Jurnal Ilmu Farmasi dan Farmasi Klinik (JIFFK)
Vol.21, No.1, Juni 2024, Hal. 85-95
ISSN: 1693-7899 e-ISSN: 2716-3814

ASTHMA CONTROL AND QUALITY OF LIFE OF ASTHMA PATIENTS AT ST GENERAL HOSPITAL

Jatmiko Susilo[1)*], Soleha Kurniawati[2)]

[1]*Pharmacy Study Program, Faculty of Health, Universitas Ngudi Waluyo, Ungaran, Jawa Tengah*
[2]*Undergraduate Pharmacy Study Program, Faculty of Health, Universitas Ngudi Waluyo, Ungaran, Jawa Tengah*
**Email: jmikosusilo@gmail.com*

Received: 05-06-2023 *Accepted:15-04-2024* *Published:30-06-2024*

INTISARI

Asma adalah kondisi saluran udara pernafasan menyempit, meradang dan menghasilkan lendir berlebih yang dapat berdampak pada kualitas hidup penderita. Pengendalian asma yang suboptimal dikaitkan dengan peningkatan biaya pengobatan dan perawatan serta penurunan kualitas hidup. Penelitian bertujuan untuk mengkaji hubungan antara pengendalian asma dengan kualitas hidup pasien asma di Rumah Sakit Umum Daerah ST. Studi potong lintang melibatkan 50 penderita asma Rumah Sakit Umum Daerah ST berusia 18-65 tahun. Kuesioner Tes Pengendalian Asma (ACT), dan kualitas hidup asma dewasa (Mini-AQLQ) digunakan. Uji Spearman Rank digunakan untuk menghitung kekuatan asosiasi (CI : 95%). Dari 50 responden yang diteliti, status asma diketegorikan terkendali partial (50%), terkendali total (14%), dan tidak terkendali (36%). Kualitas hidup buruk teramati pada responden dengan asma tidak terpengendalian, sedangkan kualitas hidup baik teramati pada responden asma terkendali sebagian (p <0,001). Ada hubungan antara pengendalian asma dengan kualitas hidup responden (rho = 0,832). Pengobatan yang tepat akan meningkatkan pengendalian asma dan memperbaiki kualitas hidup pasien yang dirawat di Rumah Sakit Umum ST. Penelitian lebih lanjut diperlukan untuk mengevaluasi faktor risiko, efek psikologis, dan skrining perilaku pada pasien asma yang tidak terkendali.

Kata kunci: asma, pengendalian, kualitas hidup

ABSTRACT

Asthma is a chronic condition characterized by chronic airway inflammation that causes various respiratory symptoms that can severely impact a patient's daily life. Suboptimal control of asthma is associated with increased costs of care and treatment and decreased quality of life (QoL). This study aims to examine asthma control status and its relationship with the QoL of asthma patients at ST. General Hospital. This cross-sectional study involved 50 asthmatics aged 18-65 who attended ST. General Hospital. Two questionnaires were used: an asthma control test (ACT) and an adult asthma quality-of-life questionnaire (Mini-AQLQ). By using SPSS, the Spearman Rank test was employed to identify associations with a 95% confidence level. Of the 50 respondents studied, asthma status was categorized as partially controlled (50%), totally controlled (14%), and uncontrolled (36%). A significantly worse QoL was observed in respondents with uncontrolled asthma, whereas a good QoL (minimal or no impairment) was observed in partially controlled respondents (p = <0.001). There was a relationship between asthma control and the respondent's QoL (rho = 0.832). Appropriate treatment will increase asthma control and improve the QoL of patients treated at ST. General Hospital.

Further research is needed to evaluate risk factors, psychological effects, and behavioral screening in poorly controlled asthma patients.

Keywords: *asthma, control, quality of life*

**corresponding author:*
Nama : Jatmiko Susilo
Institusi : Program Studi S1 Farmasi Fakultas Kesehatan Universitas Ngudi Waluyo
Alamat institusi : Jl. Diponegoro 185 Ungaran
E-mail : jmikosusilo@gmail.com

INTRODUCTION

Asthma is a chronic respiratory disease characterized by inflammation, increased reactivity to various stimuli, and airway obstruction (GINA, 2017). The Global Asthma Report (GAR, 2018) demonstrated that asthma is a chronic disease estimated to affect 339 million people worldwide. However, data from the World Health Organization (WHO, 2022) showed an estimated 262 million people had asthma in 2019, causing 455,000 deaths.

Based on data from the Indonesian Ministry of Health in 2013, the prevalence of asthma in Indonesia was 4.5%, meanwhile, in Central Java, it reaches 1.8% (NIHRD, 2013). The prevalence of asthma in adults in Indonesia is relatively low and slightly higher in women than men. Both men and women have a slightly increased chance of developing obesity-related asthma (Nisa, 2023).

Several studies were conducted in Lebanon on asthma patients by examining the scale of asthma risk factors prevalence, highlighting the relationship between various factors and the development of wheezing and asthma, assessing asthma control (Hallit *et al*, 2017). The most common factors that have been identified to affect asthma control are related to environmental, physiological, and behavioral components, access and use of health services and socioeconomic factors (eg, low income and insurance) as important variables. Smoking, perceived hyper-responsiveness (responding to asthma symptoms to one or more triggers), allergies, and long-acting bronchodilators agents, and inhaled corticosteroids (Al-Zahrani *et al*, 2015), and providing the influence of diet and obesity on asthma (Hallit *et al*, 2017).

Asthma affects the quality of life (QoL). Poor QoL in asthma patients is associated with a high prevalence of behavioral and emotional difficulties, depression, and poor academic performance (Kharaba *et al*, 2022). QoL is the multi-dimensional concept of an individual's general well-being status related to their value, environment, and cultural and social context in which they live (Phyo *et al*, 2020). Global leading health organizations have emphasized the importance of QoL and well-being as a goal across all life stages (Centers for Disease Control and Prevention, 2019).

Quality of life is increasingly used in contexts for monitoring the efficacy of healthcare services (e.g. patient-reported outcome measures, PROM), assessing outcomes of interventions, and as an indicator of unfulfilled needs. PROM can not only help patients and clinicians make better decisions but can also allow comparisons of provider performance to stimulate service improvement (Black, 2013).

Data regarding the QoL of asthma patients is still scarce, especially among adults and treatment patterns are still far from the goals set in international asthma guidelines. Inadequate disease control is associated with disease progression and poor QoL or severe impairment.

Likewise, at ST General Hospital there has been no research related to asthma control and qoL in asthma patients. Therefore, this study aims to examine the relationship between asthma control with QoL (the physical, emotional, and social aspects) in adult asthma patients at ST General Hospital.

METHOD

Study design and population

This was an observational, cross-sectional, analytical clinical study conducted at the outpatient pulmonary department of ST General Hospital. This study involved 50 patients aged 18 – 65 years and diagnosed with bronchial asthma. Asthmatic patients with comorbid upper respiratory tract infections, lung cancer, chronic obstructive pulmonary disease (COPD), heart disease, severe anemia, pregnancy and asthma in exacerbations were excluded.

Demographics

General demographic characteristics were collected from January to December 2022, such as gender, age and occupation of the respondents reported by the respondent concerned.

Asthma control evaluation

The validated Indonesian language version of the asthma control test (ACT) was used. This tool assessed general asthma symptoms and frequency of shortness of breath, inhaler use, and the effect of asthma on a patient's functional status. It had several asthma categorizations such as "well or totally controlled" (score ≥ 13), "partially controlled" (score 12-7), and "poorly controlled" (score ≤ 6) (Nathan *et al.*, 2004). It was reported by the patient or his family.

Quality of life assessment

All participants (patients or patient families) who met the requirements and were waiting for medication at the hospital were contacted directly by the research, then given a validated Indonesian version of the Mini-Asthma Quality of Life Questionnaire (Mini-AQLQ), then participants answered the questions (AQLQ).) validated Indonesian version, includes 23 questions to assess the patient's functional problems (physical, emotional, and social) due to asthma and is rated on a 7-point Likert scale from 1 (never) to 7 (always). Each response scale is recorded and transformed through description to provide a AQLQ score.

The patient's QoL was classified as minimal or no impairment (≥ 6.0 points); moderate impairment (3.0-5.9 points); and severe impairment (<3.0 points) (Bateman *et al*, 2007). Higher scores indicated a better QoL (Lahaye *et al*., 2013).

Ethical statement

The Ethics Committee at ST General Hospital approved the study protocol (09/EC/RSUDST/2023). The study was conducted according to the principles of the Declaration of Helsinki. Informed consent forms were read to each participant, and oral consent was obtained. In illiterate participants, to standardize the consent process, we decided that consent should be oral but witnessed in person by a third party to certify that consent had been read out to participants who voluntarily accepted to participate in the study. A copy of the consent form signed by the witness was also provided to the participant. The ethics committee approved the process for consent approval. No minor was included in this study. Data was then collected and analyzed anonymously. No personally identifiable participants were recorded on the survey questionnaire. Participants were free to accept, refuse to participate, or withdraw at any time without penalty.

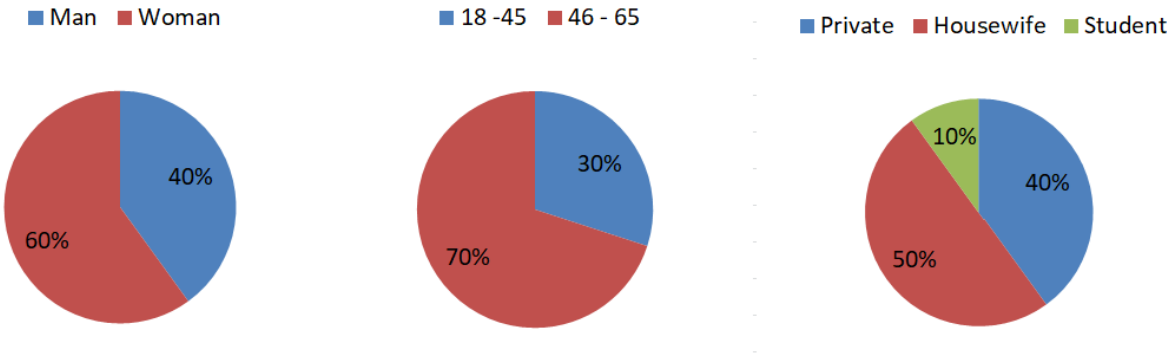
Statistic analysis

Data were summarized using frequencies and percentages for categorical variables or averages with standard deviations (SD) for measured variables. For univariate analysis, dichotomized variables based on the adequacy of asthma control became totally, partially, and poorly controlled. The Spearman Rank test analyzed the correlation between ACT and QoL. P value ≤ 0.05 was considered significant. Statistical analysis was performed with the IBM SPSS Statistical software package version 20.

RESULTS AND DISCUSSION

Respondent Demographics

The results demonstrated (Figure 1.) that asthma was suffered by 60% of women and 40% of men aged 46-65 years (70%) and 18-45 (30%). Furthermore, the respondents' occupation was a housewife (50%), private employee (40%) and students (10%).



(a) (b) (c)

Figure 1. Respondent Demography (a) Genders; (b) Age; and (c) Occupations

These results align with the research by Kasrin *et al.* (2022), revealing that most asthma sufferers were women. In the study by Putra *et al.*, (2018), respondents aged 46-65 most commonly experienced bronchial asthma due to rapid development and changes that can affect the hypothalamus. It can result in decreased cortisol production associated with inflammatory disorders that can cause bronchial narrowing (bronchoconstrictor, triggering bronchial asthma attacks).

Asthma attacks often occur in women compared to men. It is suspected because men's lungs or airways are larger than women's in adulthood (Astuti *et al.*, 2018). Asthma in women is closely related to the hormonal variations they experience during their genital life from puberty to menopause (Taillé *et al.*, 2014). Menopause is characterized by decreased ovarian hormones (progesterone and estrogen) and increased pituitary gonadotropins (Follicle stimulating hormone, FSH, and Luteinizing hormone, LH).

Women in transition, early postmenopausal, and late postmenopausal women are significantly more likely to develop asthma (odds ratios, OR= 2.1, 2.4, and 3.4, respectively) than those who remain premenopausal. The proportion of women with a new diagnosis of asthma ranges from 2.8% in women who remain premenopausal to 6.9% in those with late menopause (Triebner *et al.*, 2016). Twenty to forty percent (20–40%) of premenopausal women suffer from pre- or peri-menstrual asthma (PMA) and experience a worsening in the week preceding menstruation (Graziottin & Serafini, 2016) due to increased inflammation in the bronchi.

The Northern European Respiratory Health Study (RHINE) reported that the risk of respiratory symptoms increased in early postmenopausal and late postmenopausal women. Furthermore, those transitioning into reproductive aging were more susceptible to asthma attacks and new respiratory symptoms (Triebner *et al.*, 2016).

Female hormones affect bronchial contractility, inflammation, and cilia (Shah *et al.*, 2021). Estrogen has anti- and pro-inflammatory effects according to cell type, estrogen concentration, and target organs. At physiological doses, it has anti-inflammatory action causing the relaxation of the smooth muscle and regulating the cilia. (Keselman & Heller, 2015). Another finding from the Meta-analytic study by (McCleary *et al.*, 2018) concluded that hormone replacement therapy in postmenopausal women was associated with a higher risk of asthma (OR = 1.57, 95% CI 1.07–2.30).

Estrogen can act directly to produce harmful effects in asthma or influence other agents to exert effects on lung mechanisms and airway inflammation (Bonds & Midoro-Horiuti, 2013). Thus, estrogen, which causes bronchodilation at physiologic concentrations, has an inverse effect at high rates (Townsend *et al.*, 2012). Hormonal replacement therapy (HRT) was associated with a reduced risk of development of late-onset asthma in menopausal women (Shah, 2021). There is a potential link between key elements of the immune cell system and their interactions with sex steroids, relevant to structural cells in the pathophysiology of asthma and other lung diseases (Borkar *et al*, 2022).

In addition, during this period, asthma symptoms can be bewildered with other pathologies suggestive of dyspnea, such as Chronic Obstructive Pulmonary Disease (COPD) and heart disease (Zaibi *et al.*, 2020). In our study, asthma appeared after the age of 46-65 years in 70% of cases, and in the peri-menopausal period, it can begin in some women in their 30s. However, it often starts in women ages 40 to 44) in 30% of cases.

The age factor influences asthma attacks due to decreased lung function and airway inflammation (Afiani *et al.*, 2017). However, in productive age (15-64 years), it is associated with frequent exposure to allergens, cigarette smoke, hormonal fluctuations, inflammation and respiratory infections (Afiani *et al.*, 2017).

With increasing age, gas exchange occurs with a linear decrease in arterial oxygen pressure (PaO_2) until 70 years and a decrease in the capacity to release carbon monoxide. Therefore, the immune function of the respiratory system can be disrupted, which causes an increased risk of respiratory tract infections (Robitaille & Boulet, 2014).

Differences in gender and aging both have a significant impact on the prevalence and severity of asthma. Gender, hormones, and genetics impact the incidence and severity of asthma throughout the life course. However, this association is also influenced by many internal and external factors, such as atopy, smoking, lung aging, obesity, and environmental exposure (Zein *et al.*, 2019)

Furthermore, epidemiological studies have shown that among working populations, an individual's occupation or occupational category is associated with asthma risk (Wortong *et al.*, 2015; Abrahamsen *et al.*, 2017). It may be associated with occupational exposure to asthmogenic compounds (causing asthmatic attacks) (Le Moual *et al.*, 2018).

Previous studies have demonstrated the risk of asthma in certain occupations, including hairdressers, car painters, furniture makers, and healthcare workers (Köse *et al.*, 2014). Reports showed that professional cleaners have a high rate of asthma symptoms in Europe and North America (Siracusa *et al*., 2013). Many homemakers are exposed to chemical cleaning products (Gorguner *et al.*, 2004).

Asthmatic homemakers in the population are exposed to chemicals, indoor allergens or house dust mites when they clean rooms in the house (Saily *et al*., 2014). Moreover, research by Weinmann *et al.* (2017) supports the hypothesis that there is an association between the use of cleaning products and an increased risk of asthma and wheezing in adults (OR: 2.79, 95% CI 0.84 to 9.20). This evidence is reinforced by Abrams (2020) that household cleaning products increase the risk of asthma or wheezing in all age groups.

Twelve percent (12%) of homemakers experienced increased asthma symptoms when doing household chores with exposure to cleaning agents at home. Several studies have linked asthma symptoms to using sprays, bleach, and waxing (Mungan *et al.*, 2019). The results of this study align with other studies that the most asthma sufferers were found in homemakers, 46.58% (Saily *et al.*, 2014) and 41.9% (Desmawati *et al.*, 2013).

Bleach is significantly more common among homemakers than other working women. Frequent use of bleach for household cleaning is associated with non-allergic adult-onset asthma, increased neutrophil counts, and lower respiratory tract symptoms in women (Matulonga *et al.*, 2016). Weekly use of household cleaning sprays may harm asthma (Bédard *et al.*, 2014).

Based on this research, 10% of students have a history of asthma, while other research shows that the prevalence of bronchial asthma in adolescents is 13.1%, of which 10.3% experienced an asthma episode in the last 1 year. The prevalence was higher in men (8.77%) than women (4.33%). The prevalence was significantly higher among those who had pets at home, had a higher socioeconomic status, used smoke-producing fuels at home (firewood/cow dung/kerosene), and had a history of smoking among family members (Bhalla *et al*, 2018).

Asthma Control Evaluation

Based on Table I, asthma status is included in the categories partially controlled (38.0%), totally controlled (14.0%), and uncontrolled (8.0%). These results align with research conducted by Nurhalisa *et al.* (2022) that partially controlled asthma status ranks first, proving a relationship

between stress and the recurrence of shortness of breath. Meanwhile, Katerine *et al.* (2014) revealed more asthma control status than the uncontrolled asthma category (55.4%).

Table I. The Asthma Control Status and Quality of Life of patients

Asthma Control Status**	Quality of Life*								p_{value}
	Minimal or no impairment		Moderate impairment		Severe impairment		Total		
	f	%	f	%	f	%	f	%	
Totally Controlled	7	14,0	0	0,0	0	0,0	7	14,0	<0.001
Partially Controlled	19	38,0	5	10,0	1	2,0	25	50,0	
Poorly (Uncontrolled)	4	8,0	6	12,0	8	16,0	18	36,0	
Total	30	60,0	11	22,0	9	18,0	50	100,0	

* Minimal or no impairment (≥ 6.0 points); moderate impairment (3.0-5.9 points); and severe impairment (< 3.0 points)
** Totally controlled" (score ≥ 13), "partially controlled" (score 12-7), and "poorly controlled" (score ≤ 6)

Asthma is defined as "totally controlled" if the patient reports symptoms and the use of reliever medications twice per week or less, no night waking, no activity limitation or airway obstruction, and no exacerbations; "partialy controlled" when symptoms or reliever use are present more than twice per week, and night waking, activity limitation, airway obstruction or exacerbations are present in any week, and "uncontrolled" with the presence of any three or more of these individual features with in any week and uncontrolled asthma contributes to an increase in asthma symptoms, medication use, physician visits, and missed days of school and work (GINA, 2015).

Asthma is considered under control if nocturnal symptoms or exacerbations are absent and the patient has free daily activities and normal respiratory function (GINA, 2018). However, uncontrolled asthma remains a major public health problem. Uncontrolled asthma has the potential to impact students' self-confidence and social interactions (Isik & Isik, 2017). Asthma is not adequately controlled in developed countries in 40-70% of patients (Braido *et al.*, 2016).

Environmental factors have been identified as increasing the risk of developing asthma, such as exposure to air pollution and tobacco smoke as well as occupational risk factors. Additionally, atopy, stress, and obesity can increase the risk of asthma in genetically susceptible people (Toskala & Kennedy, 2015). Asthma severity is a strong independent risk factor for future exacerbations, and the rate of exacerbations becomes more frequent as asthma severity increases. (Nakwan, 2021).

The association between low educational attainment and uncontrolled asthma in previous studies has been reported even in low-income countries (Tarraf *et al.* 2018). The low level of education causes a lack of information about asthma prevention and control as well as a lack of self-management education. The level of education and knowledge influences asthma control. Ade *et al*, (2019) found that 78.6% of asthma was controlled, 17.1% was partially controlled, and 4.3% of medical students were not controlled.

Factors influencing asthma control include socio-demographic characteristics, psychosocial characteristics, asthma severity, medication adherence, drug inhalation techniques, and exposure to infectious agents (especially viruses) and allergens (indoor and outdoor pollutants). Co-morbidities (high blood pressure, chronic sinusitis, gastro esophageal reflux disease (GERD), obesity, hypovitaminosis D) can also increase the risk of poor asthma control (Columbo *et al.*, 2014; BinSaeed, 2015).

Quality of Life Assessment (QoL)

Based on study (Table 1), the patient's QoL was categorized as minimal or no impairment or QoL good category (60.0%), moderate impairment or QoL moderate category (22.0%), and severe impairment or poor category (18.0%). These findings are not different from those of Marantika *et al.* (2022), revealing the results mostly with good or minimal or no impairment QoL (46.2%).

Quality of life (QoL) is a concept that aims to capture the well-being of either a population or individuals, both positive and negative aspects, in their overall existence at a given point in time (Teoli & Bhardawaj, 2023). General aspects of QoL include personal health (physical, mental, and spiritual), relationships, educational status, work environment, social status, wealth, sense of security and safety, freedom, autonomy in decision-making, social ownership, and the physical environment (Teoli & Bhardawaj, 2023).

Asthma is a chronic disease that cannot be cured and can affect the QoL. However, it can be controlled by administering the right medication. If patients receive good asthma management, their QoL can remain optimal (GINA, 2019) and will increase (Mayasari *et al.*, 2015). Good asthma treatment can control symptoms, prevent recurrences or 'attacks' of the disease, keep the lungs as healthy as possible, prevent asthma from interfering with school, work or leisure, or sports activities, and help enjoy a full and active life (GINA, 2019).

Asthma Control Status and Quality of Life

This study's results indicated a significant relationship between asthma control status and the QoL of people with asthma (p-value <0.001). These results reinforce the research by Marantika *et al.* (2022) and Mayzika & Mukti (2019), revealing a significant relationship between the level of asthma control and QoL.

The relationship between the two aspects is very strong (rho: 0.832) and positive. It aligns with research by Mayasari *et al.* (2015) that the more controlled the asthma status is, the better the QoL will be.

Poor QoL is significantly associated with poor asthma control, as implied by the Mini-AQLQ score in our study. Furthermore, many other studies conducted in Saudi Arabia, Iran, and the United States have shown similar results (Al Zahrani *et al.*, 2014).

The main goal of asthma management is to optimize the control of asthma symptoms and reduce the risk of asthma exacerbations while minimizing the side effects of treatment. The determining factors for the success of an asthma control therapy strategy are the time since the onset of clinical disorders, previous severity, number of comorbid conditions, previous exacerbations, and frequency of symptoms (Delgado *et al*, 2021).

Kosse *et al.*, (2020) demonstrated that stimulating positive perceptions of disease and confidence in treatment can increase medication adherence, which in turn can improve disease control and better QoL. Conversely, patient non-adherence to treatment contributes to poor clinical outcomes (Koya *et al.,* 2018). In particular, non-compliance with asthma control therapy can lead to a progressive decrease in lung function, an increased risk of severe asthma exacerbations (Engelkes *et al.,* 2015), and a decreased QoL (Bårnes & Ulrik, 2015).

People with uncontrolled asthma showed a worse QoL than those who are controlled (Afiani *et al.*, 2017), which can be caused by a lack of awareness, knowledge, desire, and behavior to control asthma properly. Furthermore, non-compliance with drug consumption and co-morbidities are other causative factors. (Zeru *et al.*, 2020).

This study has proven that appropriate medication could improve asthma control status and increase QoL in patients admitted to ST. General Hospital.

Limitation of Study

The authors believe this study must be conducted on a larger sample size from several hospitals in different locations (multi-centers) to sufficiently represent asthma control status and its relationship to QoL. In addition, interview-based qualitative research can produce more accurate results detailing the effect of asthma on QoL than self-administered questionnaires.

CONCLUSION

This study proved that the QoL of asthmatic patients was correlated with the control of this disease. Appropriate medication could improve asthma control status and increase QoL in patients admitted

to ST. General Hospital. Further research is needed to evaluate risk factors, psychological effects, and behavioral screening in poorly controlled asthma patients.

ACKNOWLEDGMENTS

The authors would like to thank the medical record officers at ST General Hospital for their assistance in data collection.

REFERENCE

Abrahamsen, R, Fell, AK, Svendsen, MV, Andersson, E, Torén, K, Henneberger, PK & Kongerud, Jr 2017, 'Association of respiratory symptoms and asthma with occupational exposures: findings from a population-based cross-sectional survey in Telemark, Norway'. *BMJ open*, vol. *7*, no. 3, hh. e014018.

Abrams, EM 2020, 'Cleaning products and asthma risk: a potentially important public health concern'. *CMAJ: Canadian Medical Association journal = journal de l'Association medicale canadienne*. vol. 192, no.7: hh. E164-E165

Ade, S, Agodokpessi, G, Hounkpatin, SHR, Kemdjo, Y, Alassani, A, Adjobimey, M *et al*, 2019,. 'Prévalence et contrôle de l'asthme chez les étudiants en médecine à Parakou, Bénin [Prevalence and control of asthma among medical students at Parakou, Benin]'. *La Revue des Maladies Respiratoires.* vol.36, no. 6, hh. 664-671..

Afiani, I, Salam, A & Effiana, 2017, 'Factors Affecting the Quality of Life of Adult Asthma Patients in the Pontianak Pulmonary Treatent Unit', *Cerebellum journal;* vol. 3. hh. 754–769.

Al Zahrani, SS, El-Morsy, EMA, Dorgham, L 2014, 'The impact of bronchial asthma on quality of life among affected children and adolescents in Taif city, Saudi Arabia', *Life science joural,* vol. 11, no. 6, hh. 283-291.

Al-Zahrani, JM, Ahmad, A, Al-Harbi, A, Khan, AM, Al-Bader, B, Baharoon, S, Shememeri, AA, Al-Jahdali, H 2015, 'Factors associated with poor asthma control in the outpatient clinic setting'. *Annals of thoracic medicine*, vol. 10, no. 2, hh.100-104.

Astuti, WI, Hapsari, WS, & Lutfiyati, H 2018, 'Description of Drug Use and Level of Asthma Control in Outpatient Adult Asthma Patients at BKPM Magelang Period February-March 2016', *Journa; of pharmaceutical science practice,* vol. IV, no. 1, hh. 31-37.

Bårnes, CB & Ulrik, CS 2015, 'Asthma and adherence to inhaled corticosteroids: current status and future perspectives', *Respiratory care,* vol. 60, no. 3, pp: 455-468.

Bateman, ED, Bousquet, J, Keech, ML, Busse, WW, Clark, TJ, Pedersen, SE 2007, 'The correlation between asthma control and health status: the GOAL study', *The European respiratory journal*, vol. 29, no. 1, hh. 56-62.

Bédard, A, Varraso, R, Sanchez, M, Clavel-Chapelon, F, Zock, JP, Kauffmann, F, Le Moual, N 2014, 'Cleaning sprays, household help and asthma among elderly women', *Respiratory medicine*, vol. 108, no. 1, hh. 171-180.

Bhalla, K, Nehra, D, Nanda, S, Verma, R, Gupta, A, Mehra, S 2018, 'Prevalence of bronchial asthma and its associated risk factors in school-going adolescents in Tier-III North Indian City', *Journal of family medicine and primary care,* vol. 7, no. 6, hh.1452-1457.

BinSaeed, AA 2015, 'Asthma control among adults in Saudi Arabia. Study of determinants', *Saudi medical journal,* vol. 36, no. 5, hh. 599-604.

Bonds, RS & Midoro-Horiuti, T 2013, 'Estrogen effects in allergy and asthma' *Current opinion in allergy and clinical immunology*, vol. 13, no. 1, hh. 92-99.

Borkar, NA, Combs, CK, Sathish, V 2022, 'Sex Steroids Effects on Asthma: A Network Perspective of Immune and Airway Cells'. *Cells*. vol. 11, no. 14, hh. 2238..

Braido, F, Brusselle, G, Guastalla, D, Ingrassia, E, Nicolini, G, Price, D, Roche, N, Soriano, JB, Worth, H, LIAISON Study Group 2016, 'Determinants and impact of suboptimal asthma control in Europe: The International Cross-Sectional And Longitudinal Assessment On Asthma Control (Liaison) study'. *Respiratory research*, vol. 17, no. 1, hh. 51.

Centers for Disease Control and Prevention. 'Healthy People 2020', 2019 [cited 2019 August 14].

Available from: https://www.cdc.gov/nchs/healthy_people/hp2020.htm.
Columbo, M, Panettieri, RA, Jr & Rohr, AS 2014, 'Asthma in the elderly: a study of the role of vitamin D', *Allergy asthma clinical immunology*, vol. 10, no. 1, hh. 48.
Delgado, J, Martinez-Moragón, E & Fernández-Sánchez, T 2021, 'Factors Affecting the Success of Step-up Therapy in Patients With Moderate-Severe Asthma: A Real-Life Study', *Journal of investigational allergology & clinical immunology*. vol. 31, no. 2, hh. 145-150
Desmawati, IY & Gratisari, E 2013, 'Overview of Spirometry Examination Results in Bronchial Asthma Patients at the Pulmonary Polyclinic at Arifin Achmad Pekanbaru Hospital. 2013'. Accessed form: https://repository.unri.ac.id/items/a4ab0b07-3555-4af0-ac28-033cadd0ac1c
Engelkes, M, Janssens, HM, de Jongste, JC, Sturkenboom, MC, Verhamme, KM 2015, 'Medication adherence and the risk of severe asthma exacerbations: a systematic review', *European respiratory journal*, vol. 45, no. 2, hh. 396–407.
Global Asthma Report (GAR) 2018. Accessed from: www.globalasthmanetwork.org access: Januari 2023.
Global Initiative for Asthma. (GINA) 2015, 'Global Strategy for Asthma Management and Prevention', Accessed from: https://ginasthma.org/wp-content/uploads/2016/01/GINA_Report_2015_Aug11-1.pdf .
Global Initiative for Asthma (GINA) 2017, 'Global Strategy for Asthma Management and Prevention. Accessed from: https://ginasthma.org/wp-content/uploads/2019/01/2017-GINA.pdf
Global Initiative for Asthma. (GINA) 2018, 'Global Strategy for Asthma Management and Prevention. Update. www.ginasthma.org. Cited 23 May 2018'.
Global Initiative for Asthma (GINA) 2019, 'Global Strategy for Asthma Management and Prevention. Update. www.ginasthma.org. Accessed November 2022
Gorguner, M, Aslan, S, Inandi, T, Cakir, Z 2004, 'Reactive airways dysfunction syndrome in housewives due to a bleach-hydrochloric acid mixture'. *Inhalation toxicology*, vol. 16, no. 2, hh. 87-91
Graziottin, A & Serafini, A 2016, 'Perimenstrual asthma: from pathophysiology to treatment strategies'. *Multidisciplinary respiratory medicine*, vol. 11, hh. 30.
Hallit, S, Raherison, C, Waked, M, Salameh, P 2017, 'Validation of asthma control questionnaire and risk factors affecting uncontrolled asthma among the Lebanese children's population'. *Respiratory medicine*, vol. 122, hh. 51–57.
Isik, E & Isik, IS 2017, 'Students With Asthma and Its Impacts'. *NASN school nurse (Print)*, vol. 32, no. 4, hh. 212–216.
Kasrin, D, Pratiwi, L & Rizkifani, S 2022, 'Drug Classification Based on Prescribing Asthma Drugs in the Outpatient Installation of RSUD Dr Agoesdjam Ketapang', *Journal syifa scieces clinical research.*, vol. 4, no. 1, hh. 179-189
Katerine, Medison, I & Rustam, E 2014, 'The relationship between the level of knowledge about asthma and the level of asthma control', *Andalas health journal* , vol. 3, no. 1,
Kharaba, Z, Feghali, E, El Husseini, F, Sacre, H, Abou-Selwan, C, Saadeh, S, *et al*, 2022, 'An Assessment of Quality of Life in Patients With Asthma Through Physical, Emotional, Social, and Occupational Aspects. A Cross-Sectional Study'. *Frontiers in public health*, vol. 10, art. 883784, hh. 1-8
Keselman, A & Heller, N 2015, 'Estrogen Signaling Modulates Allergic Inflammation and Contributes to Sex Differences in Asthma', *Frontier in immunology*, vol. 6, hh. 568.
Köse, S, Mandiracioğlu, A, Tatar, B, Gül, S, Erdem, M 2014, 'Prevalence of latex allergy among healthcare workers in Izmir (Turkey)', *Central european journal of public health*, vol. 22, no. 4, hh. 262-265.
Kosse, RC, Koster, ES, Kaptein, AA, de Vries, TW, Bouvy, ML 2020 'Asthma control and quality of life in adolescents: the role of illness perceptions, medication beliefs, and adherence'. *Journal asthma.* vol. 57, no. 10, hh. 1145-1154.
Koya, T, Hasegawa, T, Takasawa, J, Yoshimine, F, Sakagami, T, Hayashi, M, *et al*, 2018, 'Niigata Inhalation Treatment S. Influence of adherence to inhaled corticosteroids and inhaler handling errors on asthma control in a Japanese population', *Internal medicine journal*, vol. 57, no. 23, hh. 3357-3363.

Lahaye, M, Van Broeck, N, Bodart E, Luminet, O 2013, 'Predicting quality of life in pediatric asthma: the role of emotional competence and personality', *Quality of life research,* vol. 22, no. 4, hh. 907-916.

Le Moual, N, Zock, JP, Dumas, O, Lytras, T, Andersson, E, Lillienberg, L, *et al.* 2018, 'Update of an occupational asthma-specific job exposure matrix to assess exposure to 30 specific agents', *Occupational and environment medicine,* vol. 75, no. 7, hh. 507-514.

Marantika, HO, Indriyani & Fitriyani, N 2022, 'The relationship between the level of asthma control and the quality of life of students at the Faculty of Medicine, University of Muhammadiyah Palembang', *Medical scientific journal, MESINA,* vol. 3, no. 1, hh. 23-27.

Matulonga, B, Rava, M, Siroux, V, Bernard, A, Dumas, O, Pin, I, *et al*, 2016, 'Women using bleach for home cleaning are at increased risk of non-allergic asthma' *Respiratory medicine,* no. 117, hh. 264-271.

Mayasari, A, Setyoko, & Novitasari, A 2015, 'Relationship Between Asthma Control and Quality of Life for Asthma Club Members at the Semarang Community Pulmonary Health Center', *Muhammadiyah medical journal.* vol. 2, no. 1, hh. 7-11.

Mayzika, NA & Mukti, AW 2019, 'Correlation of illness perception, asthma control, and lung function values to the quality of life of asthma outpatients', *Journal of pharmaceutical sciences,* vol. 4, no. 1, hh. 43.

McCleary, N, Nwaru, BI, Nurmatov, UB, Critchley, H, Sheikh, A 2018, 'Endogenous and exogenous sex steroid hormones in asthma and allergy in females: A systematic review and meta-analysis'. *Journal of allergy and clinical immunology,* vol. 141, no. 4, hh.1510-1513.e8

Mungan, D, Özmen, İ, Evyapan, F, Topçu, F, Akgün, M, Arbak, P, *et al.* 2019, 'Work-Related Symptoms of Patients with Asthma: A Multicenter Study'. *Turkish thoracis journal,* vol. 20, no. 4, hh. 241-247.

Nakwan, N 2021, 'Impact of asthma severity as risk factor to future exacerbations in patients admitted for asthma exacerbation', *Multidisciplinary respiratory medicine,* vol. 16, no. 1, hh. 780.

National Institute for Health Research and Development (NIHRD). 2013, 'Final report of national basic health research 2013'. Jakarta.

Nathan, RA, Sorkness, CA, Kosinski, M, Schatz, M, Li, JT, Marcus, P, *et al.* 2004, 'Development of the asthma control test: a survey for assessing asthma control', *Journal of allergy and clinical immunology,* vol. 113, no. 1, hh. 59-65.

Nisa, H 2023, 'Obesity and Asthma Risk in Indonesian Adults: Findings from the 2018 Indonesia Basic Health Research,' *National public health journal*, vol. 18, no. 1.

Nurhalisa, SYP, Tresnawan, T, Budhiana, J 2022, 'The Relationship between Stress and Anxiety with Recurrence of Shortness of Breath in Asthma Sufferers in the UPTD Work Area of the Sukabumi Health Center, Sukabumi City', *Journal of health social*. vol. 11, no. 2.

Phyo, AZZ, Freak-Poli, R, Craig, H, Gasevic, D, Stock, NP, Gonzales-Chica, DA, *et al.* 2020, 'Quality of life and mortality in the general population: a systematic review and meta-analysis'. *BMC Public Health*. vol. 20, no. 1, hh.1596.

Putra, YA, Udiyono, A, & Yuliaati, S 2018, 'Description of Anxiety Levels and Degrees of Asthma Attacks in Adult Sufferers of Bronchial Asthma (Study in the Working Area of Gunungpati Health Center, Semarang City, 2016'. *Public health journal*. vol. 6, no. 1, hh. 357-364

Robitaille, C & Boulet, LP 2014, 'L'asthme de la personne âgée [Asthma in the elderly]', Revue des malades respiratoires, vol. 31, no. 6, hh. 478-487.

Saily, SS, Adrianison, & Bebasari, E 2014, 'Physiological Description and Asthma Control Test (ACT) Scoring for Outpatient Asthma Patients at the Pulmonary Polyclinic of Arifin Achmad Hospital, Pekanbaru', *Online journal of medical faculty students,* vol. 1, hh. 1–14.

Shah, SA, Tibble, H, Pillinger, R, McLean, S, Ryan, D, Critchley, H 2021, 'Hormone replacement therapy and asthma onset in menopausal women: National cohort study'. *Journal of allergy and clinical imunology,* vol. 147, no. 5, hh. 1662-1670.

Siracusa, A, De Blay, F, Folletti, I, Moscato, G, Olivieri, M, Quirce, S, *et al*. 2013, 'Asthma and

exposure to cleaning products' - a European Academy of Allergy and Clinical Immunology task force consensus statement. *Allergy*. vol. 68, no. 12, hh. 1532-1545.

Taillé, C, Raherison, C, Sobaszek, A, Thumerelle, C, Prudhomme, A, Biron, E, *et al*. 2014, 'Particularités de l'asthme de la femme: quelle relation avec le statut hormonal? [Features of asthma in women: what is the relationship with hormonal status?]'. *Revue des maladies respiratoires*. vol. 31, no. 6, hh. 469–477.

Tarraf, H, Al-Jahdali, H, Al Qaseer, AH, Gjurovic, A, Haouichat, H, Khassawneh, B, *et al*. 2018, 'Asthma control in adults in the Middle East and North Africa: Results from the ESMAA study'. *Respiratory medicine*, no. 138, hh. 64-73.

Teoli D, & Bhardwaj, A 2023, 'Quality Of Life'. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; March 26, 2023.

Toskala, E, & Kennedy, DW 2015, 'Asthma risk factors'. *International forum of allergy & rhinology*, *5 Suppl 1*(Suppl 1), S11–S16.

Townsend, EA, Miller, VM, Prakash, YS 2012, 'Sex differences and sex steroids in lung health and disease'. *Endocrinology review*, vol. 33, no. 1, hh. 1-47.

Triebner, K, Johannessen, A, Puggini, L, Benediktsdóttir, B, Bertelsen, RJ, Bifulco, E, *et al.* 2016, 'Menopause as a predictor of new-onset asthma: A longitudinal Northern European population study'. *J ournal of allergy and clinical immunology*. vol. 137, no. 1, hh.50-57.e6.

Weinmann, T, Gerlich, J, Heinrich, S, Nowak, D, Mutius, EV, Vogelberg, C, *et al*. 2017, 'Association of household cleaning agents and disinfectants with asthma in young German adults'. *Occupational and environment medicine*, vol. 74, no. 9, hh. 684-690.

World Health Organization. 'Fact Sheet: Asthma 2022'. Accessed from:https://www.who.int/news-room/fact-sheets/detail/asthma Access Januari 2023.

Wortong, D, Chaiear, N, & Boonsawat, W 2015, 'Risk of asthma in relation to occupation: A hospital-based case-control study'. *Asian pacific journal fof allergy and immunology*, vol. 33, no. 2, hh. 152-160

Zaibi, H, Touil, A, Fessi, R, Ben Amar, J, Aouina, H 2020, 'Asthma in Menopausal Women: Clinical and Functional Particularities'. *Tanaffos*. vol. 19, no. 3, hh. 216-222.

Zein, JG, Denson, JL, & Wechsler, ME 2019, 'Asthma over the Adult Life Course: Gender and Hormonal Influences'. *Clinical in Chest medicine*, vol. 40, no. 1, hh. 149-161.

Zeru, TG, Engidawork, E, & Berha, AB 2020, 'Assessment of Asthma Control and Quality of Life among Asthmatic Patients Attending Armed Forces Referral and Teaching Hospital, Addis Ababa, Ethiopia'. *Pulmonary medicine*, vol. 2020;5389780.