SYMPTOMS, CAUSES AND TREATMENT OF ASTHMA: A Review

RAJESH KUMAR SHARMA[1]DIVYA PATHAK[2]

[1]*Assistant Professor, Dept. of Pharmacognosy, Teerthanker Mahaveer College of Pharmacy, TMU, Moradabad, U.P, India*

[2]*Assistant Professor, Dept. of Pharmacology, Teerthanker Mahaveer College of Pharmacy, TMU, Moradabad, U.P, India*

ABSTRACT

Asthma is a chronic disease that most commonly affects lungs, alveoli, trachea and other parts of the respiratory tract. Symptoms of asthma include dysponea, wheezing, cough etc. It was found that the recent increased rates of asthma are due to heritable factors other than those related to the DNA sequence and a changing living environmental. Different inflammatory cells are responsible for asthma, asthma is evident that no single inflammatory cells are able to account for the pathophysiology of allergen diseases, but some cells predominate in asthmatic episodes like mast cells, macrophases etc.

Key words- *Asthma, mast cells, macrophases.*

Introduction

Asthma is a chronic disease that makes it hard to breathe. Asthma can't be cured, but it can be managed. With proper treatment, people with asthma can live normal, active lives.

Asthma is characterized by hyper responsiveness of tracheobronchial smooth muscle to a variety of stimuli, resulting in narrowing of air tubes, often accompanied by increased secretion, mucosal edema and mucus plugging. Symptoms include dysponea, wheezing, cough and may be limitation of activity.[1]

Asthma as following two type:-

1. Extrinsic asthma

2. Intrinsic asthma

Mast cells and inflammatory cells recruited as a result of the initial reaction produce a multitude of mediators-

• Release of mediators stored in granules:-protease enzymes, histamine, TNFα.

- Phospholipids release from cell membrane followed by mediator syntheses – LTs, PAF,PGs.[2]

The factors of environmental and genetic caused by a combination thought of asthma. Allergen and air pollution to exposure include environmental factor. Medication such as beta Blocker and Aspirin include potential trigger. To therapy response of spirometer and over times, symptoms of based on the pattern diagnosis is used.Peak expiratory rate flow and volume in one second forced expiratory, the symptoms of frequency, according classified in asthma.[3]

Chronic Obstructive Pulmonary Disease

- COPD is slowly progressive diseases that are characterized by a gradual loss of lung function.
- Chronic obstructive pulmonary disease includes chronic bronchitis, chronic obstructive bronchitis, or emphysema, or combinationof these conditions.
- COP diseasesareprogressive diseases with in alveolar destruction (emphysema) and bronchiolar fibrosis in variable proportions.[4]
- The expiratory airflow limitation does not fluctuate markedly over long periods of time but there are exacerbations precipitated by respiratory infections, pollutants, etc.
- It is clearly related to smoking and characteristically starts after the age of 40. Quitting smoking reduces the rate of decline in lung function.
- Patients derive < 15% improvement in forced expiratory volume in 1 sec following inhalation of a β agonist bronchodilator: airway obstruction is largely irreversible.
- Asthma is a common chronic disorder of the airways that involves a complex interaction of airflow obstruction, bronchial hyper responsiveness and an underlying inflammation. This interaction can be highly variable among patients and within patients over time. [5]

Classification of Drugs

1. Bronchodilators

(a). β 2 Sympathomimetics:

- Short acting: -e.g. Salbutamol, Terbutaline,
- Long acting ;- e.g. Salmeterol, formoterol, Bambuterol.

(b) Methylxanthine:-

e.g. Doxophylline, Aminophylline,Theophylline.

(c)Anticholinergics:

e.g. ipratropium bromide, tiotropium bromide.

2. Leukotriene receptor antagonists

e.g. Zileuton, zafirukast, montelukast.

3. Mast Cell Stabilizers

e.g. cromolyn sodium, ketotifen.

4. Corticosteroids

(a) systemic:-

e.g. Beclomethasone, Methyl prednisolone.

(b). Inhalation: -

e.g. flunisolide, Beclomethasonedipropionate, budesonide.

5. Anti-Ige Antibody

e. g. omalizumab.[6]

Causes of asthma

- Asthma occurs due to environmental and genetic interaction.
- These interactions influence both the severity and responsiveness to treatment of asthma.
- It was found that the recent increased rates of asthma are due to heritable factors other than those related to the DNA sequence and a changing living environmental.
- The occlusion of asthma before age 12 is due to genetic influence, while onset after 12 is more likely due to environmental changes.[7]
- Asthma is not caused by any one thing, but by a variety of factors interacting with one another. One person's asthmatic factors may be completely different than another person's
- Atopy is the inherited predisposition to develop an antibody called immunoglobulin E(IgE) in response to exposure to environmental allergens.
- Asthma attacks are caused by airway hyper responsiveness that is an overreaction of the bronchi and various environmental and physiological stimuli, known as triggers.
- Several environmental factors have been associated with the development of asthma environments are allergens, air pollution, chemicals found in.[8]

Sign and symptoms

The Sign and symptoms as following:-

- Dehydration
- Marked Dyspnea
- Exhaustion
- Tachycardia
- Respiratory infection
- Hypoxemia
- Hypercapnoea
- Difficulty walking
- Difficulty talking
- Nasal Flaring
- Very fast or very slow breathing
- Pale
- Skin in neck area or rib area sucks
- Gray or blue around lips or nail beds.
- Prolonged expiratory phase [9]

Common early warning signs can include:-

Wheezing	-	Coughing
Breathing Changes	-	Throat Clearing
Throat Itches	-	Feeling Tired

Chest Tightness - Headache

Trouble Sleeping - Chin Itches Lower Peak Flow Readings

Dark Circles under Eyes - Short of Breath[10]

Pathophysiology of Asthma

Asthma is a common Pulmonary conditions characterized by chronic inflammations of respiratory tract, tightening of smooth muscle of respiratory tract, and episode of bronchoconstriction's. As per to the World Health Organization, asthma affect 235 million people all over the word. There are two major type of asthma – non allergic and allergic.

It is largely occurs dependent mechanism via immunoglobulin. The influence of important on whether atropydevelop and many genes have now been identified-

- It is many of the genetic linkage identified for asthma to all allergic disease.
- Appear of environmental factors to be more important atopic individuals develop of asthma.[11]

Airflow limitation in asthma is recurrent and caused by a variety of changes in the airway. These are including:-

- **Bronchoconstriction–** smoke, pollen, dust an allergens which are responsible for asthma episode allergens. The airways narrow and produce more quantity of mucus, making it difficult to breathe.Asthma is the result of an immune response in the bronchial airways.
- **Airway Edema:-**As the disease become more persistent and inflammation more progressive, other factors further limit airways. These include edema, inflammation, mucus hyper secretion and the formation of insistedmucus plugs, as well as structure changes including hypertrophy and hyperplasia of the airway smooth muscle.[12]
- **Airway hyper responsiveness:** -Airway hyper responsiveness an exaggerated bronchoconstriction response to a wide variety of stimuli. Its major but not necessarily unique, feature of asthma. The mechanism influencing airway hyper responsiveness are multiple and include inflammation, dysfunctional neuroregulation,structural changes.[13]

INFLAMMATORY CELL

Different inflammatory cells are responsible for asthma, asthma is evident that no single inflammatory cells are able to account for the pathophysiology of allergen diseases, but some cells predominate in asthmatic episodes.

- **Mast cell:** -who pathogenic parasites, attacks (helminthes, protozoa) the mass cells activated.[14]

- **Macrophages:** -Theseare thecells in the respiratory tract. They appear to be linkeds to the protection of gas each exchange against microbes and excessive tissues response.

- **Dendritic Cell–**These cells play animportant role in sensing the presence of foreign particles and infection agents and in produce appropriates immune response.[15]

- **Neutrophils:** -Many types of cell are involving pathophysiology in asthmatic. The contribution of mast cells, lymphocytes, and eosinophil's has been well established. Neutrophils are polymorph nuclear leukocytes that play an essential role in the immune system, acting as the first line of defense against bacterial and fungal infections. Their role in the inflammatory process was once thought to be restricted to phagocytosis and the release of enzymes and other cytotoxic agents.

- **T- Lymphocytes: -** There is now overwhelming evidence to support a major role for T cells in asthma, in particular the involvement of T helper type 2 (Th2) cells in atopic allergic asthma as well as no atopic and occupational asthma. There may also be a minor contribution from T cytotoxic type 2 CD8+T cells. Several Th2 cytokines have potential to modulate airway inflammation, in particular interleukin-13 which induces airway hyper responsiveness independently of IgE and eosinophilia in animal models.[16]

- **B- Lymphocytes: -**The role of B cells in allergic asthma remain undefined. One mechanism by which B cells clearly contribute to allergic disease is via production of specific immunoglobulin, and especially IgE. In these studies, we used a clinically relevant mouse model of chronic allergic lung disease to study the role of B cell antigen presentation in this disease. Lung B cells from chronically allergen challenged mice up- regulated MCH II and stimulatory molecules CD40, CD80 and CD86.

- **BASOPHIL: -**The basophil roles of asthma are uncurtaining in the cell has previous been difficult to detect by immunocytochemistry. Using a basophil- specific marker a small increase in basophils has been document in the airway of asthmatic patients, with an increased number after allergen challenge. However, these cells are far outnumbered by eosinophil's (approximately 10:1 ratio).

- **PLATELET -** Pathophysiology of allergic disease, since platelet activation may be observed and there is evidence for platelets in bronchial biopsies of asthmatic patient. After allergen challenge there is a significant fall in circulating platelets and release the chemokine .[17]

PREVENTION

- Patients in whom acute attacks are psychologically unpleasant situation are likely to benefit from some readjustment in their family and social life; in case of children, a discussion with the parents is helpful.

- This approach is appropriate for extrinsic asthmatics. Identification of an allergen may be aided by the patient's history (wheezing in response to contact with grasses, pollens, animals), by intradermal skin prick injection of selected allergen or by demonstrating specific IgE antibodies in the patient's serum, i.e. the RAST test (Radio Allegro Sorbent Test).[18]

- It is to be hoped that genetic findings will lead to a better classification of complex diseases such as asthma, and novel therapies will results from genetic findings.

- It is also to be hoped that genetic findings may help identify the environmental factors that protect against asthma .In this context, associations between asthma and innate immune system receptors for microbial products are particular exciting.

- Most polymorphisms so far identified do not seem to carry risk that would merit their use for the clinical classification of disease, but combination of genetic polymorphisms may be much more informative.[19]

- Develop & follow an asthma care plan.
- Plan ways to reduce the child's contact with triggers.
- Treat symptoms early.
- Be prepared for any changes in symptoms.
- Know when a doctor's help is needed & get help right away.
- Flare-ups DO NOT have to be a crisis.[20]

Treatment of Asthma

- Anti- inflammatory drugs used for treatment asthma can reverse some of these process, However a better therapeutic response is requires for tallest one week to achievea effective situation otherwise it may be incompletes.

- To improve the quality of life by treatment of asthma is the main goal by a doctor for those people which have asthma symptoms. For reducing the risk of asthma exacerbation and prevent from death caused due to asthma.

- asthma may be controlled most often by avoiding contacts with trigger & using the certain drug.Those medicine which used for treatment of asthma work on tubes that used to prevent the asthma attack or to stop an attack that already happening.

- These medicines are present in the form of puffer that used when the person thinks that asthma attack coming now.

- A controller medicines are that medicine present in pill or an puffer from and taken every day by the patient to prevent asthma attack.[21]

General treatment of asthma in Hospital

When regular treatments don't work we have other options which they can use in an emergency in hospitals: -

- Some drugs that are used as an asthma spray, but are more stronger.
- Some drug that can be administered an intravenously routes.
- It is including tubes & values in very severe case.[22]

Special groups for treatment of asthma

The person which are inhibits by asthma can treated by above described methods. However some patients want special needs of treatment which have asthma in starting age.

Children:-

- Thechildren's younger than 5 years Couse problems in diagnosis of asthma, thus it different to know whether young children have other asthma symptoms are benefit from long.
- The young children and infants will treats by doctor which are infected by asthma symptoms by using control drug delivery for long term after assessing a child, they feel that the symptoms are persistent & likely to continueafter 6 years of age.[23]

Older adults:-

- For older adults doctors may need to adjust asthma treatment which takes certain different medicine, like: - β- blockers, aspirin, anti- inflammatory& other pain relievers medicines
- All of the medicines which you take tell clearly to the doctor including over the counter drug medicines.
- By using corticosteroids develops the weak bones of adults especially in high doses. If you takes calcium and vitamin D pills then talk to your doctor and also consult about other ways which you used to make strong .[24]

Pregnant women:-

- A good supply of oxygen is requiring for pregnant women who have asthma and to control the disease in their babies. The condition in which a pregnant woman develops high blood pressure in the urine and Poor asthma also increases the risk.
- A baby will be born have low birth weight in poor asthma also increases the risk.[25]

The role of genetics in the Treatment of Asthma

- Several of the asthma susceptibility genes to far identified potential targets for asthma therapy, However, it will take some years to determine if any of these will be the basis for new treatments.

- Polymorphism may also predict the response to asthma therapy. A positive association between common arginine- 16 variants in the β- adrenergic receptor gene and the responsiveness of asthmatic patients to β −adrenergic agonists is particularly interesting.

- It's not known whether these differences is response represent Failure a β- Agonist individuals of the arginine-16 gene type, these are individual adequate with a upward adjustment in dose.[26]

- The proportion individual of severe intractable in asthma doesn't inhale steroids to responds, that individual to carry mutations controls of inflammatory response.

- Pathway is not understood completely, these are helpful of the circumstances.

- Approximately a third of the genetic predisposition to asthma has currently been uncovered. Existing research programs carried out in several countries are likely to identify the remaining important genetic effects within the next five years. The stage of genetic knowledge will need to be followed by a number of important studies.[27]

Controllers of Asthma

Controls of Asthma as following:-

- To prevent troublesome and chronic symptom, such as shortness of breath & coughing.

- To reduce your quick- relief need for medicine.

- The help of maintained in lung function good.
- The maintenance of sleep through the night&normal activity level.
- To prevent asthma attacks that could result in hospital stay an emergency room visit.[28]
- These medicines reduce inflammation and mucus production .they do nothing for bronchospasm.
- Adair is a new combination medicine of flovent and serevent. Flovent is a corticosteroid and sereventis a long acting bronchodilator either medicine is for quick relief of symptoms.[29]
- These medications relax the muscle, but they do nothing for inflammation and swelling.
- Albuterol, Ventolin, Proventil all are different board names of the same medicine.
- Exercise is the exception to the rules of two.in this case, the quick relief med should be used only to per medicate for physical exertion not for symptoms, or is needed to run down the black as opposed to playing a game of basketball, the asthma is not in control.[30]

Drugs used in Asthma

Asthma Medications: - asthma medications are categorized into two general classes-

1. Long term control medication-

Examples

- Inhaled corticosteroids: - The most consistently effective long-term control medication.
- Long-Acting bronchodilators:- These are used in combination with inhaled corticosteroid.
- Cromolyn and theophylline: - Used as alternative controller medication.
- Leukotriene modifiers: - Used as alternative controller medication.
- Immunomodulators: - Omalizumab modifies the allergic immune response.

2. Short acting beta agonists -

Examples

- Albuterol
- Levalbuterol. [31]

Other drug used: -

The drugs are used in the prevention of acute attacks (maintenance therapy) as following:-

- Salmeterol
- Formoterol
- Ephedrine hydroxide
- Theophylline
- Glucocorticoids[32]

Adverse Effects of Anti-asthmatic drugs

- Nausea
- Diarrhoea
- Plasma concentration
- Cardiac arrhythmia
- Seizures
- Headache
- Dyspepsia.[33]
- Tachycardia
- Hyperglycaemia
- Hyperkalaemia
- Hypomagnesemia
- Tremors
- Vomiting
- Insomnia
- Anxiety
- Nervousness.[34]

CONCLUSION

Asthma is a respiratory disease of lung. IT effects other part of body also. Asthma is a two extrinsic and intrinsic. Some environmental factors responsible for asthma are allergen, air pollution in other environmental factors. Many drug used for asthma. They are called bronchodilators (Salbutamol, Terbutaline) leukotriene receptors antagonists (Zileuton, Montelukast), mast cell stabilizers (ketotifen) and corticosteroids such as beclomethasone. Inhalation therapy is most effective which include some widely used drugs such as flunisolide, beclomethasone dipropionate, budesonide. The symptoms of asthma may very individual to individual.

References

1. Tripathi, K.D., Essentials of Medical Pharmacology, Jay Pee Publishers Ptd Ltd, New Delhi. Volume 2008, sixth edition, Page no 216- 217.

2.Riedller, J, Nowak, D. and von Mutius, E. 2001, Exposure to farming in early life and development of asthma and allergy: a cross- sectional survey. Lancet, page no 299, 1229-1133.

3. Hu, F. Persky, V., Flay, B. and Richardson, J. volume 1997, An epidemiological study of asthma prevalence and related factors among young adults. J. Asthma, page no 34, 67- 76.

4. Bousquet J, Jeffery PK, Busse WW, Johnson M, Vignola AM. Asthma.From bronchoconstriction to airways inflammation and remodeling. Am J RespirCrit Care Medicanal 2003, 1st edition , page no 114 -125.

5. Humbert M, Menz G, Meng S, et al. The immunopathology of extrinsic and intrinsic asthma: more similarities than differences, immunol , volume 1999, page no 528-533.

6. Salil K Bhattacharya, ParantapaSen, Arunabha Ray and Prasun K Das, Pharmacology,Second Edition, A division of Reed Elsevier India Pvt, Ltd. Page no 312-315.

7. Busse WW, Lemanske RF. Asthma. N Engl J Med, volume 2001, page no 350- 362.

8. Cookson WO, Moffatt M F. Genetics of asthma and allergic disease. Hum Mol Genet 2000;

Page no 10-11.

9. Prescott &Dunn's, Pharmacology, 4th Edition, CBS Publishers and Distributors,Pvt,Ltd Delhi page no 80-82.

10.Ying S, Humbert M, Meng Q, et al. Local expression of epsilon germline gene transcripts and RNA for the epsilon heavy chain of IgE in the bronchial mucosa in atopic and nonatopic asthma. J Allergy ClinImmunol 2001; page no 686–692.

11. Dunnill MS. The Pathology of asthma, with special reference to the changes in the bronchial mucosa, J Clinpathol , volume 1960, page no 27- 33.

12. Brightling CE, Bradding P, and Symon FA, Pavord ID. Mast- cell infiltration of airway smooth muscle in asthma, N Engl J Med. Volume 2002, page no 1699- 1705.

13. Milgrom H, Fick RB Jr, Su JQ, et al, Anti –IgE therapy in asthma: rationale and therapeutic potential, Int Arch Allergy immunol , volume 2000, page no 196- 200.

14. Barnes PJ, Corticosteroids, IgE, and atopy, J Clin Invest, volume 2001, page no 265- 266.

15. Holt PG, McMenamin C, and Stumbles PA, Regulation of immunologic homeostasis in peripheral tissue by dendritic cells; the respiratory tract as a paradigm, J Allergy Clinimmunol, volume 2000; page no 421-429.

16. Lambrecht BN, The dendritic cell in allergic airway disease, A new player to the Clin Experiment Allergy , volume 2001, page no 206- 218.

17. Barnes P J. Cytokine modulators as novel therapies for asthma. Annu Rev PharmacolToxicol 2002; page no 42,81–98.

18. Vincent S D, Toelle BG &Aroni RA, Exasperation" of Asthma a qualitative study of patient language about worsening asthma. Med J Aust 2006 'page no. 451- 455.

19. Bennett P.N. & Brown M.J, Clinical Pharmacology, 10th Edition, Churchill Livingstone Elsevier' page no 502-503.

20. Fahy JV, Kim KW & Liu J, Guideline for the diagnosis and management of asthma ,"NIH publication & department of health and human services .National Asthma education and prevention program 1991, page no.816-822.

21.Chand S, Barar F.S.K, Essentials of Pharmacotherapeutics, 1st Edition, published by S. Chand & Company LTD. , Ram Nagar New Delhi , Page No. 112.

22. Bertram G, Katzung, Basic and Clinical Pharmacology, 10th Edition, Publishers India Pvt Ltd Page no 325-329.

23. Habib MP, Garewal HS, Clements NC,Cigarette smoking and ethane exhalation in humans. Am J RespirCrit Care Medicine, volume 1995, page no 1368–1372.

24. Krishnan Z, Moodley YP, and Lalloo UG, Neutrophils in induced sputum arise from central airways, EurRespir J, volume 2000, page no 36–40.

25. Chon L, Elias JA, Chupp GL, Asthma mechanism of disease persistence and progression ,Annu Rev Immunol 2004, page no.810- 815.

26Saltos N Borgas T., Gibson PG, Airway mast cells and eosinophil's correlate with clinical severity and airway hyper responsiveness in corticosteroid- treated asthma, Jc Allergy Clin Immunology, volume 2000, page no 751–755.

27.Lim S, Barnes PJ, and Jatakanon A, Changes in sputum eosinophils predict loss of asthma control, Am J RespirCrit, Care Medecal, volume 2000, page no161- 165.

28.Dworski R, Barry KA, and Barnes CN, Sputum cysteinylleukotrienes increase after allergen inhalation in atopic asthma, Am JR Care Med, volume 2000; page 55– 58.

29. McKenzie. R, Kelly. MM, and Leigh.JK, Induced sputum examination;diagnosis of pulmonary involvement in Fairy's disease, volume 2004, page no 20- 21.

30. Bateman ED, Boushey HA & Pedersen SE, Goal investigators group. Can guideline defined Asthma control be achieved, The gaining optimal asthma control study. Am J RespirCrit care Med 2004, page no. 836- 844.

31. Haahtela T, and Laitinen A, A comparative study of the effects of an inhaled corticosteroid, budesonide, and a beta 2-agonist, terbutaline, on airway inflammation in newly diagnosed asthma; controlled trial, J Allergy and ClinImmunol, volume1994, page no 42- 44.

32. Satoskar R.S, Bhandarkar S.D &Nirmala N. Rege, Pharmacology &pharmacotherapeutics, Twenty first Edition, popular prakashan. page no 358-361.

33. Kharitonov. SA, Durham. SR, and Campbell. D, Increase in exhaled nitric oxide levels in patients with difficult asthma, and correlation with symptoms and disease severity despite treatment with oral and inhaled corticosteroids, Asthma and Allergy Group, volume 2001, page no 101- 104.

34. Richand A. Harvey, Pamela C. Champe, Luigi X. Cubeddu, Pharmacology, 4th Edition, Distribution in India. Page no 321-322.