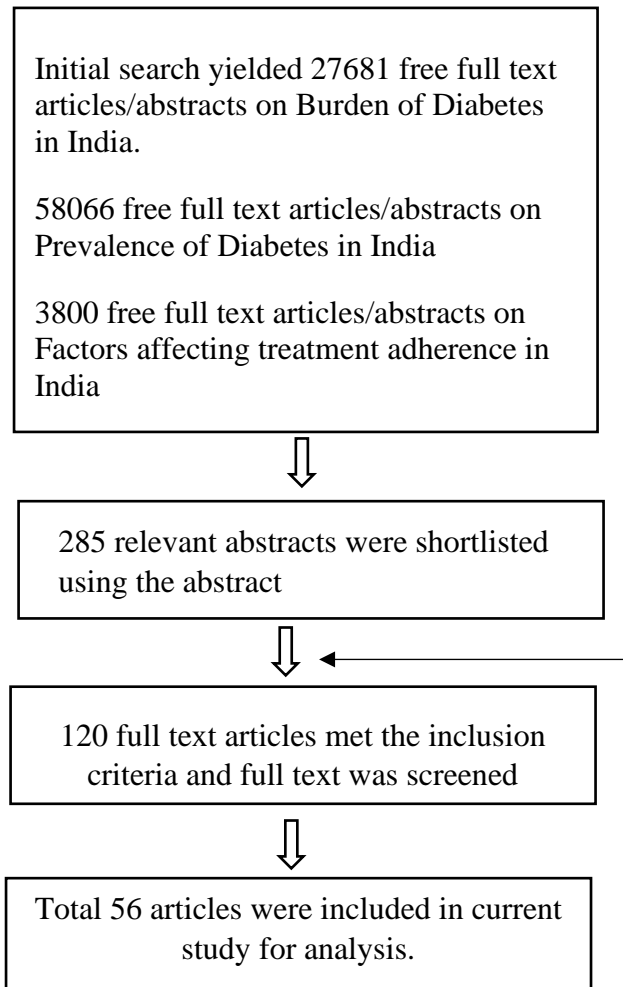
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Annexure

I. PRISMA Flow Chart

Initial search yielded 27681 free full text articles/abstracts on Burden of Diabetes in India.

58066 free full text articles/abstracts on Prevalence of Diabetes in India

3800 free full text articles/abstracts on Factors affecting treatment adherence in India

⇓

285 relevant abstracts were shortlisted using the abstract

⇓

120 full text articles met the inclusion criteria and full text was screened

⇓

Total 56 articles were included in current study for analysis.

Inclusion criteria

Prevalence of Type 2 Diabetes Mellitus, adherence to treatment in diabetics and factors affecting treatment adherence in India.

Eligible study designs included:

a. Systematic Reviews and meta-analysis

b. Analytic study designs (case-control studies, cohort studies, analytical cross- sectional studies)

c. Descriptive studies (case report, case series, cross-sectional studies),

d. Qualitative Research

e. Articles that were published from 2011-2022

Exclusion criteria

Articles which were unrelated to topic concerned, and studies that did not satisfy the review purpose

II. Self-reporting questionnaires for measuring treatment adherence used in the reviewed studies

(i) Morisky Medication Adherence Scale (MMAS)

A widely used self-reporting questionnaire assessing medication adherence is Morisky Medication Adherence Scale-8 (MMAS-8) (see Figure 1) as various studies indicate towards its optimal sensitivity, specificity, validity and reliability.[1–3] A higher score on the scale is evaluated as better adherence and a lower score on the scale indicate non-adherence. The scale originally developed with four items has now been modified and expanded to include eight items, MMAS-8. The four-item version, MMAS-4 captured the forgetfulness and symptom severity whereas the eight-item version also looks at the situational and emotional point of adherence to medication.[4] MMAS records both intentional and unintentional nonadherence whereas most methods currently employed fail to differentiate between specific types of nonadherence behaviour like forgetting unintentionally against missing or reducing doses intentionally.[5] In MMAS-8, the total score ranges from 0 to 8 and medication adherence is categorised as low adherence (<6), medium adherence (6-7) and high adherence (=8).[1]

	YES	NO
1. Do you sometimes forget to take your medication?		
2. People sometimes miss taking their medications for reasons other than forgetting. Over the past 2 weeks, were there any days when you did not take your medication?		
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?		
4. When you travel or leave home, do you sometimes forget to bring your medication?		
5. Did you take all your medication yesterday?		
6. When you feel like your symptoms are under control, do you sometimes stop taking your medication?		
7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		
8. How often do you have difficulty remembering to take all your medication? Never/Rarely…………….......... Once in a while……………….. Sometimes…………………….. Usually…………………………. All the time……………………..		

Figure 1. Morisky Medication Adherence Scale (MMAS-8)[6]

(ii) Medication Adherence Report Scale (MARS)

Another self-reporting adherence scale that looks at both intentional and unintentional non-adherence is the 10-item Medication Adherence Report Scale (MARS-10) (see Figure 2). In addition to being a reliable scale, its design minimises the social desirability bias by setting a tone that takes away judgement from non-adherence behaviour. A shorter version of MARS-10, a five-item scale Medication Adherence Report Scale (MARS-5) uses non-judgemental and non-threatening item phrases that describe a range of non-adherent behaviour. It also helps in categorising patients along the dimension of adherence rather than a

dichotomous response involving "yes/no" or "high/low" and demonstrates acceptable reliability and validity.[5]

No	Question
1	Do you ever forget to take your medication?
2	Are you careless at times about taking your medication?
3	When you feel better, do you sometimes stop taking your medication?
4	Sometimes if you feel worse when you take the medication, do you stop taking it?
5	I take my medication only when I am sick
6	It is unnatural for my mind and body to be controlled by medication
7	My thoughts are clearer on medication
8	By staying on medication, I can prevent getting sick
9	I feel weird on medication
10	Medication makes me feel tired and sluggish

Figure 2. Medication Adherence Report Scale- 10 (MARS-10)[7]