ASSESSMENT OF ASTHMA MANAGEMENT: EXPLORING KNOWLEDGE, ATTITUDES, AND PRACTICES AMONG PATIENTS IN A TERTIARY CARE SETTING

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ABSTRACT
This cross-sectional study explores the knowledge, attitudes, and practices related to asthma among 430 patients in a tertiary care setting, utilizing a convenience sampling technique. The study assessed participants' understanding of asthma, including knowledge about general information, signs and symptoms, risk factors, as well as their attitudes and practices regarding asthma management. The analysis revealed significant variations in asthma knowledge based on education level, with higher education correlating with better knowledge and more positive attitudes. The general knowledge mean rank varied significantly across educational levels (p = 0.000), with postgraduates showing the highest mean ranks in knowledge, attitude, and practices. Correlations between asthma-related knowledge and attitudes were observed, particularly between knowledge about risk factors (r = 0.230, p = 0.000) and overall asthma knowledge, which significantly influenced attitudes (r = 0.191, p = 0.000) and practices (r = 0.215, p = 0.000). Knowledge about asthma had a weak positive correlation with general knowledge (r = 0.165, p = 0.001) and a weak negative correlation with risk factors (r = -0.114, p = 0.018). Attitude and practices were significantly correlated with knowledge, with attitude also showing weak positive correlations with practices (r = 0.136, p = 0.005). Despite positive correlations, the study found that knowledge alone did not guarantee better practices, suggesting the need for more comprehensive asthma education programs. The results highlight the importance of education in improving patient outcomes and underscore the need for further research to explore the complex interactions between education, socio-economic factors, and healthcare access in shaping asthma-related practices and management strategies.

Keywords: Knowledge, Attitude, Practices, Asthma

Introduction:

Asthma is a prevalent and chronic respiratory disease affecting millions worldwide. It is characterized by airway inflammation, bronchoconstriction, and hyperresponsiveness, leading to symptoms such as wheezing, shortness of breath, chest tightness, and coughing (Beuther and Sutherland, 2007). According to the World Health Organization (WHO), asthma affects approximately 262 million people globally, contributing to over 460,000 deaths annually (Hassan et al., 2017). In Pakistan, asthma is a significant public health issue, with increasing rates of prevalence, hospital admissions, and asthma-related morbidity. Despite advances in medical treatments, including inhaled corticosteroids, bronchodilators, and biologic therapies, effective asthma management continues to pose challenges (Clemente-Suárez et al., 2023).

Asthma management involves more than just pharmacological intervention; it requires patients to actively participate in controlling their condition through self-management strategies. This includes understanding their disease, adhering to prescribed medications, avoiding triggers, and properly using inhalers (Eakin and Rand, 2012). However, studies have highlighted that asthma management is often suboptimal, with patients displaying gaps in knowledge, negative attitudes towards treatment, and poor self-management practices. These factors contribute to increased exacerbations, poor disease control, frequent hospital visits, and diminished quality of life (Miles et al., 2017).

Knowledge about asthma—its pathophysiology, triggers, and the role of medication—is fundamental to effective disease management. However, a significant body of research suggests that many asthma patients, even those receiving treatment, lack a clear understanding of these aspects (Zhang et al., 2021). Inadequate knowledge can lead to incorrect use of inhalers, failure to recognize early warning signs of exacerbations, and non-adherence to maintenance medication, all of which undermine asthma control (Amin et al., 2020).

Attitudes toward asthma and its management are also crucial in determining patient behavior. Research shows that patients' beliefs about the severity of their disease, the efficacy of treatments, and the potential side effects of medications can significantly influence their willingness to adhere to prescribed regimens (Zhang et al., 2023). Negative attitudes, such as underestimating the severity of asthma or fearing side effects of inhaled medications, are associated with poor compliance and poor asthma control. Conversely, positive attitudes toward disease management—rooted in trust in healthcare providers and the belief that asthma can be effectively controlled—are linked to better outcomes (Tiotiu et al., 2020).

Practices are the daily behaviors and actions that patients take to manage their asthma, including medication adherence, inhaler technique, monitoring symptoms, and avoiding known triggers (SharifiHeidarnazhad and Moin, 2011). A key issue in asthma management is improper inhaler technique, which can lead to ineffective drug delivery and inadequate symptom control. Studies have shown that many patients do not correctly use their inhalers, which can contribute to poor asthma control. Additionally, some patients may not consistently follow their treatment regimens or recognize the importance of regular monitoring and lifestyle modifications (Toskala and Kennedy, 2015).

In Pakistan, there is a significant gap in the available literature on asthma management in the general population, particularly in tertiary care settings (Hussain et al., 2004). While some studies have addressed asthma knowledge and practices in various parts of the country, there is limited research focusing on the knowledge, attitudes, and self-management practices of patients attending tertiary care hospitals. This gap is particularly important as tertiary care centers cater to a diverse group of patients, many of whom may have more advanced or poorly controlled asthma due to inadequate management at earlier stages of care (Khan, 2024). This study was aimed to assess the current level of knowledge, attitude and practices of asthmatic patients who were under treatment in a public sector hospital of Punjab, Pakistan.

Materials and methods:

Study Design and Setting

A cross-sectional, observational, questionnaire-based study was conducted at the Pulmonology department of Sheikh Zayed Hospital, Rahim Yar Khan, with approval from the institutional review board. The study aimed to assess the knowledge, attitudes, and practices (Kaplan et al.) of asthmatic patients attending the chest outpatient department (OPD). Data collection took place over a period of three months, from May to September 2018. This design was chosen for its ability to provide a snapshot of the current state of asthma management among patients, while allowing for the collection of a large amount of data within a relatively short time frame.

Sample Size and Population

The study sample consisted of 420 asthmatic patients who were attending the chest OPD during the study period. Sample size was calculated using the Raosoft online sample size calculator, which determined the required sample size based on a 95% confidence interval and a 5% margin of error (Raosoft Inc., 2004). This calculation ensured that the sample was sufficiently large to provide reliable and statistically significant results. By selecting a sample from patients attending the hospital's outpatient department, the study focused on individuals who were actively seeking treatment for asthma, making them an appropriate group for assessing asthma management practices.

Inclusion Criteria

The inclusion criteria for participation in the study were carefully defined to ensure that the sample represented patients who had both clinical and therapeutic experience with asthma. Patients eligible for the study were those who had been clinically diagnosed with asthma, regardless of gender, and who had been using asthma medications for at least two weeks. Additionally, patients had to demonstrate willingness to participate by providing verbal consent. This inclusion criterion ensured that participants had some experience in managing their condition, which was important for the purpose of the study, as the focus was on understanding how knowledge, attitudes, and practices influenced asthma management in a real-world context.

Sampling Method

Convenient sampling was used to recruit participants for the study. This non-random sampling method was employed due to logistical constraints, such as time and resources, while still allowing for a sample that could provide valuable insights into asthma management among patients in the tertiary care setting. While convenient sampling can introduce bias, it is often used in clinical and public health research when studying specific patient populations, as it provides a practical approach to data collection. The patients were interviewed using a structured questionnaire, which helped to standardize the data collection process and ensure consistency in responses.

Questionnaire Design

The study utilized a structured questionnaire developed under the guidance of medical and research experts, following an extensive review of the literature on asthma knowledge, attitudes, and practices. The questionnaire was designed to capture key aspects of asthma management in a comprehensive and reliable manner. It consisted of three main sections.

The first section, knowledge, included close-ended questions that assessed patients' understanding of asthma, its general characteristics, symptoms, and risk factors. These questions were designed to gauge the level of awareness among patients about the disease's nature, triggers, and the importance of regular medication. This section was grounded in the theory that a well-informed patient is more likely to adhere to treatment regimens and engage in effective self-management practices (Gibson et

al., 2004). By assessing asthma knowledge, the study aimed to identify any gaps in understanding that could negatively impact disease control.

The second section focused on attitudes, consisting of eight items that explored patients' beliefs and feelings about asthma management. These items were designed to assess how patients perceived their illness, the role of medication, and their motivation to manage the disease effectively. The responses were recorded on a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." This theoretical framework was based on the Health Belief Model (Rosenstock, 1974), which posits that individuals' health behaviors are influenced by their perceptions of the severity of the disease, the benefits of taking action, and the barriers to adopting recommended health practices. A positive attitude toward asthma management is often associated with better adherence to treatment and proactive disease management (Chapman et al., 2004).

The third section of the questionnaire examined practices related to asthma management. This section contained five close-ended questions focused on self-management behaviors, such as medication adherence, inhaler technique, and lifestyle modifications. Asthma self-management practices are critical for effective disease control, as studies have shown that inadequate practices, such as improper inhaler use, are a significant barrier to achieving optimal asthma control (Bender et al., 2000). This section aimed to capture data on how patients applied their knowledge and attitudes to their daily asthma care.

Urdu Translation of the Questionnaire
The original questionnaire was in English, and to ensure its accessibility and appropriateness for the target population, it was translated into Urdu using a backward and forward translation method. This method involved translating the questionnaire from English to Urdu by one translator and then having another translator independently translate it back into English. The two versions were compared to ensure accuracy and consistency in meaning, thereby reducing the risk of bias in the translation process.

Validity of the Questionnaire
To further validate the translated questionnaire, a panel of bilingual experts, including pulmonologists, linguists, and public health professionals, reviewed the translated version to ensure that the questions were culturally and contextually relevant. This expert review process helped to refine the wording of the questions and ensure that the meaning of the items remained consistent with the original English version. The process also addressed any cultural nuances that could affect patients' understanding of the questions, enhancing the validity and relevance of the instrument in the Pakistani context.

To assess the validity of the questionnaire, both content validity and face validity were tested before its use in the main study. Content validity refers to the extent to which the questionnaire items comprehensively cover the domain being measured—in this case, asthma knowledge, attitudes, and practices. To ensure content validity, a panel of experts, including pulmonologists, respiratory therapists, and public health researchers, reviewed the questionnaire.

The experts evaluated whether the questions were relevant to the objectives of the study, ensured comprehensive coverage of the key topics (e.g., asthma triggers, treatment adherence, inhaler use), and made any necessary revisions. This expert panel approach is widely used in healthcare research to ensure that the tool captures all relevant aspects of a condition and is aligned with clinical and patient care standards (Polit & Beck, 2006).

Face validity refers to whether the questionnaire appears to be measuring what it is intended to measure, based on a subjective judgment by the respondents or experts. For this study, face validity was assessed by administering the translated questionnaire to a small group of asthmatic patients (n=10) who were not part of the main study. Their feedback on the clarity, relevance, and cultural appropriateness of the questions helped determine whether the items were easily understood and suitable for the local population. Adjustments were made based on their feedback, ensuring that the language and wording were culturally sensitive and appropriate for the study's objectives.

Construct validity assesses whether the questionnaire accurately measures the theoretical constructs it is intended to measure—in this case, asthma knowledge, attitudes, and practices. A factor analysis was performed on the collected data from the pilot study (n=42) to examine the underlying structure of the questionnaire and determine if the questions grouped together logically to measure the three distinct constructs (knowledge, attitudes, and practices). Factor loadings greater than 0.5 were considered indicative of good construct validity. This analysis demonstrated that the items in each section correlated well with their respective constructs, confirming the overall validity of the questionnaire.

Pilot Study

A pilot study was conducted involving 10% of the total sample size to test the internal consistency and reliability of the data collection tool. This was done to ensure that the questionnaire was clear, easy to understand, and capable of gathering reliable data. The Cronbach's alpha for the 61-item questionnaire was calculated to be 0.815, indicating good internal consistency and reliability. The pilot study also provided an opportunity to refine the questionnaire, making any necessary adjustments to improve its clarity and accuracy before full-scale data collection commenced. Additionally, feedback from the pilot study participants was used to assess the ease of completion and the clarity of questions.

Scoring and Categorization

Data from the questionnaire were scored to categorize the participants' knowledge, attitudes, and practices. The scoring system was designed to provide a clear distinction between levels of asthma management proficiency. A score of less than 50% was classified as inadequate knowledge, poor attitude, and poor practices. A score between 50-75% was considered moderately adequate, while a score of more than 75% was classified as adequate knowledge, a strongly positive attitude, and good practices. This approach to scoring aligns with other studies that have used similar categorizations to assess health-related behaviors and knowledge (Malarvizhi et al., 2014). The categorization of scores allowed for a comprehensive analysis of the factors influencing asthma management in the study population and provided actionable insights into areas requiring improvement.

Statistical data analysis

Statistical analysis was performed by using the Statistical Package for social sciences (SPSS) software version 20.0. To summarize the data descriptive statistics (mean, standard deviation, frequencies and percentages) were calculated. Pearson's Chi-Square test was used to analyze the association between categorical independent and dependent variables. A p-value of less than 0.05 was considered significant. Difference of knowledge, attitude and practices score across demographics characteristics were computed through non-parametric tests (Mann- Whitney U test and Kruskal Wallis).
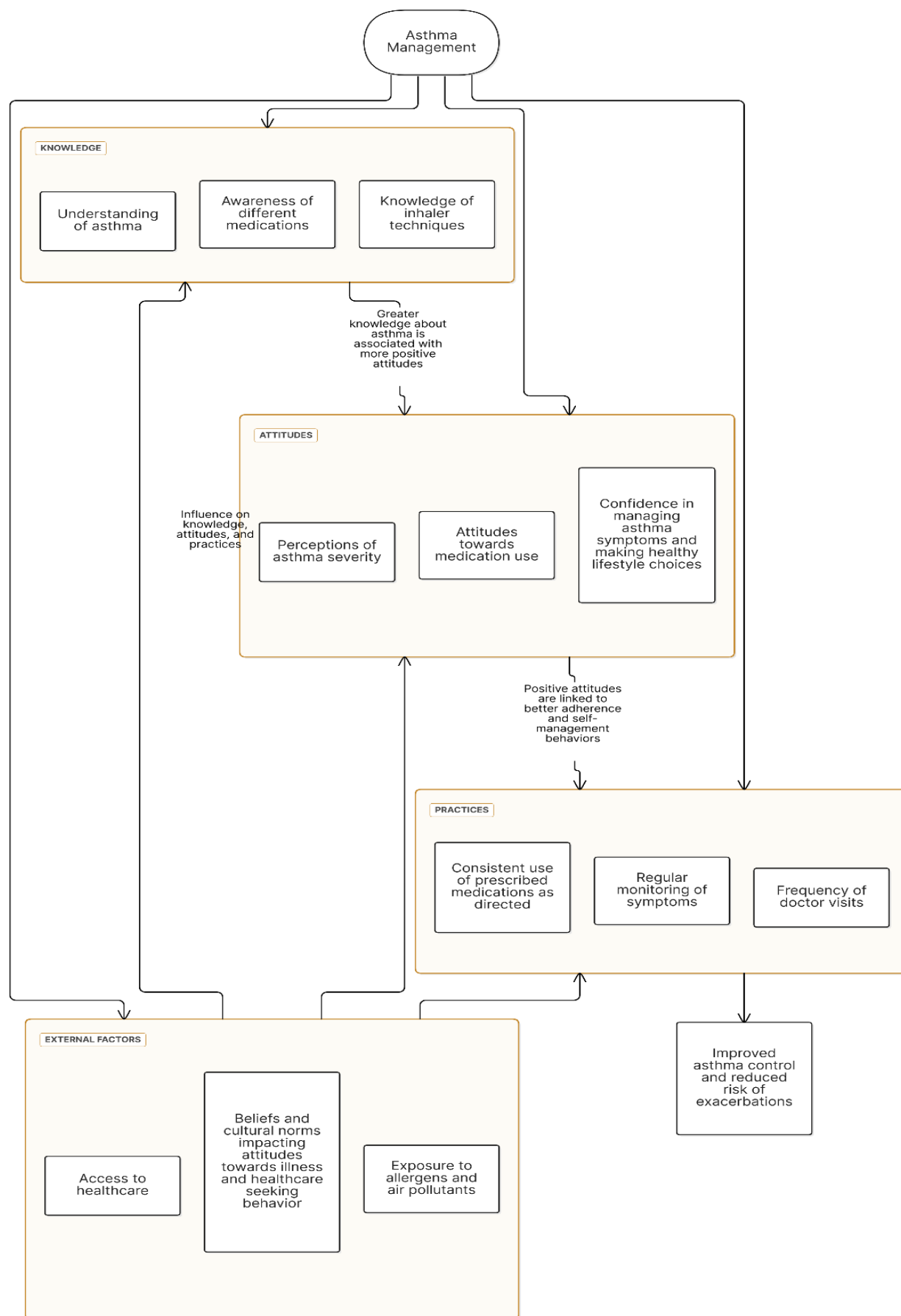
Figure: The conceptual frame

Results

Demographic characteristics

The study population comprised individuals aged 18-30 years (n=128), 29.8 percent; 31-42 years (n=142), 33 percent; 43-55 years (n=106), 24.7 percent; and those older than 55 years (n=54), 12.6 percent. Gender distribution showed males (n=196), 45.6 percent, and females (n=234), 54.4 percent. Regarding education, the majority were illiterate (n=336), 78.1 percent; followed by undergraduates (n=86), 20 percent; graduates (n=7), 1.6 percent; and postgraduates (n=1), 0.2 percent. Most participants resided in rural areas (n=272), 63.3 percent, with a smaller proportion living in urban settings (n=158), 36.7 percent. Employment status indicated that housewives (n=232) made up 54 percent; workers (n=102), 23.7 percent; farmers (n=34), 7.9 percent; employees (n=27), 6.3 percent; and the unemployed numbered 35. In terms of income, the majority earned less than 15,000 (n=409), while smaller groups earned between 15,000-25,000 (n=19) and 26,000-35,000 (n=2) (**Table 1**).

Variable		n (%)
Age	18-30	128 (29.8)
	31-42	142 (33)
	43-55	106 (24.7)
	>55	54 (12.6)
Gender	Male	196 (45.6)
	Female	234 (54.4)
Education	Illiterate	336 (78.1)
	Undergraduate	86 (20)
	Graduate	7 (1.6)
	Postgraduate	1 (0.2)
Residence	Urban	158 (36.7)
	Rural	272 (63.3)
Employment	Housewife	232 (54)
	Worker	102 (23.7)
	Farmer	34 (7.9)
	Employee	27 (6.3)
	Unemployed	35
Income	<15000	409
	15000-25000	19
	26000-35000	2

Knowledge, attitude, practices and general adherence of asthmatic patients toward asthma

The study findings revealed a mean general knowledge score of 2.81 (SD 1.064), with scores ranging from 0 to 6. Knowledge regarding signs and symptoms had a mean score of 16.21 (SD 3.464), with scores spanning from 5 to 25. Participants' knowledge regarding risk factors demonstrated a mean score of 14.98 (SD 2.018), with scores between 8 and 23. The attitude domain displayed a mean score of 33.05 (SD 2.142), with scores ranging from 26 to 40. Practice scores were relatively lower, with a mean of 3.45 (SD 1.347) and a range from 0 to 9. The total questionnaire score had a mean of 52.71 (SD 4.902), with participants scoring between 39 and 66 (**Table 2**).

Table 2: knowledge, attitude, and practices Scores

Variable	Minimum Score	Maximum Score	Mean (Marsden et al.)
General Knowledge	0	6	2.81 (1.064)
Knowledge regarding sign & Symptom	5	25	16.21 (3.464)
Knowledge regarding Risk Factor	8	23	14.98 (2.018)
Attitude	26	40	33.05 (2.142)
Practice	0	9	3.45 (1.347)
Total Score	39	66	

Comparison of age with Knowledge attitude and practice

The analysis presents the distribution of mean ranks across different age groups for various knowledge, attitude, and practice categories related to asthma, assessed using the Kruskal-Wallis test. For General Knowledge, the mean ranks varied slightly across age groups, with a non-significant p-value of 0.547, indicating no statistically significant differences. In the category of Knowledge about Signs and Symptoms, the p-value of 0.155 similarly reflects no significant differences among the age groups.

For Knowledge about Risk Factors, the mean ranks show notable variation, particularly for the >55 age group, which scored the lowest, resulting in a p-value of 0.055, approaching statistical significance. In the broader Knowledge category, significant differences were observed among age groups (p = 0.044), with the 43–55 age group showing the highest mean rank. The Attitude category also demonstrated significant differences (p = 0.049), with younger individuals (18–30) scoring the highest mean rank. However, for Practices, no significant differences were observed (p = 0.789), suggesting consistent practices across all age groups. Finally, the Questionnaire Total Score indicated variations in mean ranks but did not reach statistical significance (p = 0.056), with the >55 age group scoring notably lower than other groups (**Table 3**).

Table 3: Comparison of age with Knowledge attitude and practice

Category	Age Group	N	Mean Rank	p-value
General Knowledge	18-30	128	214.14	0.547
	31-42	142	215.99	
	43-55	106	217.5	
	>55	54	213.52	
Knowledge about Sign & Symptom	18-30	128	226.52	0.155
	31-42	142	196.78	
	43-55	106	223.83	
	>55	54	222.28	
	Total	430		
Knowledge about Risk Factors	18-30	128	217.89	0.055
	31-42	142	216.14	
	43-55	106	232.04	
	>55	54	175.69	
Total Knowledge Score	18-30	128	222.46	0.044*
	31-42	142	206.42	
	43-55	106	236.32	
	>55	54	182.03	
Attitude	18-30	128	234.45	0.049*
	31-42	142	215.42	
	43-55	106	210.45	
	>55	54	180.71	
Practices	18-30	128	209.9	0.789
	31-42	142	221.7	
	43-55	106	218.73	
	>55	54	206.14	
Questionnaire Total Score	18-30	128	226.71	0.056
	31-42	142	211.67	
	43-55	106	227.13	
	>55	54	176.16	

Comparison of gender with Knowledge attitude and practice

The analysis of educational levels across various knowledge and practice categories highlights significant variations in understanding and behaviors related to asthma. For General Knowledge about asthma, the mean ranks are similar for illiterate (216.22), undergraduate (215.00), and graduate (217.50) groups, but drastically lower for the postgraduate group (2.50). The differences are statistically significant (p = 0.000), suggesting that education level has a strong impact on general knowledge about asthma. In Knowledge about signs and symptoms, the mean ranks show a progression from illiterate (211.13) to postgraduate (109.00), with undergraduates (229.88) and graduates (263.71) scoring higher. However, the differences are not statistically significant (p = 0.306). For Knowledge about Risk Factors, the mean ranks vary, with postgraduates (420.50) significantly outscoring illiterate (214.02), undergraduate (220.76), and graduate (192.50) groups. Despite these differences, the p-value (p = 0.360) indicates no statistically significant variation. The Total Knowledge Score does not differ significantly (p = 0.698), although mean ranks suggest slight variations among groups, with postgraduates (296.00) having higher scores than graduates (204.86), undergraduates (227.13), and illiterates (212.50). For Attitude, significant differences are observed (p = 0.005). Postgraduates (427.00) exhibit the highest mean rank, followed by graduates (325.21), undergraduates (235.73), and illiterates (207.41), indicating a strong influence of education level on attitude. In Practices, significant differences are also observed (p = 0.023), with graduates (297.86) and undergraduates (242.54) outperforming illiterates (207.06). Interestingly, postgraduates have a lower mean rank (151.00), suggesting unique factors influencing their practices. Finally, for the Questionnaire Total Score, postgraduates (398.50) have the highest mean rank, followed by graduates (287.14), undergraduates (237.51), and illiterates (207.83). These differences are statistically significant (p = 0.037), emphasizing that higher education levels positively impact overall knowledge, attitudes, and practices related to asthma.

Table 4: Comparison of Education level with Knowledge attitude and practice

Category	Education Level	N	Mean Rank	p-value
General knowledge about asthma	Illiterate	336	216.22	0.000**
	Undergraduate	86	215	
	Graduate	7	217.5	
	Postgraduate	1	2.5	
Knowledge about sign & symptoms	Illiterate	336	211.13	0.306
	Undergraduate	86	229.88	
	Graduate	7	263.71	
	Postgraduate	1	109	
Knowledge about Risk Factors	Illiterate	336	214.02	0.36
	Undergraduate	86	220.76	
	Graduate	7	192.5	
	Postgraduate	1	420.5	
Total Knowledge Score	Illiterate	336	212.5	0.698
	Undergraduate	86	227.13	
	Graduate	7	204.86	
	Postgraduate	1	296	
Attitude	Illiterate	336	207.41	0.005**
	Undergraduate	86	235.73	
	Graduate	7	325.21	
	Postgraduate	1	427	
Practices	Illiterate	336	207.06	0.023*
	Undergraduate	86	242.54	
	Graduate	7	297.86	
	Postgraduate	1	151	
Questionnaire Total Score	Illiterate	336	207.83	0.037*
	Undergraduate	86	237.51	
	Graduate	7	287.14	
	Postgraduate	1	398.5	

Correlation assessment of knowledge, attitude and practice

The correlation analysis reveals several significant relationships between the variables related to asthma knowledge, attitudes, and practices. Asthma-related knowledge shows a weak positive correlation with General Knowledge (r = 0.165, p = 0.001) and a weak negative correlation with Risk Factors (r = -0.114, *p = 0.018*). No significant associations are observed with Knowledge, Attitude, or Practices. General Knowledge exhibits moderate positive correlations with Risk Factors (r = 0.230, p = 0.000) and Knowledge (r = 0.502, p = 0.000), suggesting a substantial association between these aspects of asthma understanding. No significant correlations are found with Attitude or Practices. Risk Factors strongly correlate with Knowledge (r = 0.889, p = 0.000), indicating that a greater understanding of risk factors aligns with overall knowledge. Additionally, weak positive correlations are observed with Attitude (r = 0.202, p = 0.000) and Practices (r = 0.218, p = 0.000). Knowledge shows a strong positive correlation with Risk Factors (r = 0.889, p = 0.000) and moderate positive correlations with Attitude (r = 0.191, p = 0.000) and Practices (r = 0.215, p = 0.000). This highlights that overall knowledge significantly impacts attitudes and practices. Attitude demonstrates weak positive correlations with Risk Factors (r = 0.202, p = 0.000), Knowledge (r = 0.191, p = 0.000), and Practices (r = 0.136, p = 0.005), suggesting that improved attitudes may influence practices and are linked to knowledge. Practices show weak positive correlations with Risk Factors (r = 0.218, p = 0.000), Knowledge (r = 0.215, p = 0.000), and Attitude (r = 0.136, p = 0.005), indicating that better knowledge and attitudes positively impact practices.

Table 5: Correlation assessment of knowledge, attitude and practice

		Knowledge about asthma	General_Knowledge	Risk_Factors	Knowledge	Attitude	Practics
Knowledge about asthma	Pearson Correlation	1	.165**	-.114*	-.015	-.066	-.022
	Sig. (2-tailed)		.001	.018	.755	.174	.654
	N	430	430	430	430	430	430
Knowledge about sign & symptom	Pearson Correlation	.165**	1	.230**	.502**	.019	.093
	Sig. (2-tailed)	.001		.000	.000	.701	.053
	N	430	430	430	430	430	430
Knowledge about Risk Factors	Pearson Correlation	-.114*	.230**	1	.889**	.202**	.218**
	Sig. (2-tailed)	.018	.000		.000	.000	.000
	N	430	430	430	430	430	430
Total knowledge	Pearson Correlation	-.015	.502**	.889**	1	.191**	.215**
	Sig. (2-tailed)	.755	.000	.000		.000	.000
	N	430	430	430	430	430	430
Attitude	Pearson Correlation	-.066	.019	.202**	.191**	1	.136**
	Sig. (2-tailed)	.174	.701	.000	.000		.005
	N	430	430	430	430	430	430
Practice	Pearson Correlation	-.022	.093	.218**	.215**	.136**	1
	Sig. (2-tailed)	.654	.053	.000	.000	.005	
	N	430	430	430	430	430	430

DISCUSSION:

This study provides valuable insights into the knowledge, attitudes, and practices (Kaplan et al.) of patients regarding asthma management in a tertiary care setting. Understanding these factors is essential for improving patient outcomes, as asthma is a chronic condition that requires active self-management and adherence to treatment plans.

The findings of this study provide an in-depth understanding of the knowledge, attitudes, and practices (Kaplan et al.) among asthma patients in a tertiary care setting. The observed mean scores across the various domains highlight notable strengths and weaknesses in patients' understanding and management of asthma. The general knowledge mean score (2.81 ± 1.064) indicates a moderate grasp of asthma-related facts, consistent with findings from studies in other regions that reported similar levels of baseline knowledge among patients. For example, a study reported a comparable demographic found mean general knowledge scores ranging between 2.5 and 3.0, attributing gaps to limited patient education and awareness campaigns (Marsden et al., 2016).

Knowledge regarding signs and symptoms (16.21 ± 3.464) was relatively higher, suggesting patients are more familiar with identifying asthma manifestations, aligning with findings from a study, which emphasized the role of symptom awareness in timely asthma management. However, the lower mean score for knowledge of risk factors (14.98 ± 2.018) reflects a gap in understanding the triggers and contributing factors of asthma (Merghani et al., 2012). This aligns with research , which noted that while patients could recognize symptoms, they often struggled to identify risk factors like environmental allergens and occupational hazards (Madhushani and Subasinghe, 2016).

The attitude domain demonstrated a mean score of 33.05 ± 2.142, indicating a generally positive outlook toward asthma management. This finding resonates with studies like , where participants expressed willingness to adhere to prescribed treatment and lifestyle modifications (Kambli, 2014). However, discrepancies in attitude scores across age groups and educational levels suggest that targeted interventions may be required to address specific barriers in these subgroups (Sodhi et al., 2013). The mean practice score (3.45 ± 1.347), being relatively low, highlights a critical area for improvement. This finding mirrors observations in other studies, which reported poor adherence to prescribed medication and insufficient use of preventive measures like inhalers or peak flow meters. In contrast, studies from developed regions, such as, reported significantly higher practice scores, suggesting that access to healthcare resources and patient education programs play a pivotal role in improving adherence (Vermeire et al., 2002).

The total questionnaire score (52.71 ± 4.902) provides a composite view, with variations across domains pointing to interconnected gaps in knowledge, attitudes, and practices. This supports findings by a study, which emphasized the need for comprehensive educational interventions that address multiple dimensions of asthma management (MancusoSayles and Allegrante, 2010). While these results are largely consistent with existing literature, some deviations warrant discussion. For instance, the relatively high scores for signs and symptoms knowledge contrast with findings from a study, which reported lower awareness levels in similar populations. This discrepancy could stem from localized efforts in patient education or differences in study methodologies (Shea et al., 2022). Overall, the findings reinforce the importance of tailored interventions to enhance patient knowledge, foster positive attitudes, and improve practical management of asthma. Future initiatives should consider integrating community-based education programs, leveraging digital tools for self-management, and ensuring equitable access to healthcare resources to address these gaps effectively (Kaplan et al., 2023). In the General Knowledge and Knowledge about Signs and Symptoms categories, the lack of significant differences (p = 0.547 and p = 0.155, respectively) suggests a relatively consistent baseline understanding of asthma across all age groups. This is consistent with studies such as a study, where no significant age-related differences in basic asthma knowledge were observed (DharmagePerret and Custovic, 2019).

However, the Knowledge about Risk Factors category approached statistical significance (p = 0.055), with the >55 age group demonstrating the lowest mean rank. This finding aligns with literature that suggests older individuals may have less awareness of environmental and behavioral asthma triggers due to historical differences in public health education efforts (Maulood et al., 2023a). Additionally, the significant differences in the broader Knowledge category (p = 0.044), with the 43–55 age group showing higher knowledge, may reflect accumulated health knowledge over time or more recent educational initiatives targeting this demographic (Légaré et al., 2018).

In terms of Attitude, the younger age group (18-30) scored the highest, which supports findings from, who noted that younger individuals tend to be more proactive about their health management. This contrasts with older populations, who may exhibit more fatalistic attitudes towards chronic conditions like asthma (Madhushani and Subasinghe, 2016).

Interestingly, the Practices category showed no significant differences across age groups (p = 0.789), indicating that while there may be variation in knowledge and attitude, practical adherence to asthma management strategies was consistent across ages (Kambli, 2014). This may contradict some findings in the literature, where younger individuals were often found to be more consistent in their practices, suggesting that factors such as healthcare access and support systems might play a more significant role than age alone in shaping asthma management behaviors (Marsden et al., 2016).

Finally, while the Questionnaire Total Score showed some variation, it did not reach statistical significance (p = 0.056). This indicates that despite differences in specific categories, overall asthma knowledge, attitude, and practices were relatively similar across age groups, with older individuals scoring slightly lower, potentially due to limited exposure to asthma education and self-management resources (Daniel et al., 2021).

The analysis of educational levels in relation to asthma knowledge, attitudes, and practices reveals significant insights into how education influences individuals' understanding and management of asthma. In the General Knowledge about Asthma category, a clear educational gradient is observed, with illiterate individuals having the lowest mean rank (216.22), followed by undergraduates (215.00) and graduates (217.50). Postgraduates, however, show an unusually low mean rank of 2.50, leading to significant differences (p = 0.000). This suggests that education level plays a pivotal role in shaping general asthma knowledge, consistent with previous studies where higher educational attainment was linked to better health literacy and disease awareness (Salim et al., 2021). The drastic drop for postgraduates could potentially reflect an anomaly or a sampling issue that warrants further investigation.

In Knowledge about Signs and Symptoms, although a progression in mean ranks is noted from illiterate to postgraduate groups, the differences were not statistically significant (p = 0.306). This contrasts with some studies where higher educational attainment correlates with a better understanding of disease signs and symptoms (Jeong et al., 2022). The lack of significance in this study could indicate that basic knowledge about asthma symptoms is less influenced by education level compared to other factors, such as public health initiatives or media campaigns (Ghozali and Urrohmah, 2023).

In the category of Knowledge about Risk Factors, postgraduates scored significantly higher (420.50), followed by the other groups, though the differences did not reach statistical significance (p = 0.360). The observed trend supports the idea that formal education may provide individuals with more access to information about asthma's risk factors. Similar findings were observed by a study, where higher education levels correlated with a better understanding of environmental and genetic factors in asthma, although statistical significance was not always achieved (Lotfata et al., 2023b). The Total Knowledge Score revealed no significant differences (p = 0.698), but a slight trend towards higher scores for postgraduates (296.00) compared to graduates, undergraduates, and illiterates, aligns with the general pattern that higher education is linked to broader knowledge acquisition. These results are similar to other research showing that education level often leads to a more comprehensive understanding of chronic conditions like asthma, though the findings here suggest that other variables may also be at play in determining total knowledge (Daniel et al., 2021).

Significant differences were noted in the Attitude category (p = 0.005), with postgraduates demonstrating the highest mean rank (427.00). This indicates that education level strongly influences individuals' attitudes towards asthma management, with higher education often associated with more proactive health-seeking behaviors and a positive attitude towards managing chronic conditions (Maulood et al., 2023b). In contrast, illiterate individuals scored the lowest

(207.41), suggesting that a lack of formal education may contribute to negative or passive attitudes toward managing asthma (H.P.D and Subasinghe, 2016).

In Practices, significant differences were observed (p = 0.023), with graduates (297.86) and undergraduates (242.54) scoring higher than illiterates (207.06), although postgraduates had a notably lower score (151.00). This surprising finding in the postgraduate group warrants further exploration, as it suggests that factors other than education, such as lifestyle, access to healthcare, or other socio-economic factors, may play a role in shaping asthma management practices. Previous studies have highlighted that individuals with higher education tend to engage more in preventive health behaviors, which makes the lower score in postgraduates an intriguing result that merits further inquiry (Lotfata et al., 2023a). Finally, the Questionnaire Total Score showed significant differences (p = 0.037), with postgraduates achieving the highest mean rank (398.50), followed by graduates, undergraduates, and illiterates. This reinforces the notion that higher education positively impacts overall asthma knowledge, attitudes, and practices, supporting findings from studies on health education and its role in chronic disease management (Luckie et al., 2018) .The correlation analysis reveals several significant relationships between variables related to asthma knowledge, attitudes, and practices. These findings align with and contradict previous literature on asthma management, offering valuable insights into the interplay between knowledge and behavioral outcomes. Firstly, Asthma-related Knowledge showed a weak positive correlation with General Knowledge (r = 0.165, p = 0.001) and a weak negative correlation with Risk Factors (r = -0.114, p = 0.018). These results suggest that a higher general knowledge about asthma is slightly associated with better understanding of asthma, but the negative correlation with risk factors indicates a potential disconnect between knowledge about asthma symptoms and the recognition of environmental or genetic risk factors. This finding is consistent with some studies, where knowledge of asthma symptoms does not always correlate with understanding the underlying risk factors (Toskala and Kennedy, 2015). However, other studies have demonstrated that increased awareness of asthma triggers, such as allergens and air pollution, is often a key component of asthma education programs (Tiotiu et al., 2020).

The General Knowledge variable displayed moderate positive correlations with Risk Factors (r = 0.230, p = 0.000) and Knowledge (r = 0.502, p = 0.000). This finding supports the literature that suggests a substantial relationship between general knowledge of asthma and more specific knowledge about its risk factors, such as environmental exposures or family history. Several studies have highlighted that individuals with higher general knowledge of asthma tend to be more aware of these risks, supporting the idea that broader educational efforts can improve recognition of risk factors (PristovLobe and Sočan, 2024). However, no significant correlations were found with Attitude or Practices, which might suggest that while general knowledge is foundational, it does not directly translate to behavioral changes or attitudes without additional interventions (Zhao et al., 2024).

The analysis of Risk Factors reveals a strong positive correlation with Knowledge (r = 0.889, p = 0.000), indicating that individuals with a better understanding of asthma risk factors also possess more comprehensive knowledge overall. This finding is consistent with previous studies showing that greater awareness of asthma's causes and risk factors is a significant component of effective asthma management education (Ehrlich et al., 1996). Moreover, weak positive correlations with Attitude (r = 0.202, p = 0.000) and Practices (r = 0.218, p = 0.000) suggest that understanding risk factors, while important, does not directly translate into improved attitudes or asthma management practices in a uniform way. These results align with studies that found that while knowledge of risk factors is important, its influence on behavior is mediated by other factors such as perceived severity of asthma or self-efficacy (Chokhani et al., 2021).

Knowledge itself showed a strong positive correlation with Risk Factors (r = 0.889, p = 0.000) and moderate correlations with Attitude (r = 0.191, p = 0.000) and Practices (r = 0.215, p = 0.000). This underscores the importance of comprehensive asthma education in shaping not only knowledge but also influencing attitudes and practices related to asthma management. Previous research supports

the idea that increased asthma knowledge leads to more positive attitudes toward self-management and better practices, as individuals are more likely to adopt behaviors like medication adherence or avoiding triggers when they understand their importance (Ghanname et al., 2018). However, the moderate correlations observed here suggest that while knowledge is a crucial factor, other determinants such as environmental factors, access to healthcare, and personal health beliefs also significantly influence asthma management practices (WilliamsSternthal and Wright, 2009).

In the Attitude category, weak positive correlations were found with Risk Factors ($r = 0.202$, $p = 0.000$), Knowledge ($r = 0.191$, $p = 0.000$), and Practices ($r = 0.136$, $p = 0.005$). These findings support the view that improved attitudes towards asthma management may be influenced by greater knowledge of asthma and its risk factors, but also point to the complexity of attitude formation, which may be influenced by cultural, psychological, and social factors that go beyond cognitive knowledge (Ayik et al., 2024). For instance, research has suggested that asthma-related attitudes are shaped not only by knowledge but also by the perceived benefits of management practices and the social support available to individuals (van der MolenFletcher and Price, 2018).

Finally, Practices showed weak positive correlations with Risk Factors ($r = 0.218$, $p = 0.000$), Knowledge ($r = 0.215$, $p = 0.000$), and Attitude ($r = 0.136$, $p = 0.005$). These results suggest that better knowledge and positive attitudes have a modest but significant impact on asthma management practices. This is consistent with findings from multiple studies that emphasize the importance of both knowledge and attitudes in the adoption of asthma control behaviors, such as medication use and avoiding triggers. However, the weaker correlation with practices suggests that other external factors, such as healthcare accessibility, socio-economic status, or individual health beliefs, may play a significant role in determining actual asthma management behaviors (Volerman et al., 2021).

In conclusion, the correlation analysis highlights the critical role of knowledge in shaping attitudes and practices related to asthma management. While the relationships between these variables are significant, they are moderate to weak, indicating that while knowledge is crucial, it is not sufficient by itself to ensure optimal asthma management. Other factors, such as access to healthcare, personal attitudes, and socio-economic circumstances, likely play a key role in determining effective asthma management. Future research should aim to explore these factors in more detail and investigate how they interact with knowledge to shape asthma-related behaviors (Clemente-Suárez et al., 2023).

Conclusion

This study highlights the significant relationships between asthma-related knowledge, attitudes, and practices, underscoring the importance of education in improving asthma management. The findings demonstrate that a higher level of general knowledge and understanding of risk factors is associated with better attitudes and practices, though the strength of these associations varies. Notably, knowledge about asthma and its risk factors plays a crucial role in shaping attitudes and influencing practices, although other factors such as socio-economic conditions, healthcare access, and personal beliefs also contribute to the effectiveness of asthma management.

Despite the positive correlations, the study reveals that knowledge alone does not guarantee optimal asthma control, as weak to moderate correlations were observed between knowledge and actual practices. The results emphasize the need for comprehensive asthma education programs that not only enhance knowledge but also foster positive attitudes and behavior changes. Further research should explore the interplay of various factors, including socio-environmental influences, to better understand how they collectively affect asthma management. This would aid in developing more effective, tailored interventions aimed at improving asthma outcomes across diverse populations.

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