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Original article

Assessment of Nurses' Knowledge on Asthma Care in Children in Primary Health Settings

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Abstract

Pediatric asthma is a prevalent chronic condition that requires effective management at the primary healthcare level. Nurses play a pivotal role in asthma control; however, evidence regarding their knowledge in Kazakhstan is limited. The aim of the study is to assess nurses' knowledge in Kazakhstan in managing pediatric asthma patients according to global medical standards. A cross-sectional survey was conducted among 518 nurses working in whether primary health care settings across Kazakhstan. Data were collected using a validated and adapted questionnaire based on the Newcastle Asthma Knowledge Questionnaire. Descriptive statistics, Mann–Whitney U and Kruskal–Wallis tests were performed. The majority of nurses (70.5%) demonstrated poor knowledge of pediatric asthma management, while 29.5% had moderate knowledge; none achieved a high knowledge score. Key knowledge gaps were identified in symptom recognition, asthma severity assessment, and preventive care. Primary care nurses in Kazakhstan exhibit significant knowledge deficits in pediatric asthma management. Educational interventions that enhance conceptual understanding and align nurse training with Global Initiative for Asthma guidelines are urgently needed to optimize pediatric asthma care and outcomes.

Keywords: bronchial asthma, asthma management, nursing, knowledge, primary healthcare, evidence-based practice.

1. Introduction

Bronchial asthma remains one of the most common chronic diseases in childhood, affecting quality of life and accounting for substantial health care utilization worldwide. According to the Global Initiative for Asthma (GINA), effective pediatric asthma care requires not only accurate diagnosis and pharmacological treatment but also continuous monitoring, patient education, and preventive strategies [1]. Asthma is characterized by inflammation and hyperresponsiveness of the airways, leading to episodic airflow obstruction, with symptoms such as wheezing, breathlessness, chest tightness, and coughing. Despite being a treatable condition, asthma remains underdiagnosed and undertreated, especially in low- and middle-income countries, including Kazakhstan [2]. Nurses play a critical role in managing asthma by educating patients, administering medications, and identifying early signs of exacerbations [3–5]. Their role involves tasks such as administering medications like bronchodilators and

corticosteroids and educating patients on lifestyle changes and proper inhaler techniques [4,6].

Effective asthma management requires a multidisciplinary approach where nurses play a crucial role [3]. As frontline healthcare providers, nurses' competence and perspectives are pivotal in the management of asthma [4,7].

Despite the global emphasis on guideline-based asthma management, studies indicate that gaps persist in nurses' knowledge and practices regarding asthma care [8,9]. Inadequate understanding of asthma pathophysiology, limited familiarity with inhalation techniques, and inconsistent application of clinical guidelines may hinder optimal patient education and disease control [10]. Numerous studies have assessed physicians' knowledge and practices in asthma management, revealing persistent gaps in guideline adherence and therapeutic decision-making [3,9].

While numerous studies have evaluated physicians' knowledge and adherence to asthma management guidelines, far fewer have systematically assessed the preparedness of nurses in this domain. This gap raises concerns about whether primary health care (PHC) nurses possess the necessary knowledge, skills, and confidence to manage pediatric asthma effectively in routine practice.

Research has shown that insufficient knowledge or misconceptions about asthma can result in suboptimal treatment and poorer outcomes for patients [8]. Therefore, assessing the competence of nurses in asthma management is essential to improve the quality of care provided by nurses. The GINA emphasize individualized care, which requires healthcare professionals to understand asthma, its triggers, and the correct use of medications [1]. Nurses with confidence in their knowledge are more likely to implement evidence-based practices and offer comprehensive care, while those with insufficient training may resort to outdated or ineffective methods, which can negatively affect patient outcomes [6]. To our knowledge, this is the first study to assess Kazakhstani nurses' knowledge regarding asthma management in children.

To address this gap, the present study aims to evaluate nurses' knowledge concerning bronchial asthma management. By identifying strengths and limitations in current nursing competencies, the study seeks to inform targeted educational interventions and support the development of standardized protocols that can enhance the quality of care for patients with asthma.

2. Materials and Methods

This cross-sectional study was carried out between June and November 2024 in Astana using an online survey. The study was conducted in 10 randomly selected public PHC organizations located within the urban area of Astana. Nurses who work in clinical settings and interact with asthma patients were eligible to participate in this study. Private clinics and peri-urban facilities were not included in the sample. The study participants' knowledge and behavior were evaluated using knowledge questions based on the GINA recommendations.

A total of 575 questionnaires were distributed to nurses in PHC organizations. After excluding incomplete or missing responses, 518 fully completed questionnaires were retained for the final analysis, yielding a valid response rate of 90.1%.

All nurses provided informed consent and were sent a link to a Google Form containing the study questionnaire.

The Assessment Questionnaire

The questionnaire consisted of two sections. The first section collected demographic and professional background information, including age, gender, education level, years of clinical experience, and current workplace setting.

The second section assessed asthma-related knowledge using a modified Newcastle Asthma Knowledge Questionnaire (NAKQ) [11]. Of the 30 original items, 21 were retained, and 9 were newly developed based on GINA. Minor linguistic and contextual adjustments ensured cultural and clinical relevance for the Kazakhstani PHC setting, with rewording to reflect nursing-specific responsibilities.

The knowledge section included 25 yes/no and 5 open-ended questions. Most items were scored dichotomously (1 = correct, 0 = incorrect), yielding a maximum score of 27. Bloom's cut-offs were applied (≥80% good, 60–79% moderate, <60% poor).

Six experts (two pediatricians, two allergists, two clinical nurses) through independent review and consensus evaluated open-ended responses. Question 6 (asthma triggers) was excluded from the composite score due to low variability and analyzed separately. Question 11 (asthma symptoms) required all three core symptoms. Questions 12 and 14 were excluded and analyzed descriptively, while Question 21 was scored

correct if three valid causes of therapy inefficacy were listed, consistent with GINA 2024.

Ethical considerations

The study was approved by local Ethical Committee, Astana Medical University, Kazakhstan, under protocol number 2, dated 30.01.2024 and the research was conducted in compliance with principles of the Declaration of Helsinki and the Guideline for Good Clinical Practice.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were employed to summarize demographic and professional characteristics of participants. Categorical variables were expressed as frequencies and percentages, whereas continuous variables were presented as means with standard deviations (mean ± SD) for normally distributed data or as medians with interquartile ranges (IQR) when distributions deviated from normality. Group differences in categorical variables were assessed using chi-square tests of independence. For comparisons of continuous variables across two groups, the Mann–Whitney U test was applied, while differences among more than two groups were examined using the Kruskal–Wallis test. All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant. Odds ratios (OR) with 95% confidence intervals (CI) were reported for logistic regression models. The survey design required responses to all items, ensuring a complete dataset without missing values.

3. Results

The participants' demographic details are summarized in Table 1. The sample was predominantly female (96%), with the largest proportion aged 25–39 years (54%) and having 5–10 years of work experience (53%). More than half of the participants (55%) reported holding technical or professional education, whereas fewer possessed an applied or academic bachelor's degree, and only 1% had a master's degree (Table 1).

Table 1 – Demographical characteristics of recruited participants

Variable	N (%)
Age	
25 – 39	282 (54)
40 – 60	214 (41)
60	22 (4)
Gender	
Female	499 (96)
Male	19 (4)
Work experience (years)	
5 to 10	275 (53)
10 to 15	65 (13)
15 to 20	43 (8)
≥20	135 (26)
Education level:	
Technical/professional	284 (55)
Post-secondary (Applied Bachelor's degree)	152 (29)
Higher education (academic Bachelor's degree)	76 (15)
Postgraduate (Master's degree)	6 (1)

Awareness of asthma among study participants

The second section of the questionnaire was designed to estimate the participants' knowledge of the asthma condition. In terms of knowledge of the illness's nature, symptoms, and diagnosis, this section compiles data from the participants.

Table 2 presents the nurses' knowledge about asthma. The results revealed variations according to the domain. Overall, 29.5% of nurses demonstrate good knowledge about asthma. The total average score of the nurses' level of knowledge about asthma was 54% (SD: 9.53). The minimum and maximum scores were 21%

and 79%, respectively. The percentage of correct answers for each item ranged from 93% to 9%. Item 5, which stated that asthma is non-infectious, had the highest number of correct answers (93%). However, a significant portion of participants (91%) answered incorrectly to item 21, which asked why Ventolin administered via a metered-dose inhaler might fail to relieve symptoms in a child, indicating a notable gap in understanding inhalation device use (Table 2).

Table 2 – Correct answers to each question on the Asthma knowledge questionnaire

Subscales	**Questions**	**Correct answers**	
		n	%
Nature of Asthma Disease	Asthma is not a chronic inflammatory disorder of the airways	285	55
	Children with asthma have abnormally sensitive air passages in their lungs	459	89
	If one child in a family has asthma then all his or her brothers and sisters are almost certain to have asthma as well	407	79
	Asthma is infectious (ie, you can catch it from another person)	481	93
	More than one in 10 children will have asthma at some time during their childhood	293	57
Symptoms and Diagnosis of Asthma	Symptoms of asthma does not have a seasonal pattern	251	43
	During an attack of asthma, the wheeze may be due to muscles tightening in the wall of the air passages in the lungs	462	89
	During an attack of asthma, the wheeze may be due to swelling in the lining of the air passage in the lungs	442	85
	Asthma is usually more of a problem at night than during the day.	442	85
	What are the three main symptoms of asthma?	160	31
	The best way to measure, the severity of a child's asthma is for the doctor to listen to his chest	88	17
Treatment of Asthma Disease	Antibiotics are an important part of treatment for most children with asthma	297	57
	Inhaled medications for asthma (eg, ventolin puffers, rotacaps) have fewer side effects than tablets	384	74
	Some asthma treatments (such as ventolin) damage the heart	293	57
	Short courses of oral steroids (such as prednisolone) usually cause significant side effects	231	45
	Children with asthma become addicted to their asthma drugs	248	48
	Aspirin or other nonsteroidal anti-inflammatory drugs (NSAIDS) such as Nurofen can trigger asthma	202	39
	A 5-year-old boy has an attack of asthma and takes two puffs of ventolin from a puffer (metered dose inhaler). After 5 mins he is no better. Give some reasons why this might have happened	47	9
	Multiple actuations of aerosol devices before inhaling from a spacer will result in more effective medication delivery	102	20
	The most common problem with Dry Powder Inhaler (DPI) use is incorrectly coordinating drug release and inhalation	130	25
	Dry Powder Inhalers (DPI) require higher inspiratory flow rates than metered dose inhalers (MDI)	341	66
Care and prevention of Asthma Disease	Most children with asthma should not eat dairy products	256	49
	Swimming is the only suitable exercise for asthmatics	184	36
	Parental smoking may make the child's asthma worse	460	89
	With appropriate treatment, most children with asthma should lead a normal life with no restrictions on activity	446	86
	Most children with asthma will have stunted growth	345	67
	It is a good idea to give cough syrups during an asthma attack to treat asthma-related cough	343	66

The largest number of correct answers on the Asthma knowledge questionnaire was received in the category "Nature of Asthma Disease" (74.6%). The smallest number of correct answers belonged to the category "Treatment of Asthma Disease" (44.0%) (Table 3).

Table 3 – Correct and incorrect answers on four subscales of the Asthma knowledge questionnaire

Subscales	Correct answers (%)	Incorrect answers (%)
Nature of Asthma Disease	74.6	25.4
Symptoms and Diagnosis of Asthma	58.3	41.6
Treatment of Asthma Disease	44.0	56.0
Care and prevention of Asthma Disease	65.5	34.5

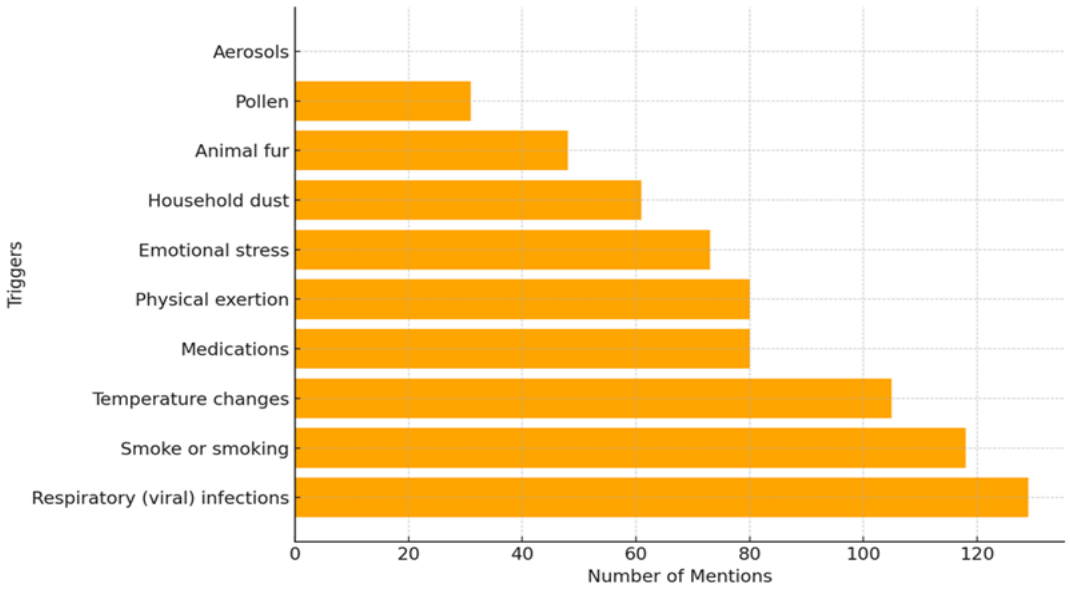

Figure 1 – Frequency of Mentioned Asthma Triggers (Question 6)

The most frequently mentioned triggers of bronchial asthma among respondents were respiratory (viral) infections (129 mentions), smoke or smoking (118), and temperature changes (105). Moderate frequency was observed for medications and physical exertion (80 each), followed by emotional stress (73) and household dust (61). Less commonly identified triggers included animal fur (48), pollen (31), and aerosols, which were not mentioned at all (Figure 1).

As indicated in question 12, respondents believed that cyanosis, a fast heartbeat (tachycardia), and duration of attack were indicators of an asthma attack, with the frequency being 31%, 19%, and 50%, respectively. It also revealed that 54%, 29%, 17% nurses believe that a spirometer, chest radiography and peak flow meter crucial tools for diagnosing asthma patients

Associations between demographic characteristics and asthma knowledge scores

Kruskal–Wallis analysis revealed statistically significant differences in asthma knowledge scores across age groups ($H = 7.40$, $p<0.05$), work experience ($H = 10.86$, $p < 0.05$), and education level ($H = 8.13$, $p <0.05$). Post-hoc pairwise comparisons using the Mann–Whitney U test indicated that nurses aged 40–60 years had significantly higher knowledge scores compared to those aged 25–39 years ($p = 0.05$). Similarly, participants with 11–15 years of experience outperformed those with 5–10 years of experience ($p <0.05$). No statistically significant differences were found in other group comparisons ($p > 0.05$).

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3. Discussion

This study was aimed at identifying potential gaps in knowledge from nurses regarding pediatric patients with asthma.

The findings revealed that the vast majority of nurses (70.5%) exhibited poor knowledge concerning pediatric asthma management. Only 29.5% of respondents demonstrated a moderate level of knowledge, and no participants achieved a high score. This emphasizes the urgent need for targeted educational interventions and continuous professional development. Similar gaps in asthma-related knowledge among PHC workers have been reported in other low- and middle-income countries. For example, a cross-sectional study conducted in Jos North by Miner et.al., assessed the knowledge and diagnostic skills of PHC workers regarding asthma and chronic obstructive pulmonary disease (COPD). The authors found that, although the overall knowledge of asthma and COPD was mostly fair, significant gaps persisted in the recognition of risk factors, symptoms, screening, and diagnostic procedures. Importantly, none of the respondents were able to demonstrate the correct use of a peak flow meter, and the majority failed to identify appropriate diagnostic tests for both conditions [12]. Consistent with these findings, Adeniyi et al. revealed that even physicians showed significant gaps in asthma-related knowledge, particularly in identifying triggers, applying guideline-based treatment protocols, and ensuring long-term control strategies, which ultimately compromised the quality of care. Together, these studies highlight critical gaps in knowledge across different cadres of PHC workers and reinforce the urgent need for structured training and continuous professional development in asthma care.

This study observed knowledge gaps were particularly pronounced in domains related to symptoms and diagnosis, treatment, and care/prevention. Less than half of the nurses correctly answered questions related to core clinical indicators of asthma, including the recognition of key symptoms, seasonality misconceptions, and proper severity assessment. Similar trends have been reported elsewhere, such as in the study by Adenyi et al., where overwhelming respondents correctly identified primary symptoms, but had limited understanding of device use [13]. Together, these studies highlight critical gaps in knowledge across different cadres of PHC workers and reinforce the urgent need for structured training and continuous professional development in asthma care.

In the treatment domain, misconceptions persisted regarding the safety profile of corticosteroids, the potential for NSAIDs to exacerbate symptoms, and fears around dependency on asthma medications in children. Moreover, many respondents demonstrated insufficient understanding of inhaler techniques and common errors such as the improper use of dry powder inhalers or incorrect actuation with spacers. These findings are in line with prior research. De Tratto et al., showed a marked discrepancy between self-perceived knowledge of inhaler technique and objectively demonstrated performance [14]. A systematic review of inhaler errors among healthcare professionals highlighted that device mishandling remains a pervasive issue, with critical mistakes affecting therapeutic outcomes [15].

In the care and prevention domain, misconceptions such as restricting dairy or limiting exercise options reveal the need for updated evidence-based guidance and practical training. Nurses' variability in recognizing signs of asthma exacerbation further reflects inconsistencies in training and experience. The American Academy of Allergy, Asthma and Immunology (AAAAI) explicitly rejects the dairy-restriction myth, stating there is no strong evidence that dairy worsens asthma in the absence of allergy [16]. Similarly, many myths about exercise-induced asthma persist, despite evidence that controlled exercise is beneficial and can be safely integrated into asthma care plans [16]. In addition, systemic reviews of nurses' roles in asthma management note that lack of uniform training contributes to heterogeneity in recognizing exacerbation signs, adjusting treatment, and instructing patients on preventive measures [4].

International models from countries such as the UK, Canada, and Australia illustrate the benefits of clearly defined nurse-led roles in asthma care. These programs, which incorporate inhaler technique assessment, structured symptom monitoring, and proactive patient education, have been shown to reduce exacerbations and improve control [17,18].

In Kazakhstan, aligning nurse education with GINA guidelines could offer similar benefits. Specifically, our findings suggest under-implementation of core GINA components such as action plans, peak flow monitoring, and patient education. National asthma strategies should clearly define nurses' roles in delivering these elements and support them through continuing education.

This study contributes to the growing body of literature calling for more precise definition of nurse roles in asthma care across post-Soviet health systems. The lack of clearly defined responsibilities in national protocols may hinder optimal engagement of nursing staff in asthma control. Kazakhstan's insufficient asthma control has been previously linked to inadequate follow-up and provider training [2]. Improved interprofessional collaboration and nurse empowerment through well-defined education and operational frameworks will be critical in bridging this gap.

Limitation

One limitation of this study is its cross-sectional design, which does not allow for causal inferences. The use of convenience sampling may have introduced selection bias and reduced the generalizability of the findings. In addition, the reliance on self-reported questionnaires increases the risk of socially desirable responses, while the lack of skill assessment limits the practical applicability of the results. Future studies should consider stratified or cluster sampling and include objective measures of skills and clinical outcomes.

4. Conclusions

Based on the results of the study, it is evident that nurses in PHC settings demonstrate a moderate understanding of asthma, with strengths in recognizing its nature and common triggers. However, there are significant gaps in their knowledge of asthma care. Factors such as age, work experience, and education level were found to influence the nurses' knowledge, with more experienced and older nurses showing better understanding. These findings suggest the need for targeted training programs that focus on

Conflict of interest. The authors declare no conflicts of interest.

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Медициналық-санитариялық алғашқы көмек жағдайында балалардағы бронх демікпесін басқару бойынша мейіргерлердің білімін бағалау

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Түйіндеме

Балалардағы бронх демікпесі – медициналық-санитариялық алғашқы көмек деңгейінде тиімді басқаруды қажет ететін кең таралған созылмалы ауру. Мейіргерлер бронх демікпесін жүргізуде маңызды рөл атқарады, алайда Қазақстандағы мейіргерлердің білімі қатысты деректер шектеулі. Осы зерттеудің мақсаты - Қазақстандағы мейіргерлердің балалардағы бронх демікпесін жүргізу бойынша халықаралық стандарттарға сәйкес білім деңгейін бағалау. Қазақстандағы медициналық-санитариялық алғашқы көмек көрсету

мекемелерінде жұмыс істейтін 518 мейіргерлердің қатысуымен қималық-зерттеу (cross-sectional) жүргізілді. Деректер Newcastle Asthma Knowledge Questionnaire негізінде бейімделген және валидацияланған сауалнама арқылы жиналды. Сипаттамалық статистика, Манн–Уитни U және Краскел–Уоллис критерийлері қолданылды. Мейіргерлердің басым бөлігі (70,5%) балалардағы демікпесін жүргізу бойынша төмен білім деңгейін көрсетті, 29,5% - орта деңгейде болды; жоғары білім деңгейі ешбір қатысушыда байқалмады. Негізгі білім олқылықтары симптомдарды тану, демікпенің ауырлығын бағалау және алдын алу көмегіне қатысты болды. Қазақстандағы медициналық-санитариялық алғашқы көмек көрсету деңгейіндегі мейіргерлер балалардағы демікпесін жүргізуде айқын білім жетіспеушілігін көрсетеді. Балаларға көрсетілетін көмекті оңтайландыру және нәтижелерді жақсарту үшін мейіргерлердің тұжырымдамалық түсінігін арттыруға және олардың даярлығын Global Initiative for Asthma ұсынымдарына сәйкестендіруге бағытталған білім беру интервенциялары қажет.

Түйін сөздер: бронх демікпесі, демікпені жүргізу, мейіргер ісі, білім, медициналық-санитариялық алғашқы көмек, дәлелдемелі тәжірибе.

Оценка знаний медицинских сестер по управлению бронхиальной астмой у детей в условиях первичной медико-санитарной помощи

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Резюме

Бронхиальная астма у детей является распространенным хроническим заболеванием, требующим эффективного ведения на уровне первичной медико-санитарной помощи. Медицинские сестры играют ключевую роль в контроле астмы, однако данные об их знаниях в Казахстане ограничены. Цель данного исследования является оценка уровня знаний медицинских сестер Казахстана в ведении пациентов с детской астмой в соответствии с международными стандартами. Проведено кросс-секционное исследование с участием 518 медицинских сестер, работающих в учреждениях первичной медико-санитарной помощи Казахстана. Данные были собраны с помощью валидизированного и адаптированного опросника на основе Newcastle Asthma Knowledge Questionnaire. Применялись описательная статистика, U-критерий Манна–Уитни и критерий Краскела–Уоллиса. Большинство медицинских сестер (70,5%) продемонстрировало низкий уровень знаний по ведению бронхиальной астмы у детей, 29,5% имели средний уровень знаний; высокий уровень знаний не был выявлен ни у одного участника. Основные пробелы касались распознавания симптомов, оценки тяжести астмы и профилактического ухода. Медицинские сестры первичной медико-санитарной помощи Казахстана имеют выраженные дефициты знаний в области ведения детской астмы. Необходимы образовательные интервенции, направленные на повышение концептуального понимания и приведение подготовки медсестер в соответствие с рекомендациями Global Initiative for Asthma для оптимизации помощи детям с астмой и улучшения исходов.

Ключевые слова: бронхиальная астма, ведение астмы, сестринское дело, знания, первичная медико-санитарная помощь, доказательная практика.