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Barriers and facilitators to implementing guideline-based asthma management in Somaliland: a CFIR-informed cross- sectional study of physicians

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Abstract

Background

Adherence to asthma management guidelines remains inconsistent in many healthcare settings, particularly in low-resource contexts. Identifying determinants that influence guideline implementation is essential for improving asthma care. This study assessed healthcare providers' adherence to guideline-based asthma management in Somaliland and identified perceived barriers and facilitators using the Consolidated Framework for Implementation Research (CFIR).

Methods

A cross-sectional survey was conducted among physicians in Somaliland. Data were collected using a structured questionnaire assessing provider characteristics, knowledge of asthma guidelines, attitudes toward guideline use, self-efficacy and practice behaviours, and perceived barriers to and facilitators of adherence. Descriptive statistics summarized responses, and logistic regression was used to examine associations between adherence and selected predictors. Findings were mapped to CFIR domains to identify multilevel implementation determinants.

Results

A total of 147 physicians participated. Overall, 57% demonstrated good knowledge of asthma management guidelines and 78% reported positive attitudes toward guideline use, while 54.4% reported good adherence to guideline-based asthma management. The most frequently reported barriers included poor patient adherence to treatment (83.0%), lack of diagnostic tools such as spirometry (78.3%), limited access to asthma educators (76.8%), and limited availability of inhaler devices (73.5%). Key facilitators included regular asthma guideline training (85.7%), sufficient consultation time (85.7%), and improved availability of inhaler devices (83.7%).

Conclusion

Adherence to asthma management guidelines in Somaliland is influenced by determinants including provider knowledge, health system resources, and patient-related factors. Implementation strategies addressing training, diagnostic capacity, medication access, and patient education are needed to improve guideline uptake and strengthen asthma care delivery.

CONTRIBUTIONS TO THE LITERATURE

• This study provides one of the first implementation-focused assessments of barriers and facilitators to guideline-based asthma management in Somaliland, contributing context-specific evidence from a low-

resource healthcare setting where implementation research on chronic respiratory diseases remains limited.

• Using the Consolidated Framework for Implementation Research (CFIR), the study systematically identifies multilevel determinants influencing asthma guideline adherence, including provider-level factors (knowledge and self-efficacy), organizational constraints (limited diagnostic tools and inhaler availability), and patient-level barriers (medication affordability and adherence).

• The findings highlight that knowledge and positive attitudes toward guidelines alone are insufficient to ensure implementation in resource-constrained settings, emphasizing the importance of addressing structural health-system barriers.

• By mapping determinants to CFIR domains, the study provides a structured foundation for designing contextually appropriate implementation strategies to improve adherence to evidence-based asthma management in similar low- and middle-income healthcare systems.

INTRODUCTION

Asthma is a chronic inflammatory airway disease affecting an estimated 262 million people globally and remains a leading cause of years lived with disability [1, 2]. Although effective pharmacologic therapies and structured self-management strategies are widely available, asthma-related morbidity and mortality disproportionately affect low- and lower-middle-income countries, where underdiagnosis, undertreatment and inconsistent implementation of evidence-based care persist [1, 3]. The Global Initiative for Asthma (GINA) provides detailed, regularly updated recommendations for diagnosis, pharmacologic management, inhaler technique assessment, and supported self-management [4]. However, translating these recommendations into routine clinical practice remains challenging across diverse healthcare systems.

Suboptimal adherence to asthma guidelines has been documented in both high-income and resource-constrained settings. Studies in primary care report inconsistent use of spirometry, inadequate provision of written asthma action plans, inappropriate reliance on short-acting beta-agonists, and delayed initiation of inhaled corticosteroid (ICS)-containing therapy [5–7]. In sub-Saharan Africa, implementation gaps are compounded by limited diagnostic infrastructure, restricted access to inhaled medications, and high out-of-pocket costs [8, 9]. Mortimer and colleagues describe asthma care in the region as constrained by structural resource limitations, while Kirenga *et al*. highlight the substantial burden of severe asthma linked to delayed diagnosis and inadequate long-term control [8, 10]. These findings indicate that availability of guidelines alone is insufficient to ensure evidence-based care.

Implementation science offers conceptual tools to understand and address such gaps. The Consolidated Framework for Implementation Research (CFIR) synthesizes constructs across five domains, namely intervention characteristics, outer setting, inner setting, characteristics of individuals, and implementation process, to explain determinants of implementation effectiveness [11]. In the

context of asthma guideline adherence, CFIR highlights how factors such as perceived complexity of guidelines (intervention characteristics), patient needs and financial constraints (outer setting), organizational resources and culture (inner setting), clinician knowledge and self-efficacy (characteristics of individuals), and availability of training or feedback mechanisms (process) may interact to influence practice.

Empirical studies align closely with these CFIR domains. At the individual level, knowledge gaps and variable self-efficacy have been associated with lower adherence to guideline-recommended care [6, 12]. Even where clinicians express positive attitudes toward guidelines, perceived complexity and time burden can reduce uptake [5, 13]. Within the outer setting, medication affordability, cultural beliefs, and patient adherence behaviours shape prescribing and monitoring decisions [14]. Inner setting determinants—including limited access to spirometry, high patient volume, insufficient continuing professional development, and weak institutional support—further constrain implementation [8, 9, 12]. Process-related determinants such as lack of structured audit, feedback, or facilitation mechanisms also hinder sustained adherence [15].

In Somaliland, asthma represents a growing but under-recognized noncommunicable disease burden. The Somaliland Health and Demographic Survey reports a prevalence exceeding 6% [16]. The health system faces workforce shortages, limited diagnostic capacity, and constrained financial resources [17]. Despite these structural challenges, no published studies have examined healthcare providers' adherence to asthma management guidelines or systematically explored determinants of implementation in this setting. The absence of context-specific implementation evidence limits policymakers' capacity to design targeted strategies to improve asthma care.

From a CFIR perspective, Somaliland presents a complex implementation environment. Intervention characteristics may include perceived adaptability of GINA recommendations to local resource constraints. Outer setting factors likely involve patient affordability, cultural beliefs about inhaled therapy, and limited insurance coverage. Inner setting constraints may include insufficient spirometry availability, limited range of inhaler devices, high patient load, and variable organizational support for continuing education. Individual-level determinants include clinician knowledge, attitudes toward guideline utility, and confidence in managing exacerbations. Finally, implementation processes, such as training workshops, multidisciplinary collaboration, and clinical decision-support mechanisms, may be inconsistently available.

Understanding how these domains interact is essential for designing effective, contextually appropriate interventions. Evidence from other low- and middle-income settings suggests that multicomponent strategies, combining provider education, practice facilitation, access to diagnostic tools, and team-based care, can improve guideline adherence [15]. However, successful implementation depends on identifying locally salient barriers and facilitators rather than extrapolating from other contexts. Without such insight, interventions risk poor fit, limited uptake, and unsustained change.

This study therefore aimed to investigate perceived barriers and facilitators influencing healthcare providers' adherence to guideline-based asthma management in Somaliland. Guided by CFIR, the objectives were to: (1) assess healthcare providers' knowledge, attitudes and self-reported practices related to asthma guideline recommendations; (2) identify perceived barriers to adherence; (3) determine facilitators that enable guideline-concordant care; and (4) examine associations between provider characteristics and adherence. By explicitly mapping determinants to CFIR domains, this study seeks to generate actionable implementation evidence.

The findings are intended to inform multilevel implementation strategies aligned with GINA recommendations and tailored to Somaliland's healthcare context. In doing so, this work contributes to the limited body of implementation research addressing chronic respiratory disease management in the Horn of Africa and advances understanding of how global evidence-based guidelines can be effectively operationalized within resource-constrained primary care systems.

METHODS

Study design

We conducted a cross-sectional quantitative study to examine determinants of adherence to guideline-based asthma management among physicians practicing in Somaliland. The study was conceptually informed by the Consolidated Framework for Implementation Research (CFIR) [11], which guided the selection and categorization of determinants across domains including characteristics of individuals (knowledge, attitudes, self-efficacy), inner setting (organizational support, availability of diagnostic tools), outer setting (patient affordability and preferences), and implementation process (training exposure). A cross-sectional design was selected to provide a pragmatic assessment of implementation determinants and self-reported adherence within a resource-constrained health system, consistent with approaches commonly used in implementation research to identify context-specific barriers and facilitators prior to intervention development [18]. The study is reported in accordance with relevant methodological guidance for observational implementation studies [19].

Setting and participants

The study was conducted across the six administrative regions of Somaliland. Public-sector secondary and tertiary hospitals were selected as study sites because they represent the primary facilities in which asthma diagnosis and management are routinely delivered.

The target population comprised licensed medical doctors practicing in main public hospitals who were directly involved in diagnosing and managing asthma. Eligible participants included physicians working in medical wards, paediatric wards, outpatient departments, and emergency units. Physicians practicing exclusively in private hospitals, surgical specialties, obstetrics and gynaecology, ophthalmology,

otolaryngology, and non-clinical roles were excluded. Foreign physicians were also excluded to ensure contextual relevance to the local health system.

Sampling and sample size

In the absence of a comprehensive national registry of practicing physicians, the Somaliland Medical Doctors Association (SLMA) registry (N = 523) was used as the sampling frame. The sample size was calculated for estimation of a single proportion using a 95% confidence level and a conservative expected proportion of 50% to maximize sample size precision. The initial calculation yielded 384 participants. Finite population correction was applied due to the relatively small source population (N = 523), resulting in an adjusted minimum sample size of 221. Allowing for a 5% non-response rate, the final target sample size was 232 physicians.

A convenience sampling strategy was employed. Physicians who were present at participating hospitals during the data collection period and who consented to participate were included. Although non-probability sampling may limit generalizability, this approach was considered appropriate given logistical constraints, and the exploratory implementation focus of the study [18].

Data collection procedures

The study used a structured self-administered questionnaire developed to assess healthcare providers' adherence to guideline-based asthma management. The instrument consisted of five sections covering provider characteristics, knowledge, attitudes and perceptions, self-efficacy and practice behaviours, and perceived barriers and facilitators to guideline adherence. Knowledge was assessed using 12 multiple-choice questions based on asthma management guidelines. Attitudes, self-efficacy, and practice behaviours were measured using Likert-scale statements ranging from strongly disagree to strongly agree or from never to always. Barriers and facilitators were assessed using five-point scales ranging from "not a barrier" to "very major barrier" of "not a facilitator" to "major facilitator" respectively. The questionnaire also included a checklist assessing correct inhaler technique steps.

The questionnaire was delivered electronically via Google Forms. Eligible physicians were contacted individually through secure messaging platforms and provided with information about the study objectives and consent procedures. Participation was voluntary and anonymous. Prior to full deployment, the questionnaire was pilot tested among a small group of physicians to assess clarity, comprehension, and completion time. Minor wording adjustments were made based on feedback. Completed questionnaires were reviewed for completeness, and data were stored on a password-protected computer accessible only to the principal investigator.

Measures

Conceptual framework

Survey domains were mapped to CFIR constructs [11]. Knowledge, attitudes, and self-efficacy corresponded primarily to the “Characteristics of Individuals” domain. Organizational support, availability of spirometry, access to inhaler devices, and workload reflected “Inner Setting” constructs. Patient affordability, cultural factors, and adherence were categorized within the “Outer Setting.” Exposure to asthma-specific training represented an “Implementation Process” determinant.

Knowledge

Knowledge of guideline-based asthma management was assessed using multiple items addressing controller therapy selection, management of uncontrolled asthma, diagnostic confirmation (including spirometry), inhaler technique, follow-up frequency, adverse effects of corticosteroids, peak expiratory flow monitoring, and recognition of life-threatening asthma features. Correct responses were summed and categorized into good, moderate, or poor knowledge based on predefined thresholds.

Attitudes and perceptions

Attitudes toward asthma guidelines were measured using Likert-scale items evaluating perceived usefulness, trustworthiness, applicability to the local context, perceived complexity, and perceived time burden. Additional items assessed perceptions of patient-related and system-related barriers.

Self-efficacy and practice behaviours

Self-efficacy was assessed through agreement with statements regarding confidence in diagnosing asthma, selecting controller therapy, teaching inhaler technique, developing asthma action plans, and managing exacerbations. Practice behaviours included frequency of inhaler technique assessment, spirometry ordering, and perceived routine adherence to guideline-recommended care.

Perceived barriers and facilitators

Participants rated potential barriers and facilitators to adherence using structured Likert-scale items. Barriers included lack of diagnostic tools, limited inhaler availability, medication cost, patient non-adherence, high workload, limited continuing medical education, and cultural factors. Facilitators included availability of spirometry, access to asthma educators, affordable medications, regular training, sufficient consultation time, and access to diverse inhaler devices.

Adherence outcome

Self-reported adherence to guideline-based asthma management was operationalized as a composite measure derived from reported practice behaviours and categorized as good or poor adherence.

Data analysis

Data were cleaned, coded, and analysed using SPSS software (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies, percentages) were used to summarize participant characteristics and survey responses. Associations between provider characteristics (e.g., age, years of practice, training exposure), knowledge levels, attitudes, self-efficacy, and adherence were examined using chi-square tests. Statistical significance was set at $p < 0.05$ with 95% confidence intervals where applicable. Given the exploratory implementation focus, analyses were hypothesis-generating rather than confirmatory [18].

Ethical considerations

Ethical approval

was obtained from the University of Burao Institutional Review Board. Administrative permission was secured from participating hospitals. Participants provided informed consent electronically prior to questionnaire completion. No personal identifiers were collected. Data were stored securely and reported in aggregate form to preserve confidentiality.

RESULTS

Participants' characteristics

A total of 147 physicians participated in the study (Table 1). The majority were aged 30–39 years (68.7%), followed by 20–29 years (25.9%) and 40–49 years (5.4%). Most participants were male (83.0%), while females accounted for 17.0%. General practitioners constituted the largest professional group (78.9%), with smaller proportions of residents (7.5%), paediatricians (6.8%), internal medicine physicians (4.8%), emergency medicine physicians (1.4%), and family medicine specialists (0.7%). Regarding clinical experience, 39.5% had 1–3 years of practice, 25.2% had 4–6 years, 24.5% had 7–10 years, and 10.9% had more than 10 years. Most physicians reported seeing fewer than 10 asthma patients per week (88.4%). Additionally, 38.1% had formal postgraduate training, while only 29.3% had attended asthma-specific training within the previous three years. Overall, 54.4% of participants reported good adherence to asthma management guidelines, whereas 45.6% reported poor adherence (Table 1).

Knowledge of asthma management among providers

Figure 1 shows the distribution of participants' knowledge of asthma management and the proportion of correct responses across specific knowledge domains. Overall, 57% of participants demonstrated good knowledge, 40% had moderate knowledge, and 3% had poor knowledge (Figure 1A).

Regarding individual knowledge areas (Figure 1B), the highest proportion of correct responses was observed for knowledge of adverse effects of long-term high-dose oral corticosteroid use (96.6%). High levels of correct responses were also reported for confirming asthma diagnosis using the preferred test (94.6%), identifying cells involved in the early asthmatic response (94.6%), management of uncontrolled

asthma despite regular inhaled corticosteroid therapy (91.2%), and understanding key elements of an asthma action plan (90.5%).

Moderate knowledge levels were observed for follow-up frequency for well-controlled asthma (86.4%), peak expiratory flow monitoring (85%), and routine assessment of inhaler technique (85%). Lower proportions of correct responses were noted for identifying the most appropriate daily controller therapy for persistent asthma (64.6%), defining short-acting beta-agonist overuse (64.6%), and correct inhaler instructions (54.4%). The lowest proportion of correct responses was observed for recognizing clinical features suggestive of life-threatening asthma (46.9%). Overall, the results indicate generally good knowledge of core asthma management principles, particularly in asthma diagnosis and pharmacologic management. However, knowledge gaps were evident in recognising severe asthma features and certain practical aspects of management.

Practice self-efficacy and asthma management behaviour among providers

The distribution of healthcare providers according to their overall self-efficacy and practice behaviours related to asthma management is presented in Figure 2. Overall, most participants demonstrated moderate self-efficacy and practice (61%), while 36% reported good self-efficacy and practice, and only 3% reported poor levels.

High levels of confidence were reported for several core clinical tasks. A large proportion of participants indicated confidence in diagnosing asthma based on history, physical examination, and spirometry (87.7%). Similarly, 91.2% reported confidence in selecting appropriate controller therapy for adults, and 91.8% felt confident in teaching correct inhaler technique to patients. Confidence in developing individualized asthma action plans was also high (86.4%). However, confidence was lower for managing asthma exacerbations in outpatient settings, with only 51.0% agreeing or strongly agreeing that they felt confident in this area. Overall, the findings indicate generally moderate to high self-efficacy among providers for routine asthma management tasks, although lower confidence in managing exacerbations suggests an area where additional training and support may be beneficial.

Attitude of providers towards asthma guideline

The analysis of providers' attitude towards asthma guidelines (Table 2) revealed that most respondents expressed positive attitudes toward guideline use. A large majority agreed that following asthma management guidelines improves patient outcomes (89.8%) and that they trust the recommendations in current guidelines (84.4%). Additionally, 70.1% agreed that international asthma guidelines are applicable to their local clinical setting.

However, some perceived challenges were reported. About 23.1% of participants indicated that guidelines are too complex for routine consultations, while 66.7% disagreed with this statement. Nearly one-third (29.9%) indicated that adhering to guidelines is time consuming, whereas 54.4% disagreed. Patient-related and system-level factors which affect providers' attitude were also highlighted.

Specifically, 39.5% indicated that patient preferences prevent them from following guidelines, and 53.1% reported that medication costs hinder guideline-concordant prescribing. Furthermore, only 21.8% agreed that they receive adequate organizational support to follow asthma guidelines, while 63.3% disagreed. Overall, the findings indicate generally positive attitudes toward guidelines but highlight notable system and patient-related constraints affecting their implementation.

Analysis of predictors of guideline adherence among providers in Somaliland

Table 3 presents the multivariable logistic regression analysis examining the association between adherence to asthma management guidelines and selected provider characteristics. None of the examined predictors showed a statistically significant association with guideline adherence ($p > 0.05$). Although physicians with good knowledge of asthma had higher odds of adherence (adjusted OR = 1.717; 95% CI: 0.888–3.320), this association did not reach statistical significance ($p = 0.107$). Similarly, younger physicians aged less than 30 years (aOR = 1.047; 95% CI: 0.498–2.199; $p = 0.904$), male physicians (aOR = 1.291; 95% CI: 0.548–3.039; $p = 0.558$), and those in specialist medical professions (aOR = 1.213; 95% CI: 0.458–3.216; $p = 0.697$) were not significantly more likely to adhere to guidelines.

Practice-related characteristics also showed no significant associations. Physicians seeing fewer than 10 asthma patients per week (aOR = 0.817; 95% CI: 0.293–2.278; $p = 0.698$), those with postgraduate training (aOR = 1.063; 95% CI: 0.544–2.075; $p = 0.858$), and those with positive attitudes toward guideline use (aOR = 0.910; 95% CI: 0.413–2.003; $p = 0.814$) did not demonstrate significantly different adherence. Likewise, positive self-efficacy in practice (aOR = 0.788; 95% CI: 0.432–1.439; $p = 0.438$) and having less than seven years of clinical experience (aOR = 1.168; 95% CI: 0.593–2.302; $p = 0.653$) were not significantly associated with guideline adherence. Overall, the analysis indicates that none of the examined provider characteristics independently predicted adherence to asthma management guidelines in this study population.

Analysis of barriers and facilitators of asthma guideline adherence among providers in Somaliland

Figure 3 presents healthcare providers' perceptions of barriers (Figure 3A) and facilitators (Figure 3B) influencing adherence to guideline-based asthma management. Among the barriers, poor patient adherence to prescribed therapy was the most frequently reported, identified by 83.0% of participants. System-related constraints were also prominent, including lack of necessary diagnostic tools such as spirometry or peak expiratory flow meters (78.3%), limited access to asthma educators or trained nurses (76.8%), limited availability of inhaler devices or formulations at healthcare facilities (73.5%), and inadequate continuing medical education on asthma (72.1%). Financial barriers were also notable, with 61.2% of respondents indicating that patients' inability to afford controller medications hindered guideline-concordant care. Workload-related challenges were moderately reported, including lack of time during consultations (47.6%) and high patient load (47.0%). Guideline complexity was less frequently identified as a barrier (39.5%).

Regarding facilitators, several factors were perceived to support adherence to asthma management guidelines. The most frequently identified facilitators were regular training or workshops on asthma guidelines (85.7%) and sufficient consultation time per patient (85.7%). Other key facilitators included availability of a range of inhaler devices (83.7%), access to asthma educators or respiratory nurses (82.3%), affordable medication access or subsidy programs (78.2%), and availability of spirometry and other diagnostic resources (74.9%). Overall, the findings highlight the importance of improving healthcare system resources, provider training, and patient access to medications to enhance adherence to guideline-based asthma management.

CFIR-Based Mapping of Implementation Determinants

Barriers and facilitators influencing adherence to asthma management guidelines were mapped to domains of the Consolidated Framework for Implementation Research (CFIR) (Table 4.0). Determinants were identified across multiple CFIR domains, indicating that guideline adherence is influenced by a combination of individual, organizational, and patient-related factors. Within the intervention characteristics domain, most providers perceived asthma guidelines as beneficial, with 89.8% reporting that guideline use improves patient outcomes and 84.4% expressing trust in guideline recommendations, although 23.1% considered guidelines complex to implement in routine consultations. In the outer setting, patient-related factors were prominent barriers, including poor patient adherence to therapy (83.0%), medication affordability constraints (61.2%), and patient preferences influencing prescribing decisions (39.5%).

Within the inner setting, structural limitations were frequently reported, including lack of diagnostic tools such as spirometry (78.3%), limited access to asthma educators (76.8%), and limited availability of inhaler devices (73.5%), while only 21.8% of providers reported adequate organizational support for guideline implementation. The characteristics of individuals domain highlighted generally good provider knowledge (57% demonstrating good knowledge) and positive attitudes toward guideline use (78%), although some knowledge gaps and variations in self-efficacy were observed. Finally, determinants within the implementation process domain emphasized the importance of training and continuing professional development, with 85.7% identifying regular guideline training as a key facilitator and 72.1% reporting inadequate continuing medical education as a barrier. These findings demonstrate that effective implementation of asthma management guidelines requires addressing determinants across multiple CFIR domains.

DISCUSSION

This study examined perceived barriers and facilitators influencing healthcare providers' adherence to guideline-based asthma management in Somaliland using the Consolidated Framework for Implementation Research (CFIR). The findings indicate that determinants of adherence occur across multiple CFIR domains, including characteristics of individuals, inner setting, outer setting, intervention characteristics, and implementation processes. Overall, the results suggest that while healthcare

providers generally demonstrate adequate knowledge and positive attitudes toward asthma management guidelines, implementation in routine clinical practice is constrained by structural health-system limitations, patient-related factors, and insufficient implementation support.

More than half of the physicians in this study demonstrated good knowledge of asthma management recommendations, and most expressed positive attitudes toward guideline use. A large proportion agreed that asthma guidelines improve patient outcomes and reported trusting the recommendations contained within current guidelines. These findings are consistent with studies conducted in other settings, which show that healthcare providers generally recognize the value of asthma management guidelines but often encounter difficulties implementing them consistently in routine practice [20].

Despite relatively high knowledge and positive attitudes, adherence to guideline-based asthma management was not optimal. This finding reflects the widely documented knowledge-to-practice gap in healthcare, whereby awareness of evidence-based recommendations does not necessarily translate into consistent clinical implementation [21]. Previous studies have similarly reported variability in clinicians' adherence to asthma guidelines, particularly with respect to objective diagnostic testing, inhaler technique assessment, and provision of written asthma action plans [22]. The results of the present study therefore reinforce the importance of examining contextual determinants that influence guideline implementation.

Mapping the findings to CFIR domains demonstrated that barriers and facilitators to adherence operate at multiple levels, highlighting the need for multicomponent implementation strategies rather than interventions targeting individual knowledge alone.

Within the CFIR domain of **characteristics of individuals**, providers demonstrated generally good knowledge of asthma management and moderate to high levels of self-efficacy in performing routine asthma care tasks. Participants reported strong confidence in diagnosing asthma, selecting appropriate controller therapy, and teaching inhaler technique. These findings are consistent with previous research demonstrating that clinician knowledge and confidence are important determinants of guideline adherence [23].

However, knowledge gaps remained in some areas, particularly regarding recognition of severe or life-threatening asthma and certain practical aspects of guideline implementation. Similar gaps have been reported in studies conducted in primary care settings, where clinicians may be familiar with guideline principles but less confident in applying them in complex clinical scenarios [24]. Continuing medical education and targeted training programs have been shown to improve clinicians' competence and adherence to guideline-recommended asthma care [25].

Notably, in the present study, knowledge and positive attitudes were not independently associated with guideline adherence. This finding highlights the importance of contextual and organizational determinants in shaping implementation outcomes. Implementation science literature consistently

emphasizes that individual knowledge alone is insufficient to ensure guideline adoption when structural or system-level barriers exist.

Determinants within the inner setting domain emerged as major barriers to guideline adherence in this study. Many physicians reported limited access to diagnostic tools such as spirometry or peak expiratory flow meters, limited availability of inhaler devices, and lack of access to trained asthma educators or respiratory nurses. These structural constraints are consistent with previous studies conducted in low- and middle-income settings, where limited healthcare infrastructure often restricts the implementation of guideline-recommended asthma management practices [26].

Spirometry plays a central role in confirming asthma diagnosis and monitoring disease control. However, the present study found that many physicians rarely used spirometry in routine practice, largely due to lack of availability. Similar challenges have been reported in several healthcare systems, where limited access to diagnostic equipment reduces the use of objective testing in asthma management [27].

Organizational support also emerged as an important determinant. Only a small proportion of providers reported receiving adequate institutional support to follow asthma guidelines. Organizational factors such as leadership support, clinical workflow design, and team-based care structures have been identified as critical determinants of successful guideline implementation [28]. Strengthening organizational capacity to support evidence-based asthma management may therefore represent an important strategy for improving guideline adherence.

The outer setting domain also played a significant role in influencing guideline adherence. Patient-related barriers were among the most frequently reported determinants, particularly poor patient adherence to prescribed therapy and financial barriers to accessing asthma medications.

Medication affordability is a well-recognized determinant of asthma management outcomes. When patients cannot afford recommended treatments, clinicians may be forced to modify treatment plans or prescribe less effective alternatives, resulting in deviations from guideline recommendations. Financial barriers to medication adherence have been widely documented in asthma research and are particularly pronounced in resource-constrained settings [29].

Patient preferences and beliefs also influenced physicians' ability to follow guideline recommendations. Some participants reported that patient expectations or preferences sometimes prevented them from prescribing recommended therapies. Previous studies have shown that patient concerns about inhaled corticosteroids, cultural perceptions of medications, and misconceptions about asthma treatment can influence treatment adherence and clinical decision-making [30]. Addressing these patient-level determinants through education and shared decision-making strategies may improve adherence to recommended asthma therapies.

Within the intervention characteristics domain, asthma management guidelines were generally perceived as credible and beneficial. Most physicians reported trusting guideline recommendations and believed

that guideline adherence improves patient outcomes. These perceptions represent important facilitators for guideline implementation.

However, some participants reported that guidelines were complex or time-consuming to apply during routine consultations. Complexity is a commonly reported barrier to clinical guideline implementation, particularly in busy clinical settings where consultation time is limited [31]. Simplifying clinical decision pathways, integrating decision-support tools, and adapting guidelines to local resource contexts may help reduce perceived complexity and facilitate adoption.

Determinants within the implementation process domain emphasized the importance of training and professional development. Many participants reported that inadequate continuing medical education represented a barrier to guideline adherence. Conversely, regular training workshops and educational programs were identified as key facilitators for improving implementation.

Educational interventions have been shown to improve healthcare providers' adherence to asthma management guidelines, particularly when combined with additional implementation strategies such as audit and feedback, practice facilitation, and clinical decision support tools [32]. Implementation science research increasingly emphasizes the importance of tailoring implementation strategies to specific contextual barriers identified through frameworks such as CFIR [28].

Implications for implementation strategies

The findings of this study suggest that improving adherence to asthma management guidelines in Somaliland will require multilevel implementation strategies addressing determinants across several CFIR domains. Educational interventions alone are unlikely to be sufficient. Instead, comprehensive strategies addressing healthcare system infrastructure, organizational support, and patient-level barriers are needed.

Potential implementation strategies may include strengthening diagnostic capacity through improved access to spirometry, expanding training programs on asthma management guidelines, ensuring consistent availability of inhaler medications, and integrating multidisciplinary care models involving asthma educators or trained nurses. In addition, patient-focused interventions such as education programs and policies to improve medication affordability may help address important outer setting barriers.

Strengths and limitations

This study has several strengths. First, it represents one of the few studies examining determinants of asthma guideline adherence in Somaliland, providing important context-specific evidence from an under-studied healthcare setting. Second, the use of the CFIR framework enabled systematic identification and categorization of implementation determinants across multiple levels of the healthcare system.

However, several limitations should be acknowledged. The study relied on self-reported data, which may be subject to social desirability bias. Physicians may overestimate their adherence to guidelines or underreport barriers. Additionally, the cross-sectional design limits causal inference regarding the relationship between determinants and guideline adherence. Finally, the use of convenience sampling may limit the generalizability of the findings to all healthcare providers in Somaliland.

CONCLUSION

In conclusion, adherence to guideline-based asthma management in Somaliland is influenced by determinants across multiple CFIR domains. While healthcare providers generally demonstrate good knowledge and positive attitudes toward asthma management guidelines, implementation is constrained by structural health-system limitations, patient-related barriers, and gaps in continuing professional development. Addressing these challenges will require multilevel implementation strategies that strengthen healthcare infrastructure, enhance provider training, and improve patient access to affordable asthma medications. Applying implementation science frameworks such as CFIR can facilitate the development of targeted strategies to improve guideline adoption and ultimately strengthen asthma care delivery.

Abbreviations

CFIR
Consolidated Framework for Implementation Research
CME
Continuing Medical Education
GINA
Global Initiative for Asthma
ICS
Inhaled Corticosteroids
LMICs
Low–and Middle–Income Countries
OCS
Oral Corticosteroids
PEF
Peak Expiratory Flow
SABA
Short–Acting Beta–Agonist
SLMA
Somaliland Medical Doctors Association
WHO
World Health Organization

Declarations

Ethics approval and consent to participate:

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the University of Burao, Somaliland. Administrative permission to conduct the study was also obtained from the management of the participating public hospitals. All procedures were conducted in accordance with relevant ethical guidelines and regulations. Participation in the study was voluntary. Eligible physicians were provided with information about the study objectives, procedures, and confidentiality measures before participation. Informed consent was obtained from all participants prior to completion of the questionnaire.

Consent for publication:

Not applicable

Competing interests:

The authors declare that they have no competing interests.

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Author Contribution

OOO, LT, and ANJ conceptualised the idea for the manuscript. ANJ collected data. ANJ, OOO, LT, OH, and AAF conducted literature search and data analysis. OOO and AAF produced the first draft of the manuscript. LT, YAA, and LT provided feedback on the manuscript. AAF and YAA revised the first draft to incorporate feedback from authors. All authors reviewed and approved the manuscript for submission for publication.

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Footnote: Not applicable

Data Availability

All data generated or analysed during this study are included in this published article.

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Tables

Tables are available in the Supplementary Files section.

Figures

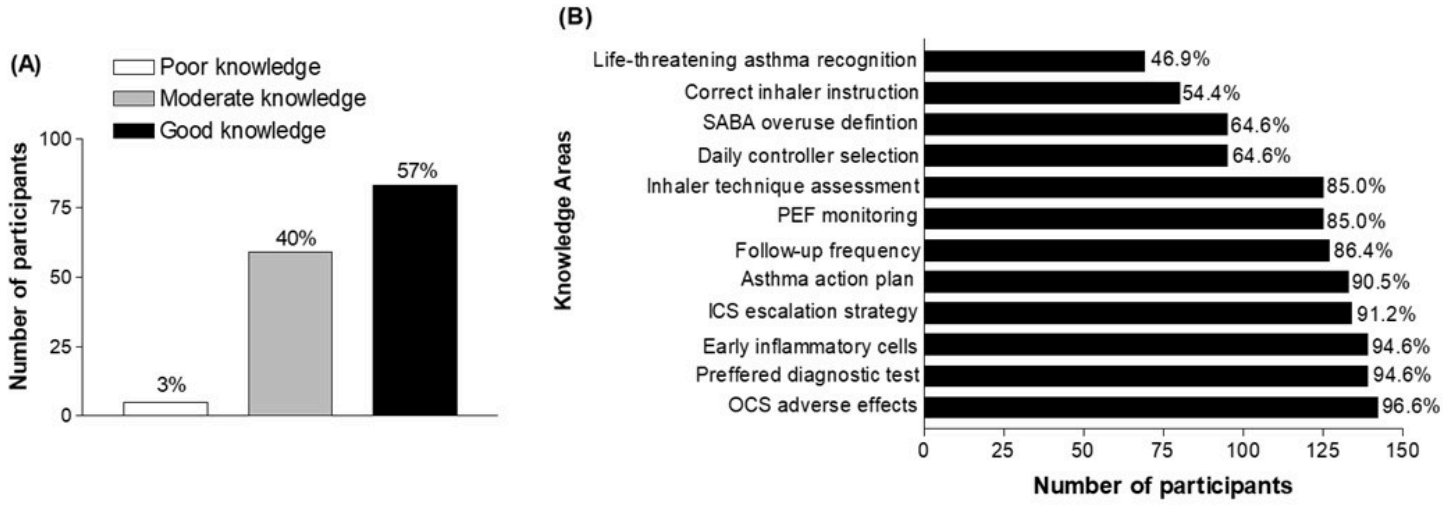


Figure 1

Knowledge of asthma management among selected providers in Somaliland. Poor knowledge = Score of 0 – 33%, Moderate knowledge = Score of 34 – 66% and Good knowledge = Score of 67 – 100%. Percentage values represent the proportion of participants in each category of knowledge (A) or with correct response to each knowledge area (B).

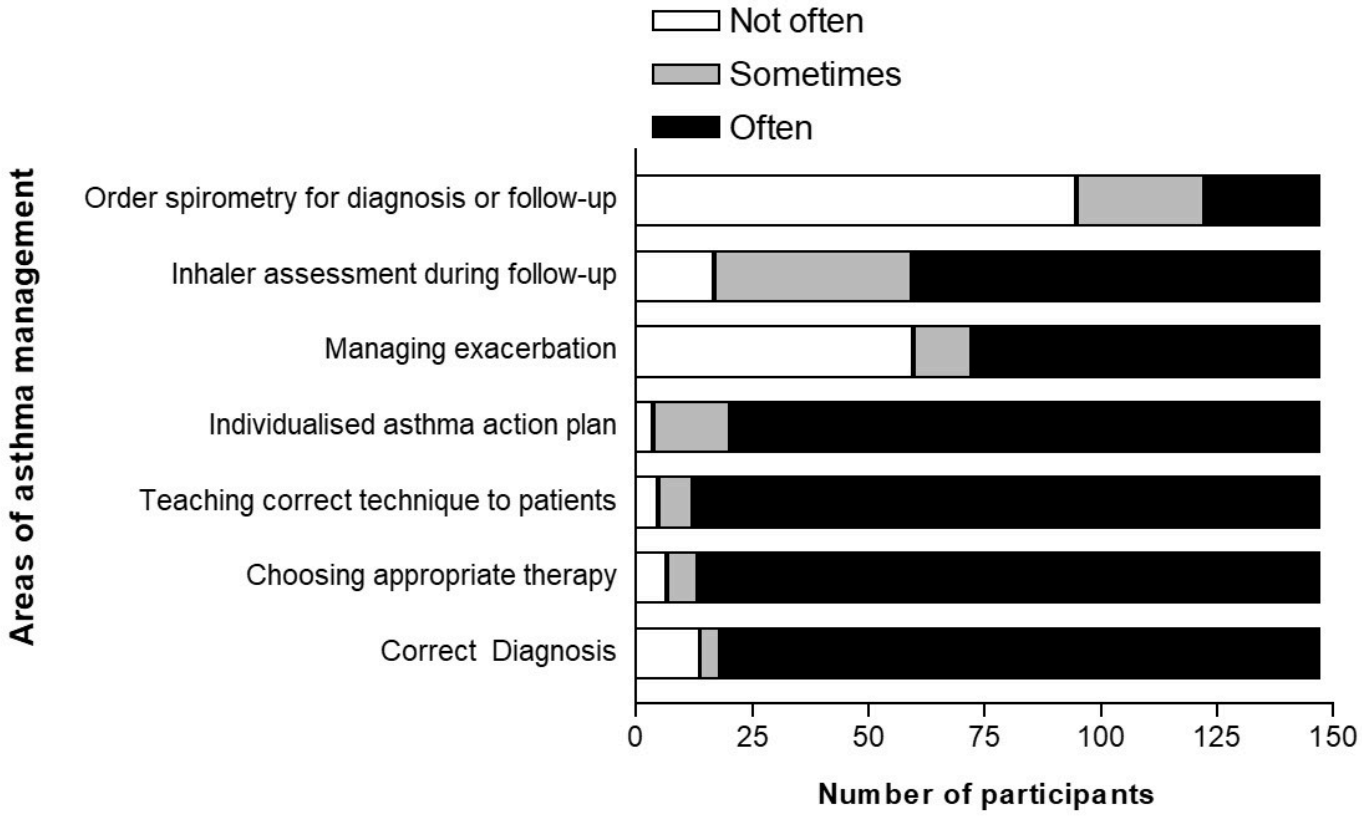


Figure 2

Distribution of providers based on their practice self-efficacy and asthma management behaviours.

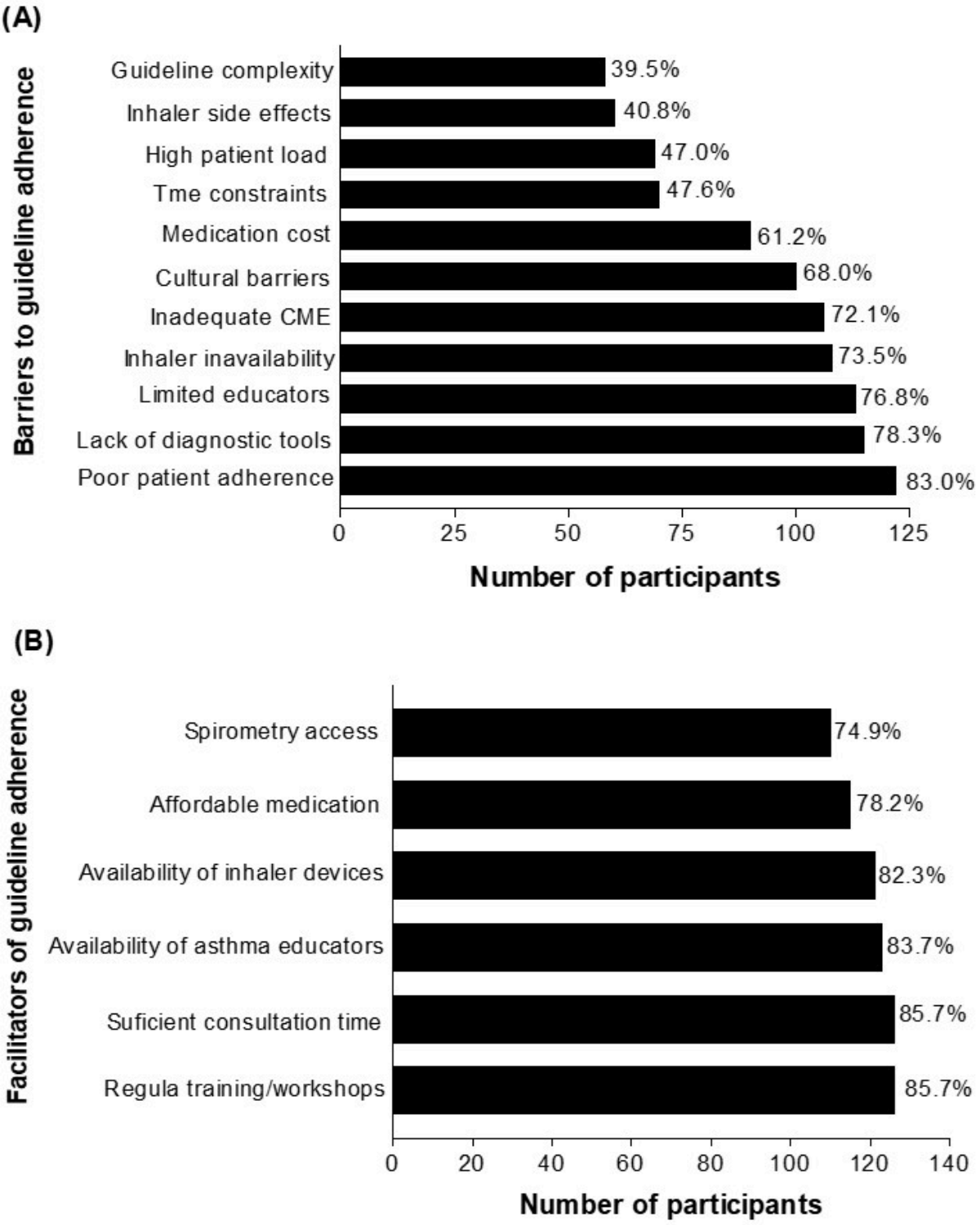


Figure 3

Analysis of barriers (A) and facilitators (B) of asthma guideline adherence among selected providers in Somaliland. Percentage values represent the proportion of participants indicating item as barrier (A) or facilitator (B).

Supplementary Files

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