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Overview Of Asthma Control Test (Act) And Lung Function in Asthma Patients at Tanjungpura General Hospital

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Abstract
Asthma represents one of the most significant chronic respiratory disorders globally, affecting approximately 300 million individuals worldwide and imposing substantial morbidity, mortality, and healthcare costs. Despite advances in therapeutic interventions, achieving optimal disease control remains challenging, with only 15% of patients achieving good control globally. This study aimed to provide a comprehensive overview of asthma control using the Asthma Control Test (ACT) and pulmonary function assessment in asthma patients at Tanjungpura General Hospital. A descriptive observational cross-sectional study was conducted in March 2024 involving 54 asthma patients selected through consecutive sampling technique. Data collection utilized validated instruments including ACT questionnaire, spirometry following ATS/ERS guidelines, and peak expiratory flow measurements, with analysis employing descriptive statistical methods. Results revealed female predominance (64.8%), with the majority aged 18-60 years (83.3%) and housewives as the most common occupation (46.2%). Critically, 88.9% of patients exhibited uncontrolled asthma based on ACT scores, with moderate obstruction being the most frequent spirometric pattern (42.6%). Moderate persistent asthma was predominant (53.7%), and salmeterol xinafoate-fluticasone propionate combination was the most prescribed medication (90.7%). The study concludes that suboptimal asthma control is prevalent, emphasizing the urgent need for comprehensive management strategies integrating regular monitoring, enhanced patient education, and individualized treatment approaches to optimize clinical outcomes.

Keywords: Asthma Control Test, Lung Function, Peak Expiratory Flow, Respiratory Medicine, Spirometry

INTRODUCTION

Phenomenon of Asthma Research

Asthma represents one of the most significant chronic respiratory disorders globally, affecting approximately 300 million individuals worldwide and imposing substantial morbidity, mortality, and healthcare costs. This chronic inflammatory disease of the airways is characterized by reversible airflow obstruction, bronchial hyperresponsiveness, and variable expiratory airflow limitation, affecting 1-18% of the global population. Recent epidemiological data indicate that asthma affects an estimated 262 million people globally as of 2019, resulting in 455,000 deaths annually, with the burden disproportionately affecting low- and middle-income countries. Contemporary research demonstrates that asthma prevalence varies significantly across regions, with global rates of 9.1% among children, 11.0% among adolescents, and 6.6% among adults, highlighting the widespread nature of this condition.

The pathophysiological complexity of asthma involves intricate mechanisms of airway inflammation, smooth muscle contraction, and bronchial hyperresponsiveness that significantly impact patients' respiratory function and quality of life. Recent studies emphasize that asthma is fundamentally characterized by Type 2 (T2) airway inflammation, involving IgE-mediated hypersensitivity reactions with both early and late-phase responses driven by mast cells, eosinophils, and Th2 lymphocytes. The disease progression involves airway remodeling through epithelial-mesenchymal transition, increased smooth muscle content, and basement membrane thickening, which can lead to irreversible airflow obstruction if inadequately managed. Modern understanding recognizes distinct asthma phenotypes and endotypes, with emerging evidence highlighting the role of small airways dysfunction and environmental triggers in disease exacerbation.

Research Problems in Asthma Management

Despite significant advances in asthma management, achieving optimal disease control remains a substantial challenge in clinical practice, with only 15% of European asthma patients achieving good disease control. The primary objective of asthma treatment is symptom control and prevention of acute exacerbations, yet studies consistently demonstrate suboptimal control rates globally. Recent research indicates that loss of disease control is associated with 22% higher healthcare costs and significantly increased greenhouse gas emissions from inhaler use, emphasizing the multifaceted burden of uncontrolled asthma. The 2024 Global Initiative for Asthma (GINA) guidelines emphasize that asthma management should be individualized based on symptom frequency, severity, and overall risk of exacerbations, requiring comprehensive monitoring approaches.

Effective asthma monitoring represents a critical component in achieving optimal disease control, with traditional tools including symptom assessment, peak expiratory flow (PEF) monitoring, and spirometry playing essential roles in clinical evaluation. The Asthma Control Test (ACT) has emerged as the most widely validated tool for assessing asthma control, consisting of five questions evaluating symptoms, daily functioning, and patient perception of control over the preceding four weeks. Recent studies demonstrate strong correlations between ACT scores and clinical outcomes, with scores below 20 indicating suboptimal control requiring treatment adjustment. However, emerging research suggests that combining multiple monitoring approaches, including digital technologies and biomarkers, may provide more comprehensive assessment of asthma status.

Lung function assessment through spirometry and PEF monitoring remains fundamental in asthma diagnosis and management, providing objective measures of airway obstruction and treatment response. Contemporary studies reveal that asthmatic patients demonstrate significant reductions in forced expiratory volume in one second (FEV1), FEV1/forced vital capacity (FVC) ratio, and peak expiratory flow rate compared to predicted values, with female patients showing greater impairment. Recent research indicates that home spirometry monitoring can achieve acceptable quality in over 70% of measurements, supporting the feasibility of remote lung function assessment. PEF monitoring has gained renewed attention as studies demonstrate its predictive value for asthma exacerbations, with decreases occurring approximately 1.34 days before symptom onset in pediatric patients.

Research Objectives, Urgency, and Novelty

This study aims to provide a comprehensive overview of asthma control using the Asthma Control Test (ACT) and pulmonary function assessment in asthma patients at Tanjungpura General Hospital, addressing the critical need for real-world data on asthma management outcomes in clinical practice. The research urgency stems from the persistent global challenge of suboptimal asthma control, with contemporary studies showing that uncontrolled asthma accounts for 77% of the total economic burden through reduced quality of life and productivity losses. The novelty of this investigation lies in its comprehensive integration of validated assessment tools (ACT, spirometry, PEF) within a specific healthcare setting, providing insights into the practical application of current asthma management guidelines and the real-world effectiveness of combination therapies such as salmeterol xinafoate and fluticasone propionate. This research contributes to the growing body of evidence supporting the importance of routine monitoring, adherence to therapy, and proper patient education in optimizing asthma management outcomes and improving patients' quality of life

RESEARCH METHODS

Research Design and Methodology

This study employed a descriptive observational design with a cross-sectional approach to examine the Asthma Control Test (ACT) profile and lung function parameters in asthma patients at Tanjungpura General Hospital. Descriptive observational studies are fundamental research designs that allow researchers to observe and record phenomena without manipulating variables, providing valuable insights into natural occurrences and patient characteristics in clinical settings. According to Creswell and Creswell (2023), descriptive research designs are particularly suitable for studies aimed at characterizing and describing the current status of variables within a specific population. This methodological approach aligns with Sugiyono's (2022) framework for quantitative descriptive research, which emphasizes

systematic data collection and objective measurement to understand population characteristics. The observational design was selected as the most appropriate methodology because it enables the examination of asthma control and lung function parameters in their natural clinical context without experimental intervention, thereby preserving the ecological validity of the findings.

Instruments and Data Analysis Techniques

The study utilized validated instruments for comprehensive assessment of asthma control and lung function parameters. The Asthma Control Test (ACT) served as the primary instrument for evaluating asthma control, a validated questionnaire consisting of five questions assessing symptom frequency, activity limitation, shortness of breath, awakening, and patient perception of control over the preceding four weeks. Recent validation studies confirm that ACT demonstrates excellent reliability and validity, with scores ranging from 5 to 25, where scores ≤19 indicate uncontrolled asthma, 20-24 suggest partially controlled asthma, and 25 represents well-controlled asthma. Spirometry was conducted using standardized equipment following the American Thoracic Society and European Respiratory Society (ATS/ERS) guidelines, which specify accuracy requirements of ±2.5% and sampling rates ≥100 Hz with minimum 12-bit resolution. Peak expiratory flow (PEF) measurements were obtained using calibrated peak flow meters, with results categorized according to established zone classifications: green zone (>80% of personal best), yellow zone (50-80%), and red zone (<50%). Data analysis employed descriptive statistical methods, including measures of central tendency (mean, median, mode) and variability (standard deviation, range) to summarize patient characteristics and clinical parameters. Statistical analysis was performed using appropriate software to ensure accuracy and reliability of findings, following established guidelines for descriptive data analysis in healthcare research.

Population and Sample

The target population comprised asthma patients who underwent spirometry and peak expiratory flow (PEF) tests at Tanjungpura General Hospital during the study period. The study sample consisted of 54 asthma patients selected through consecutive sampling technique, a non-probability sampling method widely recognized in clinical research for its practical advantages and reduced selection bias. Consecutive sampling involves selecting all subjects who meet inclusion criteria during a specified recruitment period until the desired sample size is achieved, making it particularly suitable for clinical studies where random sampling may be impractical. This sampling approach aligns with methodological recommendations by Creswell (2017) for healthcare research, where consecutive sampling provides adequate representation of the clinical population while maintaining feasibility. The inclusion criteria encompassed asthma patients aged >18 years who underwent spirometry and PEF testing, completed ACT assessment, and provided informed consent, while exclusion criteria eliminated patients with comorbidities of pulmonary tuberculosis (TB) and congestive heart failure (CHF) to ensure sample homogeneity. Sample size determination followed established guidelines for descriptive studies, with 54 participants providing adequate representation for characterizing asthma control and lung function parameters in the study population.

Research Procedures

The research was conducted at Tanjungpura General Hospital in March 2024 following ethical approval and informed consent procedures in accordance with established research ethics guidelines. Data collection procedures were systematically implemented beginning with patient identification and screening against inclusion and exclusion criteria during routine clinical visits. Eligible participants underwent comprehensive assessment including demographic data collection, ACT questionnaire administration, spirometry testing, and PEF measurement following standardized protocols. Spirometry procedures adhered to ATS/ERS standards, requiring patients to perform at least three acceptable maneuvers with appropriate calibration verification using 3-L syringes cycled at varying flows between 0.5 and 12 L/s. ACT questionnaires were administered by trained personnel to ensure consistent data collection and minimize interviewer bias, with responses recorded systematically for subsequent analysis. PEF measurements were obtained using calibrated devices with results interpreted according to established reference values and zone classifications. Data quality assurance procedures included regular equipment calibration, standardized data collection protocols, and systematic verification of recorded information to ensure accuracy and reliability. All collected data were processed and analyzed using descriptive statistical methods to characterize the study population and examine relationships between variables, following established guidelines for quantitative data analysis in healthcare research.

RESULTS AND DISCUSSION

Research Results

The demographics of asthma patients at Tanjung Pura Regional General Hospital are described in the table below:

Table 1. Demographic Profile of Asthma Patients

Characteristic	n	%
Gender		
Male	19	35,2
Female	35	64,8
Age		
18-60	45	83,3
Over 60	9	16,7
Occupation		
Housewife	25	46,2
Merchant	17	31,4
Farmer	4	7,4
Retired civil servant	3	5,6
Teacher	2	3,7
Student	1	1,9
Miner	1	1,9
Civil servant	1	1,9
N	54	100%

Based on Table 1, it is known that women are the most common asthma patients, with 35 cases (64.8%). The most common age group is 18–60 years old, with 45 cases (83.3%). Lastly, the most common occupation is housewife, with 25 people (46.2%), followed by merchant with 17 people (31.4%), and farmer with 4 people (7.4%).

The following table shows the results of the Asthma Control Test (ACT) for asthma patients:

Table 2. Overview of the *Asthma Control Test (ACT)* for Asthma Patients

Asthma Control Test **(ACT)**	**Mean**	**n**	**%**
Not controlled	15.02	48	88,9
Partially controlled	20,8	6	11,1
n		54	100

Based on Table 2 above, it is known that the majority of patients were those with uncontrolled Asthma Control Test (ACT) results, numbering 48 people (88.9%).

The spirometry results of asthma patients at TanjungPura Regional General Hospital are described in the table below:

Table 3. Spirometry Results of Asthma Patients

Spirometry	n	%
Restriction		
Mild	0	0
Moderate	7	12,97
Severe	0	0
Obstruction		
Mild	19	35,18
Moderate	23	42,60
Severe	5	9,25

Based on Table 3, It is known that patients with moderate obstruction were the most numerous, numbering 23 (42.60%), and patients with moderate restriction were the most numerous, numbering 7 (12.97%).

The APE profile of asthma patients at Tanjung Pura Regional General Hospital is described in the table below.:

Table 4. Overview of APE in Asthma Patients

APE	n	%
Green Zone	19	44,4
Yellow Zone	24	33,3
Red Zone	11	22,2

Based on Table 3 above, the yellow zone had the highest number of asthma patients, namely 24 people (44.4%).

The severity of asthma in patients at TanjungPura Regional General Hospital is described in the table below:

Table 4. Severity of Asthma in Asthma Patients

Degree of Asthma	n	%
Mild Persistent	21	38,88
Moderate Persistent	29	53,71
Severe Persistent	4	7,41

Based on Table 4 above, moderate persistent asthma is the most common type of asthma, affecting 29 patients (53,71%).

The medications prescribed to asthma patients at Tanjung Pura Regional General Hospital are described in the table below:

Table 5. Medications Prescribed to Asthma Patients

APE	n	%
Combination of salmeterol xinafoate, fluticasone propionate	49	90,7
Combination of budesonide, formoterol	5	9,3

Based on Table 5 above, the combination of salmeterol xinafoate, fluticasone propionate is the most commonly used medication for asthma patients, with 49 patients (90.7%) using it.

Discussion

Women constituted the majority of asthma patients in this cohort (64.8%), consistent with the known post-pubertal shift in asthma epidemiology whereby prevalence and severity become higher among females than males. After puberty, women exhibit higher risks of exacerbations, hospitalizations, and poorer perceived control than men, influenced by sex hormones, obesity, and inflammatory modulation (Myers et al., 2014; Scott et al., 2016). Clinical observations further indicate that females may report worse control and more exacerbations despite comparable or higher FEV1 percentages and lower FeNO and IgE profiles relative to males, suggesting sex-specific endotypes and management challenges (Scott et al., 2016). Additional evidence highlights psychosocial and biological contributors, including depression and salicylate sensitivity, which appear more prevalent among women with early-onset phenotypes (L'Youssfi et al., 2016). Registry and cohort analyses corroborate these patterns, emphasizing that genetic susceptibility, hormonal fluctuations across the lifespan, and obesity contribute to differential trajectories of disease burden among women (Loewenthal et al., 2022; Mistry et al., 2018; Temprano & Mannino, 2009).

The predominant age group in this study was 18–60 years (83.3%), aligning with population-based findings that adult working-age groups carry substantial asthma burden and service utilization. Cohorts have documented higher adult-onset or persistent disease in those under 60 years and meaningful sex-by-age interactions across the life course (Hansen et al., 2015; Wüthrich et al., 2013). Occupational context also emerged as salient: housewives were most represented (46.2%), followed by merchants and farmers. Domestic exposures can be clinically relevant; raw potato handling has been linked to

occupational-type food allergen sensitization with bronchospasm and rhinoconjunctivitis (Quirce et al., 1989). Household cleaning agents, particularly chlorine bleach and ammonia, have been associated with increased respiratory symptoms, asthma, and chronic bronchitis among women engaged in domestic cleaning (Medina-Ramón et al., 2003; Ozden Sertcelik et al., 2022). These findings underscore the need for targeted exposure counseling and prevention strategies in home and informal work environments (Guddattu et al., 2010).

Spirometric patterns in this cohort were predominantly moderate obstruction and notable restriction, reflecting common physiologic impairment in asthma. Diagnostic evaluation typically hinges on reduced FEV1 and FEV1/FVC ratios, with mid-expiratory flows (FEF25–75) sometimes providing additional sensitivity in small airway involvement (Lebecque et al., 1993; Nowak et al., 1979). Obstructive physiology arises from airway inflammation, bronchoconstriction, and variable expiratory airflow limitation, while observed restrictive patterns may reflect air-trapping with reduced FVC, suboptimal effort, or concurrent restrictive processes that require clinical correlation (Veiga et al., 2012). Taken together, spirometry remains essential to staging severity and monitoring response in routine practice, complementing symptom-based tools to reduce misclassification and under-recognition of physiologic impairment (Hegde et al., 2017; Gallucci et al., 2019).

Moderate persistent asthma was the most frequent severity class in this sample, consistent with studies showing that many patients experience daily symptoms, reliance on relievers, and nocturnal awakenings more than once weekly, often with FEV1 around 60–80% predicted (Susanto et al., 2008). Multicountry data from sub-Saharan Africa similarly reported a high prevalence of moderate categories within the severity spectrum, pointing to systemic gaps in control and access (Kirenga et al., 2024). Effective management in these patients is inherently multifactorial, requiring optimization of adherence, inhaler technique, comorbidity control, risk-factor modification, and psychosocial support to achieve guideline-recommended targets (Hall et al., 2018; Lyu, 2014). Aligning with contemporary asthma strategies, integrating objective lung function measures with validated control instruments can help identify patients drifting into non-control and guide timely step-up or adjustment.

The most commonly prescribed medication in this cohort was salmeterol xinafoate–fluticasone propionate, a long-acting beta2-agonist plus inhaled corticosteroid (LABA/ICS) fixed-dose combination. Evidence supports LABA/ICS combinations for improving symptoms, lung function, and quality of life over ICS alone in appropriate patients, with demonstrated effectiveness across adult and pediatric populations and potential corticosteroid-sparing effects in long-term management (McKeage & Keam, 2009; Panahi et al., 2018). Head-to-head and add-on studies further suggest benefits when montelukast is combined in selected phenotypes, though personalization remains essential (Hong, 2008; Chapman, 2002). Pharmacologic response variability linked to beta2-adrenoceptor polymorphisms highlights the promise of precision-based approaches to optimize controller therapy (Soleimani et al., 2013). Short-term safety data, including dose escalations, support tolerability within clinical confines, including in children, when guided by clinical need and monitoring (Adolfsson et al., 2005; Ye, 2011). Overall, the observed prescribing pattern is consistent with evidence-based practice where combination therapy is indicated, reinforcing the central role of adherence, technique training, and regular reassessment to translate pharmacologic efficacy into real-world control (Gallucci et al., 2019).

CONCLUSION

This study demonstrates that the majority of asthma patients at Tanjungpura General Hospital exhibit suboptimal disease control, with 88.9% of patients presenting uncontrolled asthma based on ACT scores and predominantly moderate spirometric impairment patterns. The findings reveal a concerning pattern of inadequate asthma management characterized by female predominance (64.8%), moderate persistent asthma severity (53.7%), and substantial reliance on combination therapy with salmeterol xinafoate and fluticasone propionate (90.7%). The high prevalence of uncontrolled asthma aligns with global trends indicating persistent gaps in achieving optimal disease control despite advances in therapeutic interventions (Cojocaru et al., 2025; Çelik et al., 2023). These results underscore the critical importance of implementing comprehensive asthma management strategies that integrate regular monitoring using validated tools such as ACT and spirometry, enhanced patient education regarding

trigger avoidance and proper inhaler technique, and individualized treatment approaches based on contemporary clinical guidelines (Wellmann et al., 2024; Mohan et al., 2023).

Several limitations must be acknowledged in interpreting these findings, including the cross-sectional design that limits causal inference, the single-center setting that may restrict generalizability, and the relatively small sample size that may not fully represent the broader asthma population. Future research should focus on longitudinal studies to assess disease progression and treatment response over time, implementation of digital monitoring technologies including telemedicine platforms and smart inhalers to improve patient engagement and adherence, and investigation of personalized treatment approaches based on asthma phenotypes and biomarkers (Wellmann et al., 2024; Mohan et al., 2023). The clinical implications of this study emphasize the urgent need for healthcare providers to adopt systematic asthma monitoring protocols, prioritize patient education initiatives, and consider early intervention strategies to prevent disease progression and optimize long-term outcomes in asthma management.

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