

Chapter 4

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ASTHMA

Asthma is a chronic inflammatory disorder causing recurrent, reversible airway obstruction resulting from *bronchial hyper-responsiveness* (increased sensitivity to stimuli like cold, dust, smoke, exercise, emotion, allergens, etc.) and *inflammatory changes in the air-ways*; and manifested by breathlessness, chest tightness, wheezing and coughing. This is thus a two component disease.

Drugs employed in the management of asthma therefore need to address these two components for successful control of the disease. These include selective **beta2-agonists** and **corticosteroids**, both administered preferably by aerosol **inhalation** using pressurized metered dose inhalers (MDIs). This permits direct delivery to the site of action, smaller dosage and consequent reduction in side effects. Spacing devices can be fitted to MDIs to act as reservoirs for drug to make it safer and easier for

patients (CHILD or older patients) to inhale each dose. Dry powder meter dosed inhalers (DPIs) are recent advancements. Severe asthma can be fatal and must be treated promptly and carefully. Solutions for inhalation from a nebuliser are available for use in severe acute asthma. These are administered over 5-10 minutes from a nebuliser.

Drugs such as **beta2-agonists**, **corticosteroids** and **xanthenes**, **magnesium sulphate** are administered parenterally in severe acute asthma when nebulisation is considered inappropriate.

Oral route is used when administration by inhalation is not possible. Systemic side effects occur more frequently when a drug is given orally rather than by inhalation. Drugs given by mouth include **beta2-agonists**, **corticosteroids**, **theophylline** and **leukotriene receptor antagonists**.

Beta2-agonists relax bronchial smooth muscles to produce bronchodilatation by

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selectively stimulating **beta2-adrenoceptors**. Short acting beta2-agonists such as **salbutamol** and **terbutaline** are the initial drugs of choice, administered as required, rather than regularly. Regular administration of a **beta2-agonist** is preferred with long acting **beta2-agonists** (such as **salmeterol** or **formoterol**) which are usually reserved for patients who have already progressed to a prophylactic treatment. Longer acting **beta2-agonists** are not indicated for the relief of an acute attack.

Corticosteroids (**Beclomethasone dipropionate**, **fluticasone propionate** by inhalation) are used for their anti-inflammatory properties and to reduce bronchial hyperresponsiveness. Since chronic asthma is a two component disease, a corticosteroid with long acting bronchodilator is useful for optimum asthma control for many patients. Regular administration is recommended to achieve maximum benefit in chronic asthma prophylaxis. (*For guidelines to treatment of chronic asthma see table shown below*). In addition, xanthines (**Theophylline**, **aminophylline** orally) and anti-muscarinics (e.g. **Ipratropium bromide** by inhalation) may be given for their bronchodilating properties. Theophylline modified release preparation given as single dose at night may be useful in controlling nocturnal asthma and early morning wheezing.

Cromoglycates or **nedocromil** may be used as an alternative to corticosteroids for prophylaxis of less severe asthma or in conjunction with other therapy. Antileukotrienes such as **zafirlukast** and **montelukast** are now becoming available as other alternatives.

PREGNANCY AND LACTATION. It is particularly important that asthma should be well controlled during pregnancy. Where this is achieved, asthma has no important effects on pregnancy, labour, or on the fetus. Drugs for asthma should preferably be administered by inhalation to minimize exposure of the fetus. Severe exacerbation to asthma can have an adverse effect on pregnancy and should be treated promptly with conventional therapy, including oral or

parenteral administration of a corticosteroid including nebulisation of a selective **beta2-agonist**; **Prednisolone** is the preferred corticosteroid for oral administration since very little of the drug reaches the fetus. Caution should be taken during using prostaglandin F2alpha because it can cause serious bronchoconstriction.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Drug treatment of COPD (chronic bronchitis and emphysema) is primarily symptomatic and palliative using bronchodilators, corticosteroids and oxygen therapy. Prevention of respiratory infections should be considered. Emphysema and chronic bronchitis can be managed by an inhaled short-acting **beta2-adrenoceptor** stimulant or an inhaled antimuscarinic (e.g. **ipratropium bromide**). A xanthine such as **theophylline** by mouth may also be considered. A limited trial of high dose inhaled corticosteroid or an oral corticosteroid is recommended for patients with moderate airflow obstruction to determine the extent of the airway reversibility and to ensure that asthma has not been overlooked.

Long term **oxygen** therapy prolongs survival in patients with chronic obstructive pulmonary disease.

In recent times, the European Union and US FDA have approved the use of a combination of **fluticasone propionate** and **salmeterol** delivered from a special dry powder delivery device known as Diskus/Accuhaler for use in COPD.

TABLE 4A

Management of chronic asthma in adults and children

CHRONIC ASTHMA : Adults and Children over 5 years of age

Step 1 : Occasional relief with bronchodilators : Inhaled short-acting

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beta2 stimulants as required (up to once daily).

Step 2 : Regular inhaled preventer therapy-

Inhaled short-acting **beta2 stimulants** as required

plus

Either regular standard-dose(1) inhaled corticosteroid *or one of the following (but less effective)*

- Regular cromoglycate or nedoc-romil (but change to inhaled corticosteroid if control not achieved).
- Leukotriene receptor antagonist
- Theophylline

Step 3 : Inhaled corticosteroid + long-acting inhaled beta2 stimulants :

Inhaled short-acting **beta2 stimulants** as required

plus

Regular standard-dose (1) inhaled corticosteroid

plus

Regular inhaled long-acting **beta2 stimulant** (e.g. salmeterol).

If asthma not controlled

Increase dose of inhaled corticosteroid to upper end of standard-dose(1)

If asthma still not controlled

Add one of

- Leukotriene receptor antagonist
- Modified-release oral theophylline

Step 4: High-dose inhaled corticosteroid + regular bronchodilators :

Inhaled short-acting **beta2 stimulants** as required

With

Regular high-dose (2) inhaled corticosteroid

plus

Inhaled long-acting **beta2 stimulants** (salmeterol)

plus

In adults 6-week sequential therapeutic trial of one or more of:

- Modified-release oral theophylline.

- Modified-release oral **beta2 stimulants**.
- Leukotriene receptor antagonist

Step 5: Regular corticosteroid tablets:

Inhaled short-acting **beta2 stimulants** as required

with

Regular high-dose(2) inhaled corticosteroid

and

one or more long-acting bronchodilators (see step 4)

plus

Regular prednisolone tablets (as single daily dose)

Stepping down

Review treatment every 3-6 months; if control achieved step wise reduction may be possible; if treatment started recently at step 4 or 5 (or contained corticosteroid tablets) reduction may take place after short interval; in other patients a 1-3 month or longer period of stability needed before slow step wise reduction is undertaken.

CHRONIC ASTHMA : Children Under 5 Years

Step 1 : Occasional relief

bronchodilators-

Short-acting **beta2 stimulants** as required (not more than once daily)

Step 2 : Regular preventer therapy

Inhaled short-acting **beta2 stimulants** as required

plus

Either Regular inhaled corticosteroid in standard(1) dose

Regular inhaled cromoglycate (powder *or* metered-dose inhaler via large volume-spacer)

Step 3 : Add-on therapy

Inhaled short-acting **beta2 stimulants** as required

plus

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Regular inhaled corticosteroid in standard (1) dose
plus
Regular inhaled long-acting beta2 stimulants (if age 4 yrs or more)
or
regular modified-release oral theophylline
or
leukotriene receptor antagonists

Step 4 :High dose inhaled corticosteroid + regular bronchodilators:

Inhaled short-acting beta2 stimulants as required

plus
Regular inhaled corticosteroid in high-dose(2)

plus
Regular inhaled long-acting beta2 stimulants (if age 4 yrs or more)

Plus/or
regular modified-release oral theophylline

Plus/or
leukotriene receptor antagonists

Step 5 : Regular corticosteroid tablets:

All of Step 4

plus
Regular prednisolone tablets (daily single dose)

Stepping down

Regularly review need for treatment

1. Standard dose inhaled corticosteroid (given through metered dose inhalers) are beclomethasone dipropionate 100-400 micrograms (CHILD: 100-200 micrograms) twice daily or fluticasone propionate 50-200 microgram (CHILD: 50 100 micrograms) twice daily; initial dose according to severity of asthma.

2. High dose inhaled corticosteroid (given through metered dose inhalers) are beclomethasone dipropionate 0.8-2 mg daily (in divided doses) or fluticasone propionate 0.4-1.0 mg daily (in divided doses); CHILD: 5-12 years, beclomethasone dipropionate up to 400 micrograms

twice daily or fluticasone propionate up to 200 micrograms twice daily.

3. Doses of prednisolone tablets are CHILD under 1 year 1-2 mg/kg daily, 1-5 years 20 mg daily; rescue courses usually for 1-3 days.

ACUTE SEVERE ASTHMA

It is a medical emergency, can be fatal and must be treated promptly. It is characterized by persistent breathlessness poorly relieved by bronchodilators, high pulse rate (over 110/minute), exhaustion and a very low peak expiratory flow ($\leq 50\%$). Acute severe asthma may require admission to hospital. Such patient should initially be given **oxygen** (40-60%) and high doses of inhaled **beta2-agonists** (salbutamol by nebuliser) followed by large doses of corticosteroids (**prednisolone** 40–60 mg orally or **hydrocortisone** 200 mg intravenously; CHILD: **prednisolone** 1-2 mg/kg by mouth or hydrocortisone 100 mg (preferably as sodium succinate) intravenously. If the response is not satisfactory, additionally **lpratropium** by nebuliser or **aminophylline** by slow intravenous injection (if patient is not already receiving theophylline) or the **beta2-agonists** by intravenous route.

Intermittent positive pressure ventilation may be needed, if patient deteriorates despite treatment (Consult Table 4.B).

TABLE 4B

Management of acute severe asthma

Uncontrolled asthma in adults

- Speech-can not complete sentence in 1 breath
- Pulse >110 beats/min
- Respiration >25 breaths/min
- Peak flow <50% of predicted or best

Treat at home but response to treatment must be assessed before doctor leaves.

Treatment

Nebulised **salbutamol** 5 mg or **terbutaline** 10 mg.

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Monitor response 15-30 minutes after nebulisation.

If peak flow 50-75% of predicted or best, oral prednisolone 30-60 mg and step up usual treatment.

Alternatively, if peak flow 75% of predicted or best, step up usual treatment.

Follow up:

Monitor symptoms and peak flow.

Set up self management plan.

Review in clinic within 48 hours.

Modify treatment at review according to guidelines for chronic asthma.

Note: Failure to respond adequately at any time requires immediate referral to hospital.

Acute severe asthma in adults

- Cannot complete sentences
- Pulse >110 beats/min
- Respiration >25 breaths/min
- Peak flow <50% of predicted or best

Seriously consider hospital admission if more than one of above features present

Treatment

Oxygen 40-60%; if available nebulized **salbutamol** 5 mg or **terbutaline** 10 mg. Oral prednisolone 30-60 mg or intravenously hydrocortisone 200 mg. Monitor response 15-30 minutes after nebulisation.

If any sign of acute asthma persist:

Arrange hospital admission.

While awaiting ambulance repeat nebulised **beta2 stimulants** and give with nebulized **ipratropium** 500 micrograms. Or give subcutaneous **terbutaline** (or **salbutamol**).

Or give slow intravenous **aminophylline** 250 mg (not if taking orally).

Or give intravenous magnesium sulphate. Alternatively if symptoms have improved, respiration and pulse settling, and peak flow >50% of predicted or best:

Step up usual treatment and continue **prednisolone**.

Follow up:

Monitor symptoms and peak flow

Set up self management plan

Review in surgery within 48 hours

Modify treatment at review according to guidelines for chronic asthma.

Life threatening asthma in adults

- Silent chest
- Cyanosis
- Bradycardia or exhaustion
- Peak flow < 33% of predicted or best

Arrange **immediate** hospital admission.

Treatment

Oral **prednisolone** 40-60 mg or intravenous **hydrocortisone** 200 mg to be given immediately.

Oxygen-driven nebuliser in ambulance.

Nebulised **beta2 stimulants** with nebulized **ipratropium**.

Or give subcutaneous **terbutaline** (or **salbutamol**).

Or give slow intravenous **aminophylline** 250 mg.

ACUTE EPISODES OR EXACERBATION OF ASTHMA IN YOUNG CHILDREN IN PRIMARY CARE

Mild or moderate episode in young children.

- Short-acting **beta2 stimulant** from metered dose inhaler via large-volume spacer, up to 10 puffs (1 puff every 10-15 sec); alternately given by nebuliser every 3-4 hours.
- If favorable response (respiratory rate reduced, improved 'behavior' pattern), repeat inhaled **beta2 stimulant** every 3-4 hours; consider doubling dose of inhaled **corticosteroids**.
- If **beta2 stimulant** still required every 3-4 hours after 12 hours, start short course of oral **prednisolone** for 1-3 days (Under 1 year 1-2 mg/kg daily; 1-5 years 20 mg daily).
- If unresponsive or relapse within 3-4 hours:
 - Immediately refer to hospital.
 - Increase frequency of **beta2 stimulant**.
 - Start oral **prednisolone**.
 - Give high flow **oxygen** via facemask.

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4.1 BRONCHODILATORS

- 4.1.1 SELECTIVE BETA2 ADRENOCEPTOR STIMULANTS
- 4.1.2 ANTIMUSCARINIC BRONCHODILATORS
- 4.1.3 XANTHINE BRONCHODILATORS.

4.1.1 SELECTIVE BETA₂ ADRENOCEPTOR STIMULANTS

A short-acting selective beta₂ adrenoceptor stimulant such as **salbutamol** or **terbutaline** (preferably given by aerosol inhalation) is the safest and a most effective treatment for mild to moderate acute symptoms of asthma. If **beta₂ adrenoceptor stimulant** inhalation is needed more than once daily, prophylactic treatment should be considered. However, in more severe exacerbation a short course of an oral corticosteroid may also be necessary to bring the asthma under control. Treatment of patient with acute severe asthma or airways obstruction is safer in hospital where oxygen and resuscitation facilities are immediately available.

REGULAR TREATMENT. Short-acting beta₂-adrenoceptor stimulants (such as salbutamol and terbutaline) should not be prescribed on a regular basis in patients with chronic asthma since several studies have shown that regular treatment with them provides no clinical benefit. Longer acting beta₂ adrenoceptor stimulants such as **salmeterol**, **formoterol** (eformoterol), **indacaterol** when taken regularly have shown clear benefit compared to placebo or to regular treatment with short-acting beta₂ adrenoceptor stimulants.

INHALATION. Administration by inhalation delivers the drug directly to the bronchi and therefore effective in smaller doses, provides relief more rapidly and causes fewer side-effects.

ORAL. Oral preparations are available for patients who cannot manage the inhaled route, particularly children. Oral

preparations have a slower onset but a slightly more prolonged action than the aerosol inhalers. The longer acting preparations may be of value in nocturnal asthma as an alternative to modified-release theophylline preparation.

PARENTERAL. Intravenous injections of **salbutamol** and **terbutaline** are given for severe bronchospasm.

CHILD. Selective **beta₂-adrenoceptor** stimulants are useful even in children under the age of 18 months. They are most effective by the inhalation route, but an inhalation device may be needed. They may also be administered as tablets or oral liquids although administration by inhalation is preferred. In severe attacks nebulization using a selective beta₂-adrenoceptor stimulant or ipratropium is advisable.

PREGNANCY AND LACTATION. See general notes under Asthma.

BAMBUTEROL HYDROCHLORIDE

Indications: see under *Salbutamol*

Cautions: renal impairment hepatic impairment (avoid if severe), pregnancy

Interactions: see *Appendix-2*

Side-effects: see under *salbutamol*

Dose: 20mg once daily at bedtime if patient has previously tolerated beta₂ agonist, other patient, initially 10mg once daily at bedtime, increased if necessary after 1-2 weeks to 20mg once daily; CHILD not recommended

Proprietary Preparations

Bambelor (*Incepta*), Syrup, 5 mg/5 ml, Tk. 25.00/60 ml; Tab., 10 mg, Tk. 1.50/Tab; 20 mg, Tk. 3.00/Tab.

Buterol (*ACI*), Syrup, 5 mg/5 ml, Tk. 35.13/100 ml; Tab., 10mg, Tk. 1.51/Tab.

Dilator (*Eskayel*), Syrup, 5 mg/5 ml, Tk. 30.00/60 ml; Tab., 10 mg, Tk. 3.00/Tab.; 20 mg, Tk. 4.00/Tab.

Muterol (*Acme*), Syrup, 5 mg/5 ml, Tk. 20.07/60 ml; Tab., 10 mg, Tk. 1.50/Tab.; 20 mg, Tk. 3.00/Tab.

Venterol (*Ibn Sina*), Tab., 10 mg, Tk. 1.50/Tab.; Tab., 20 mg, Tk. 3.01/Tab.; Syrup, 5 mg/5 ml, Tk. 35.14/60 ml

FORMOTEROL FUMARATE

(Eformoterol Fumarate)

Formoterol (or **eformoterol**) is a longer-acting beta-2-adrenoceptor stimulant which is administered by inhalation on a once or twice-daily basis. It is not indicated for the relief of an acute attack.

Indications: reversible airways obstructions including nocturnal asthma and prevention of exercise-induced bronchospasm in patients requiring long-term regular bronchodilator

Cautions: see under *Salbutamol* and above note

Interactions: see *Appendix-2*

Side-effects: see under *Salbutamol* significant incidence of paradoxical bronchospasm may be clinically important in severe or deteriorating asthma

Dose: by inhalation of powder, 6-12 micrograms (1-2 times daily); CHILD under 12 years, not recommended

Proprietary preparations

Efo Cozycap (*Square*), Inhalation powder, hard Capule 12 microgram (for use with a inhaler device) Tk. 3.33/Cap

INDACATEROL

Indications: long-term control of chronic obstructive pulmonary disease (COPD) symptoms.

Cautions: see under *Salbutamol* and notes above; convulsive disorders

Interactions: see *Appendix-2*

Side-effects: see under *Salbutamol*

Dose: by inhalation of powder, ADULT over 18 years, 150 micrograms once daily, increased to max. 300 micrograms once daily

Proprietary Preparations

Onbrez Breezhaler^(l) (*Novartis*), Inhalation Powder, Cap., 150 microgram, Tk. 93.20/Cap.; 300 microgram, Tk. 126.50/Cap.

Orniva (*Beximco*) Inhalation Powder, Cap., 75 microgram, Tk. 18.00/Cap

SALBUTAMOL^[ED]

Indications: asthma and other conditions associated with reversible airways obstruction; premature labour

Cautions: hyperthyroidism, myocardial insufficiency, and susceptibility to QT-interval prolongation, hypertension, pregnancy and breast-feeding, diabetes -especially intravenous administration to diabetics

Interactions: see *Appendix-2*

Side-effects: fine tremor (usually of hands), nervous tension, headache, peripheral vasodilatation, arrhythmia, palpitations, tachycardia, sleep and behavioral disturbances in children; rarely muscle cramps; hypokalaemia after high doses; hypersensitivity reaction including paradoxical bronchospasm, urticaria, and angioedema reported; slight pain on intramuscular injection

Dose: by mouth, 4 mg (elderly and sensitive patients initially 2 mg) 3-4 times daily; max. single dose 8 mg (but unlikely to provide extra benefit or to be tolerated); CHILD under 2 years 100 micrograms/kg 4 times daily; 2-6 years 1-2 mg 3-4 times daily, 6-12 years 2 mg

By subcutaneous or intramuscular injection, 500 micrograms, repeated every 4 hours if necessary

By slow intravenous injection, 250 micrograms, repeated if necessary

By intravenous infusion, initially 5 micrograms/min, adjusted according to response and heart-rate usually in range of 3-20 micrograms/min, or more if necessary; CHILD: 1 month-12 years 0.1-1 micrograms /kg/minute

By aerosol inhalation, 100-200 micrograms (1-2 puffs), for persistence symptoms up to 3-4 times daily; CHILD: 100 micrograms, increased to 200 micrograms if necessary; for persistent symptoms up to 3-4 times daily; CHILD: 100 micrograms, increased to 200 micrograms if necessary. Prophylaxis in exercise-induced bronchospasm, 200 micrograms, CHILD 100 micrograms

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By inhalation of powder, 200-400 micrograms; for persistent symptoms up to 3-4 times daily; CHILD: 200 micrograms. Prophylaxis in exercise induced bronchospasm 400 micrograms; CHILD 200 micrograms

By inhalation of a nebulised solution, chronic bronchospasm unresponsive to conventional therapy and severe acute asthma, ADULT and CHILD over 18 months 2.5 mg, repeated up to 4 times daily; may be increased to 5 mg if necessary, but medical assessment should be considered since alternative therapy may be indicated; CHILD under 18 months, clinical efficacy uncertain consider supplemental oxygen

Proprietary Preparations

Asmalin (*Aristo*), Aerosol Inhaler, 100 microgram/Puff, Tk. 195.00/ can;100 microgram/Puff, Tk. 155.00/can; Syrup, 2 mg/5 ml, Tk. 22.92/100 ml

Asul (*Asiatic*), Syrup, 2 mg/5 ml, Tk.22.92/100ml; 4 mg, Tk.0.34/Tab.

Azmasol (*Beximco*), Aerosol Inhaler, 100 microgram/puff, Tk. 260.00/300 doses; 100 microgram/puff, Tk. 195.00/200 doses; 100 microgram/puff, Tk. 170.00/200 doses; Res., Solu., 5 mg/ml, Tk. 120.00/20 ml; Tab., 2 mg, Tk.0.26/Tab.; 4 mg, Tk. 0.40/Tab.

Azmasol Bexicap(*Beximco*), Inhalation powder,Cap.,(for use with a inhaler device)200 microgram. , Tk.2.50/Cap.

Brodil (*ACI*), Resp., Solu., 5 mg/ml, Tk. 120.00/20 ml;Syrup, 2 mg/5 ml Tk. 22.93/100 ml Tab., 2 mg, Tk.0.26/Tab.; 4 mg, Tk.0.46/Tab; Inhalation powder,Cap.,(for use with a inhaler device)200 microgram. , Tk.2.50/Cap. Aerosol Inhaler, 100 microgram/puff, Tk. 195.00/200 puffs(with device); 100 microgram/puff, Tk. 170.00/200 puffs (without device); SR Cap., 8 mg, Tk. 4.82/Cap.

Broncotrol (*Pacific*), Tab., 4 mg, Tk. 0.26/Tab.; Syrup, 2 mg/5 ml, Tk. 16.54/100 ml

Bronkolax(*Beximco*), Syrup, 2 mg/5 ml, Tk. 22.93/100 ml

Dilatol (*Kemiko*), Syrup, 2 mg/5 ml, Tk. 22.84/100 ml

G-Salbutamol (*Gonoshasthaya*), Tab., 4 mg, Tk. 0.46/Tab.;Syrup, 2 mg/5 ml, Tk. 21.00/100 ml; Resp., Solu., 5 mg/ml, Tk.100.00/20 ml

Orsal (*Orion*), Syrup, 2 mg/5 ml, Tk. 22.85/100 ml

Pulmocare (*Healthcare*), Aerosol Inhaler ,100 microgram/puff, Tk. 230.00/200puff; Tk. 198.00/200 puffs (refill pack)

Pulmolin (*Opsonin*), Tab., 4 mg, Tk.0.35/Tab.;Syrup, 2 mg/5 ml, Tk. 17.24/100 ml;Tk. 7.89/100 ml

Respolin (*Jayson*), Syrup, 2 mg/5 ml, Tk. 22.92/100ml;Tab., 4 mg, Tk.0.33/Tab.

Salbu (*Biopharma*), Syrup, 2 mg/5 ml, Tk. 11.04/60 ml;Tk. 22.93/100 ml;Tab., 2 mg, Tk.0.26/Tab.; 4 mg, Tk.0.34/Tab.;

Salbut (*General*), Tab., 4 mg, Tk.0.34/Tab.; Syrup, 2 mg/5 ml,Tk.22.90/100 ml

Salbutal (*Sanofi*), Tab., 2 mg, Tk.0.26/Tab.; 4mg, Tk. 0.46/Tab.; Syrup, 2 mg/5 ml, Tk. 22.89/100 ml

Salbutamol (*Popular*), Tab., 4 mg, Tk.0.40/Tab.

Salbutamol (*Amico*), Syrup, 2 mg/5 ml, Tk.21.75/100 ml;

Salbutamol (*Albion*), Syrup, 2 mg/5 ml, Tk.17.00/100 ml; 2 mg, Tk.0.26/Tab.; 4 mg, Tk. 0.34/Tab.

Salmolin (*Acme*),Inhalation powder, Cap., (for use with a inhaler device) 200 microgram/ Cap., Tk. 2.50/Cap.

Salmolin (*Acme*), Aerosol Inhaler, 100 microgram/puff, Tk. 195.00/200 puffs; Respirator Solution, 5 mg/ml, Tk. 120.00/20ml; Syrup, 2 mg/5 ml, Tk. 22.93/100 ml; Tk. 14.48/60 ml;Tab., 4 mg, Tk.0.46/Tab.

Sultolin (*Square*), Inhalation powder,Cap., (for use with a inhaler device) 200 microgram/ Cap., Tk. 1.50/Cap.; Aerosol Inhaler 100 microgram/puff, Tk. 195.00/200 puffs

Tk. 170.00/200 puffs (refill pack);Aerosol Inhaler, 100 microgram / puff, Tk. 180.68/200 puffs.; Nebuliser Solution, 2.5 mg/2.5 ml, Tk. 14.00; Resp., Solu, 5 mg/ml, Tk. 120.46/20ml; Syrup, 2mg/5ml, Tk.22.93/100ml; Tab., 4 mg, Tk.0.46/Tab.; SR Tab., 8 mg, Tk. 0.92/Tab.

Ventisal (*Ibn Sina*), Syrup, 2 mg/5 ml, Tk. 22.92/100 ml; Tab., 4 mg, Tk.0.34/Tab.

Ventol (*Central*), Syrup, 2 mg/5 ml, Tk. 15.00/100 ml;Tk. 10.50/60 ml

Ventolin (*GSK*), Syrup, 2 mg/5 ml, Tk. 20.17/100 ml.; Resp., Solu, 5 mg/ml, Tk. 152.10/20 ml.; Tab., 2 mg, Tk.0.23/Tab.; 4mg, Tk. 0.41/Tab. Aerosol Inhaler 100 microgram/ Puff, Tk. 202.33/200 dose;

Ventolin Nebules ^(b)(*GSK*), Solu for Nebulization, 2.5 mg/2.5 ml, Tk. 23.92/ 2.5ml

Windel (*Incepta*), Inhalation powder,Cap.,(for use with a inhaler device)200 microgram/Cap.; Tk. 2.50/Cap. Nebuliser Solu, 2.5 mg/2.5 ml, Tk. 14.00/2.5ml; Resp., Solu, 5 mg/ml, Tk. 120.00/20 ml; Syrup, 2 mg/5 ml, Tk. 22.90/100 ml; Tab., 2 mg, Tk.0.26/Tab.; Tab., 4 mg, Tk. 0.34/Tab

SALMETEROL

Salmeterol is a long-acting beta 2 adrenoceptor stimulant which is administered by inhalation on a once or twice-daily basis. It is *not* indicated for

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the relief of an acute attack. Salmeterol can be useful in nocturnal asthma

Indications: reversible airways obstructions including nocturnal asthma and prevention of exercise-induced bronchospasm in patients requiring long-regular bronchodilator

Cautions: see under *Salbutamol* and above note

Interactions: see Appendix-2

Side-effects: see under *Salbutamol*; significant incidence of paradoxical bronchospasm may be clinically important in severe or deteriorating asthma

Dose: ADULT & CHILD over 4 years, by *inhalation*, 50 micrograms (2 puffs) twice daily; CHILD under 4 years not recommended

Note: Salmeterol is not for immediate relief of acute attacks and existing corticosteroid therapy should not be reduced or withdrawn

Proprietary Preparations

Arobid (*Aristo*), Aerosol Inhaler 25 microgram/puff Tk. 210/200 doses

Bexitrol (*Beximco*), Aerosol Inhaler, 25 microgram/puff, Tk. 210.00/200 doses

Salmate (*Square*), Aerosol Inhaler, 25 microgram/puff, Tk. 210.00/200 doses; 25 microgram/puff Tk. 190.72/200 doses

TERBUTALINE SULPHATE

Indications: see under *Salbutamol*

Cautions: see under *Salbutamol*

Interactions: see Appendix-2

Side-effects: see under *Salbutamol*

Dose: by *mouth*, initially 2.5 mg 3 times daily for 1-2 weeks, then up to 5 mg 3 times daily; CHILD 75 micrograms/kg 3 times daily; 7-15 years 2.5 mg 2-3 times daily

By *subcutaneous, intramuscular or intravenous injection*, 250-500 micrograms up to 4 times daily. CHILD 2-15 years 10 micrograms/kg to a max. of 300 micrograms

By *aerosol inhalation*, ADULT and CHILD, 250-500 micrograms (1-2 puffs);

for persistent symptoms up to 3-4 times daily (see Table 4A)

Proprietary Preparations

Samisil (*Supreme*), Syrup, 1.5 mg/5 ml, Tk. 25.00/100 ml; Tab. 2.5 mg,

Tk. 0.50/Tab.;Tk. 35.14/100 ml

Tervent (*Unimed*), Syrup 1.5 mg/5 ml, Tk. 25.00/100 ml; Tab. 2.5 mg, Tk. 0.50/Tab.

4.1.2 ANTIMUSCARINIC BRONCHODILATORS

Ipratropium or **oxitropium** may be used by inhalation in the management of chronic asthma in patients who already require high-dose inhaled corticosteroid. Ipratropium by nebulization may be added to other standard treatment in life threatening asthma or where acute asthma fails to improve with standard therapy.

IPRATROPIUM BROMIDE

Indications: relative airways obstruction, particularly in chronic cases.

Cautions: glaucoma, prostatic hypertrophy, pregnancy

Side-effects: dry mouth, urine retention, constipation

Dose: by *aerosol inhaler*, 20-40 micrograms in early treatment up to 80 micrograms at a time, 3-4 times daily.

By *inhalation of nebulized solution*, 100-500 micrograms up to 4 times daily

Proprietary Preparations

G-Ipra (*Gonoshasthaya*), Resp., Solu., 250 microgram/ml, Tk. 60.00/20 ml

Ipramid (*Beximco*), Aerosol Inhaler, 20 microgram/puffs, Tk. 220.00/200 MD

Ipratop (*Incepta*), Nebuliser Solu., 0.025 gm/100 ml, Tk. 130.00/20 ml

Iprex (*Square*), Aerosol Inhaler, 20 microgram/puff, Tk. 200.75/200 puffs; Nebuliser Solu., 500 microgram/2ml, Tk. 140.00/2ml Res., Solu., 250microgram/ml, Tk. 130.49/20ml; Aerosol Inhaler, 20 microgram/puff, Tk. 230.00/120Puffs; Tk.250.00/200 puffs

Rinase (*ACI*), Resp., Solu, 250microgram/ml, Tk. 130.00/20 ml

Salbutamol + Ipratropium Bromide

Combair (*ACI*), Resp., Soln., 0.5 mg+2.5 mg/ml, Tk. 225.70/20 ml; Aerosol Inhaler, 100

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microgram+ 20 microgram/puff, Tk. 250.00/200 puffs

Ipralin (*Aristo*), Aerosol Inhaler, 100 microgram + 20 microgram/Puff, Tk. 250.00/200puffs

Iprasol (*Beximco*), Aerosol Inhaler, 100 microgram + 20 mg/puffs, Tk. 250.00/200 MD

Salpium HFA (*Acme*), Aerosol Inhaler, 100 microgram+ 20 microgram/puff , Tk. 250.00/200 puffs

Sulprex (*Square*), Aerosol Inhaler, 100 microgram + 20 microgram/puff, Tk. 250.00/200 Puffs; Refill pack, Tk. 230.00/Puffs; Inhaler, 100 microgram + 20

microgram/puff, Tk. 230.86/200 Puffs; Nebuliser Solu., 2.5 mg+500 microgram/2.5ml, Tk. 150.00/2.5ml

Windel Plus (*Incepta*), Nebuliser Solu., 2.5 mg + 250 mg, Tk. 150.00/ 2.5ml

4.1.3 XANTHINE BRONCHODILATOR

AMINOPHYLLINE

Aminophylline (theophylline ethylene diamime) is 20 times more soluble than theophylline, dilates the bronchi and stimulates the respiratory center, and it produces an immediate relief of symptoms in attacks of cardiac asthma. It is useful in the treatment of right-sided heart failure, since it relieves the dyspnoea which may be a feature of the conditions; it also improves the cardiac output.

Aminophylline is employed in the treatment of severe acute attacks of bronchial asthma that do not respond to a nebulized beta₂ adrenoceptor stimulant; it is usually given by slow intravenous injection or infusion but may also be given by mouth

Indications: reversible airways obstruction, severe asthma

Cautions: see under *Theophylline*

Interactions: see *Appendix-2*

Side-effects: see under *Theophylline*

Dose: by mouth, initially 100-300 mg twice daily for one week, then 200-600 mg twice daily; CHILD over 3 years, initially 6 mg/kg twice daily, may be increased after a week to 12 mg/kg

By slow intravenous injection over at least 20 minutes, 250-500 mg usually given in 5% dextrose in aqua or normal saline

By rectum suppositories, 360 mg once or twice daily.

Proprietary Preparations

Aminophylline (*Ambee*), Tab., 100 mg , Tk. 4.75/Tab; Inj., 125mg/ 5ml, Tk. 5.46/5 ml

Aminophyllinum Retard (*Novartis*), Tab., 350 mg, Tk. 2.22/Tab.

Filin (*Opsonin*), Tab., 100 mg, Tk. 0.29/Tab.; Inj., 125 mg/5 ml, Tk. 4.10/Amp.

Minomal (*Pacific*), Tab., 175 mg, Tk. 0.92/Tab.; Tab., 350 mg, Tk. 1.66/Tab.; SR Tab., 600 mg, Tk.3.50/Tab.

THEOPHYLLINE

Theophylline is a bronchodilator used for reversible airways obstruction. It may have an additive effect when used in conjunction with small doses of beta₂ adrenoceptor stimulants; the combination may increase the risk of side-effects including hypokalaemia. There are considerable variations in its half-life particularly in smokers, in patients with hepatic or renal impairments or heart failure or if certain drugs are taken concurrently (see *Appendix-2*). Theophylline is given by injection as aminophylline which is a mixture of theophylline with ethylenediamine.

Theophylline modified-release preparations are usually able to produce adequate plasma concentrations for up to 12 hours. When given as a single dose at night they have a useful role in controlling nocturnal asthma and early morning wheezing.

Indications: reversible airways obstruction, severe asthma

Cautions: cardiac diseases, hypertension, hyperthyroidism, peptic ulcer, hepatic impairment, epilepsy, pregnancy and breast-feeding, elderly, fever

Interactions: see *Appendix-2*

Side-effects: tachycardia, palpitation, nausea, and other GI tract disorders, headache, insomnia, arrhythmia, and

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convulsions especially if given by intravenous injection

Dose: 125 mg 3-4 times daily after food, increased up to 250 mg if required; CHILD, 7-12 years 62.5 mg 3-4 times daily

Proprietary Preparations

Arofil (*Incepta*), SR Tab., 200 mg, Tk. 1.60/Tab.; SR Tab., 300 mg, Tk. 2.35/Tab.; SR Tab. 400 mg, Tk. 2.98/Tab.
Asmacon (*Pacific*), SR Tab. 400 mg, Tk. 2.01/Tab.
Asmaloc (*Sharif*), SR Tab., 300 mg, Tk. 2.35/Tab.; SR Tab., 400 mg, Tk. 2.98/Tab.; Syrup, 120 mg/5 ml, Tk. 30.00/100 ml
Contifil (*Square*), SR Tab., 300 mg, Tk. 2.35/Tab.; SR Tab., 400 mg, Tk. 2.98/Tab.
Contine (*Aristo*), Syrup, 120 mg/5 ml, Tk. 30.95/100 ml; SR Tab., 400mg, Tk. 2.98/Tab.; SR Tab 200mg, Tk. 1.60/Tab.; SR Tab 300mg, Tk. 2.35/Tab.
G-Theophylline (*Gonoshasthaya*), Syrup, 120 mg/5 ml, Tk. 15.00/15 ml; Tab., 300 mg, Tk. 1.20/Tab.
Jasophyllin (*Jayson*), Syrup, 120 mg/5 ml, Tk. 25.10/100 ml
Neulyl (*Orion*), SR Tab., 400 mg, Tk. 2.51/Tab.
OD Phylline (*Sun*), Tab., 400 mg, Tk. 2.67/Tab.
Tealex (*ACI*), SR Tab., 200 mg, Tk. 1.49/Tab.; SR Tab., 300 mg, Tk. 2.00/Tab.; SR Tab., 400 mg, Tk. 2.67/Tab.
Thenglate (*Acme*), SR Tab., 250 mg, Tk. 1.76/Tab.; SR Tab., 400 mg, Tk. 2.68/Tab.; Syrup, 120mg/5ml, Tk. 30.95/100 ml
Theovent (*Drug Int.*), Cap., 300 mg, Tk. 2.92/Cap.; SR Tab., 400 mg, Tk. 2.68/Tab.; SR Tab., 200 mg, Tk. 1.59/Tab.; SR Tab., 300 mg, Tk. 2.00/Tab.
Unikon (*Ibn Sina*), SR Tab. 400mg, Tk. 2.68/Tab.; Syrup 120 mg/5 ml, Tk. 26.00/100ml
Unilin (*Opsonin*), Syrup, 120 mg/5 ml, Tk. 23.27/100 ml; Tk. 11.47/50ml

4.2 CORTICOSTEROIDS

Corticosteroids are very effective in asthma. They reduce airways inflammation (and thus reduce oedema and secretion of mucus into the airway).

INHALATION. Inhaled corticosteroids are recommended for prophylactic treatment of asthma when patients are using a beta 2-adrenoceptor more than once daily. Corticosteroid inhalation must be used regularly to obtain

maximum benefit; alleviation of symptoms usually occurs 3 to 7 days after initiation. **Beclomethasone dipropionate, budesonide and fluticasone propionate** appear to be equally effective.

AEROSOL INHALATION. Corticosteroids are preferably inhaled from aerosol inhalers using large-volume spacer devices, particularly if high doses are required. **Budesonide** is also available as a suspension for nebulization. **Corticosteroids** may also be taken orally or parenterally. Inhaled corticosteroids have considerably fewer systemic side-effects than oral corticosteroids.

ORAL. Acute attacks of asthma should be treated with short course of oral corticosteroids starting with high dose, e.g. prednisolone 30-60 mg daily for a few days, gradually reducing once the attack has been controlled.

PARENTERAL. Hydrocortisone injection is used in the emergency treatment of acute severe asthma (see Table 4B).

BECLOMETHASONE DIPROPIONATE

(Beclometasone Dipropionate)

Indications: treatment of airway inflammation in chronic asthma

Cautions: active or quiescent tuberculosis, systemic therapy may be required during periods of stress or when airways are obstructed or mucus prevent drug access to smaller airways

Side-effects: hoarseness and candidiasis of mouth or throat; rarely hypersensitivity reactions including rash and angioedema

Dose: by aerosol inhalation, standard dose inhalers, 200 micrograms twice daily or 100 micrograms 3-4 times daily; CHILD 50-100 micrograms 2-4 times daily

By aerosol inhalation, high dose inhalers 500 micrograms twice daily or 250 micrograms 4 times daily; if necessary may be increased 500 micrograms 4 times daily

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Proprietary Preparations

Beclocort (*Aristo*), Aerosol inhaler, microgram/Puff, Tk. 270.00/200 Puffs ; 250 microgram/Puff, Tk. 350.00/200 Puffs ; 50 microgram/Puff, Tk. 220.00/200 Puffs
Beclomin (*Square*), Aersole inhaler, 100 microgram/puff, Tk. 270.00/200 Puffs ; 250 microgram/puff, Tk. 320.00/200 Puffs
Decomit (*Beximco*), Aersol inhaler 100 microgram/puff, Tk. 270.00/200 MD ;, 50 microgram/puff, Tk. 220.00/200 MD
Steradin (*ACI*), Aersol inhaler, 100microgram/puff , Tk. 271.02/200 Puffs ; 250microgram/puff Tk. 351.32/200 Puffs

BUDESONIDE

Indications: chronic asthma not controlled by short acting beta2-stimulants

Cautions: active or quiescent tuberculosis, systemic thrapy may be required during periods of distress or when airways obstruction or mucus prevent drug access to smaller airways

Side-effects: hoarseness and candidiasis of mouth or throat

Dose: by aerosol inhalation, standard dose inhalers, 200-400 micrograms twice daily, in severe asthma dose may be increased to 800 micrograms twice daily; CHILD, 50-200 micrograms twice daily, in severe cases may be increased to 400 micrograms twice daily

By inhalation of powder, 200-800 micrograms daily, in severe asthma may be up to 1600 micrograms daily in divided doses; CHILD, 200-800 micrograms daily in divided doses in severe asthma

Proprietary Preparations

Budicort (*Incepta*), Nebuliser Susp., 0.025 gm/100 ml, Tk. 40.00; Nasal Spray, 100 microgram/spray, Tk. 250.00/120 MD
Aeronid (*Beximco*), Aerosol Inhaler, 200 microgram/Puff, Tk. 410.00/120 MD

Formoterol fumarate + Budesonide

Bufocort (*Square*), Inhalation powder, Cap12 microgram + 400 microgram , Tk. 14.00/Cap.; 6 microgram + 200 microgram , Tk. 9.00/Cap.; 6 microgram + 100 microgram , Tk. 7.00/Cap.
Budison F-80 (*Aristo*), Inhalation powder ,Cap 4.5 microgram + 80 microgram, Tk. 400.00/Cap.; 4.5 microgram + 160 microgram, Tk. 500.00/Cap.

Budemet (*Incepta*), Inhalation powder Cap, 6 microgram + 100 microgram, Tk. 7.00/Cap.; 6 microgram + 200 microgram, Tk. 9.00/Cap. 12 microgram + 400 microgram, Tk. 14.00/Cap.

Oxycort (*ACI*), Aerosol Inhaler, 4.5 microgram + 80microgram/ puff , Tk. 600.00/ Can; 4.5microgram+ 160microgram/puff , Tk. 800.00/can ; 0.006mg+ 0.200mg , Tk. 9.00/Cap.; 0.006mg+ 0.100mg , Tk. 7.00/Cap.; 0.012mg+ 400mg , Tk. 14.00/Cap.

Symbion (*Beximco*), Aerosol Inhaler, 4.5 microgram + 160 microgram/puff, Tk. 980.00/Can; Inhalation powder ,Cap. , 6 microgram + 0.1 mg, Tk. 7.00/Cap.

Symbion BexiCap (*Beximco*), Inhalation powder Cap. , 6 microgram + 0.2mg, Tk. 9.00/Cap.

CICLESONIDE

Indications: asthma and allergic rhinitis

Side effects: headache, burning or irritation in the nose, painful white patches in nose or throat, flu-like symptoms, rash, itching, hoarseness

Contraindications: allergy to ciclesonide aerosol; recent open sore in nose, nasal surgery, or a nasal injury and it has not healed yet.

Dose: by aerosol inhalation, 160 micrograms daily as a single dose reduced to 80 micrograms daily if control maintained; dose may be increased to max. 320 micrograms twice daily.

Proprietary Preparations

Cesonide (*Beximco*), Inhaler, 160 mcg/puf, Tk. 375.00/120 MD
Ezonide (*Square*), Aersol Inhaler, 80 mcg/puff, Tk. 275.00/120 Puff ; 160 mcg/puf, Tk. 375.00/120 Puff

FLUTICASONE PROPIONATE

Indication: chronic asthma not controlled by short-acting beta2-stimulants

Cautions: see *Beclomethasone*

Side-effects: see *Beclomethasone*

Dose: by inhalation, ADULT & CHILD over 16 years, 100 to 250 micrograms twice daily, increased according to severity of asthma to up to 1 mg twice daily. CHILD 4-16 years, 50-100

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micrograms twice daily adjusted as necessary

Proprietary Preparation

Fluticon (*Acme*), Inhalation powder, Cap., 50microgram Tk. 2.51/Cap.; 100microgram Tk.4.27/Cap.; 250microgram , Tk. 8.04/Cap.; 500microgram Tk. 13.05/Cap

4.3 COMBINED THERAPY

For patients remaining symptomatic on inhaled corticosteroids alone, treatment options include increasing the corticosteroid dose or the addition of a long acting beta2-agonist. Adding salmeterol to inhaled corticosteroid produces greater improvements in lung function and symptom control.

While corticosteroids and long acting beta2-stimulants are available as single component preparations, combination of **salmeterol** with the corticosteroid **fluticasone propionate** has become available and may be beneficial for compliance.

SALMETEROL plus FLUTICASONE

Indication: chronic asthma not controlled by long acting beta2-agonist or corticosteroid individually

Cautions: see *Fluticasone & Salmeterol*

Side-effects: see *Fluticasone and Salmeterol*

Dose: the product is available in different fixed combinations of salmeterol and fluticasone propionate to meet individual requirements as *CFC Free aerosol inhaler (Evohaler)* and *Dry Powder for inhalation (Accuhaler)*

ADULT & CHILD over 12 years, 1 aerosol inhalation (Accuhaler) or 2 dry powder inhalations (Evohaler) twice daily as per severity of asthma

Proprietary Preparations

Aroflo (*Aristo*), Aerosol Inhaler , 25 microgram + 50 microgram/Puff, Tk. 520.00/Can ; 25microgram + 250 microgram/Puff, Tk. 795.00/Can; 25 microgram + 250microgram/Puff, Tk. 430.00 25 microgram + 125microgram/Puff, Tk. 595.00/Can

Arotide (*Eskayef*), Aerosol Inhaler, 25 microgram + 250 microgram/puff, Tk. 750.00/Can;25 microgram + 125 microgram/puff, Tk. 575.00/Can

Bexitrol F (*Beximco*), Aerosol Inhaler, 25 microgram + 125 microgram/puff, Tk. 595.00/120 doses ; 25 microgram + 250 microgram/puff, Tk. 795.00/120doses; 25 microgram + 50 microgram/puff, Tk. 520.00/120 doses

25 microgram + 250 microgram/puff, Tk. 430.00/60 doses; (with dose counter device) 25 microgram + 250 microgram, Tk. 795.00 /Can Inhalation powder..(for use with a device) 50 microgram + 100 microgram Tk. 4.85/Cap. ; 50 microgram + 250 microgram, Tk. 9.20/Cap.

50 microgram + 500 microgram, Tk. 15.00/Cap.

Flumetol inhaler (*Healthcare*), Aerosol Inhaler. 25 microgram + 250 microgram, Tk. 850.00/Can

Flutisal (*Incepta*), Inhalation powder, Cap., (for use with a inhaler device) 50 microgram + 100 microgram Tk. 5.00/Cap. ; 50 microgram + 25 microgram, Tk. 10.00/Cap. ; 50 microgram + 500 microgram, Tk.15.00/Cap.

Salflu (*Acme*), Inhalation powder ,Cap. ,(for use with a inhaler device), 50 microgram + 250 microgram, Tk. 9.04/Cap.; 50 microgram + 100 microgram, Tk. 4.76/Cap.; 50 microgram + 500 microgram, Tk.

15.05/Cap.;Aerosol Inhaler, 25microgram + 125 microgram/puff, Tk. 595.00/can; 25 microgram + 250 microgram/puff, Tk. 795.00/can;25 microgram + 50 microgram/puff, Tk. 520.00/can

Seretide Accuhaler^(GSK), Inhalation powder, disk 50 microgram +100 microgram, Tk. 970.10/60 doses; 50 microgram +50 microgram, Tk. 1,105.46/60 doses 50 microgram + 500 microgram, Tk. 1,285.95/60 doses

Seretide Evohaler^(GSK), Aerosol Inhaler, 25 microgram + 125 microgram, Tk. 959.54/200 doses; 25 microgram + 50 microgram, Tk. 669.64/120 doses, 25 microgram + 250 microgram, Tk. 1,116.07/120 doses

Seroxyn (*ACI*), Aerosol Inhaler, 25microgram + 250 microgram/Puff , Tk. 795.00/can; 25 microgram + 125 microgram/Puff , Tk. 595.00/can ;Inhalation powder ,Cap. ,(for use with a device), 50 microgram + 500 microgram , Tk. 15.00/Cap. ;50 microgram + 250microgram , Tk. 9.20/Cap.; 50 microgram + 100microgram , Tk. 4.85/Cap

Ticamet (*Square*), Aerosol Inhaler 25 microgram + 250 microgram/ puff, Tk. 795.00/120 Puff; 25 microgram + 125 microgram / puff, Tk. 595.00/120 Puff; 25

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microgram + 50 microgram / puff, Tk. 520.00/120 Puff
Inhalation powder ,Cap.,(for use with a inhaler device) 50 microgram + 100 microgram, Tk. 6.50/Cap.; 50microgram + 250 microgram, Tk. 9.21/Cap.

4.4 CROMOGLYCATES AND RELATED THERAPY, LEUKOTRIENE RECEPTOR ANTAGONISTS

- 4.4.1 CROMOGLYCATES
 - 4.4.2 RELATED THERAPY
 - 4.4.3 LEUKOTRIENE RECEPTOR ANTAGONISTS
-

4.4.1 CROMOGLYCATES

In general, *prophylaxis* with regular inhalation of **sodium cromoglycate** is less effective than with corticosteroid inhalations. Children may respond better than adult. Sodium cromoglycate is of value in the prevention of exercise-induced asthma, a single dose being inhaled half-an-hour before. It is not effective in acute asthma. The mode of action of sodium cromoglycate is not completely understood.

Inhalation of dry powder may cause sudden bronchospasm, which can be prevented by prior inhalation of a selective beta2-adrenoceptor stimulant such as salbutamol or terbutaline.

Nedocromil has a pharmacological action similar to that of sodium cromoglycate.

SODIUM CROMOGLYCATE

Indications: prophylaxis of asthma; food allergy; allergic conjunctivitis; allergic rhinitis

Side-effects: coughing, transient bronchospasm, and throat irritation due to inhalation of powder

Dose: *by aerosol inhalation*, ADULT and CHILD, 10 mg (2 puffs) 4 times daily, increased in severe cases or during periods of risk to 6–8 times daily; additional dose may also be taken before exercise; maintenance 5 mg (1 puff) 4 times daily

By inhalation of nebulised solution, ADULT & CHILD 20 mg 4 times daily, increased in severe cases up to 6 times daily

Proprietary Preparations

see section 11.2

NEDOCROMIL SODIUM

Indication: prophylaxis of asthma

Side-effects: *see under sodium cromoglycate*; also nausea, vomiting, dyspepsia, headache, abdominal pain, bitter taste

Dose: *by aerosol inhaler*, ADULT and CHILD over 6 years, 4 mg (2 puffs) 4 times daily; when control achieved, may reduce to twice daily

Generic Preparation

Aerosol inhalation, 2mg/metered dose

4.4.2 RELATED THERAPY

Antihistamines are of no value in the treatment of bronchial asthma. **Ketotifen** is an antihistamine with an action said to resemble that of sodium cromoglycate, but it has not proved encouraging.

KETOTIFEN

Indications: *see notes above*

Cautions: previous anti-asthmatic treatment should be continued for a minimum of 2 weeks after initiation of ketotifen treatment; pregnancy and lactation

Side-effects: drowsiness, dry mouth, slight dizziness; CNS stimulation

Interactions: *see Appendix-2*

Dose: ADULT: 1 mg twice daily with food increased if necessary to 2 mg twice daily; initial treatment in readily sedated patients 0.5-1 mg at night; CHILD over 2 years 1 mg twice daily

Proprietary Preparations

Alarid (Square), Syrup, 1 mg/5 ml, Tk. 50.00/100 ml.; Tab., 1 mg, Tk. 1.50/Tab.
Asmafen (Globe), Tab., 1 mg, Tk. 1.50/Tab.; Syrup, 1 mg/5 ml, Tk. 40.00/100 ml

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Broket (*Orion*), Syrup, 1 mg/5 ml, Tk. 40.15/100 ml.; Tab., 1 mg, Tk. 1.51/Tab.
Fenat (*Drug Int*), Tab., 1 mg, Tk. 2.00/Tab.
Syrup, 1 mg/5 ml, Tk. 45.00/100 ml
Ketifen (*Acme*), Tab., 1 mg, Tk. 2.00/Tab.; Syrup, 1 mg/5 ml, Tk. 45.00/100 ml
Ketodil (*Techno*), Cap., 1 mg, Tk. 2.00/Cap.; Syrup, 1 mg/5 ml, Tk. 35.00/100 ml
Ketof (*Ibn Sina*), Syrup, 1 mg/5 ml, Tk. 50.00/100 ml.; Tab., 1 mg, Tk. 1.60/Tab.
Ketomar (*Incepta*), Syrup, 1 mg/5 ml, Tk. 40.00/100 ml.; Tab., 1 mg, Tk. 2.00/Tab.
Ketopac (*Pacific*), Syrup, 1 mg/5 ml, Tk. 30.07/100 ml.; Tab., 1 mg, Tk. 1.50/Tab.
Ketorif (*Biopharma*), Syrup, 1 mg/5 ml, Tk. 40.00/100 ml.; Tab., 1 mg, Tk. 1.50/Tab.
Ketosma (*Leon*), Syrup, 1 mg/5 ml, Tk. 45.00/100 ml
Ketotif (*Delta*), Tab., 1 mg, Tk. 1.50/Tab.
Kofen (*Opsonin*), Tab., 1 mg, Tk. 1.5/Tab.; Syrup, 1 mg/5 ml, Tk. 33.83/100 ml
Ocutifen (*General*), Syrup, 1 mg/5 ml, Tk. 40.00/100 ml
Prosuma (*ACI*), Syrup, 1 mg/5 ml, Tk. 50.00/100 ml.; Tab., 1 mg, Tk. 2.00/Tab.
Sanketo (*Novartis*), Tab., 1 mg, Tk. 2.50/Tab.
S-kit (*Sharif*), Tab., 1 mg, Tk. 2.00/Tab.; Syrup, 1 mg/5 ml, Tk. 45.00/100 ml
Stafen (*Aristo*), Syrup, 1 mg/5 ml, Tk. 50.00/100 ml.; Tab., 1 mg, Tk. 2.00/Tab.
Ticofen (*Chemist*), Syrup, 1 mg/5 ml, Tk. 45.00/100 ml
Tifen (*Somatec*), Syrup, 1 mg/5 ml, Tk. 45.00/100 ml.; Tab., 1 mg, Tk. 2.00/Tab.
Tofen (*Beximco*), Syrup, 1 mg/5 ml, Tk. 50.00/100 ml.; Tab., 1 mg, Tk. 2.00/Tab.
Toma (*Navana*), Syrup, 1 mg/5 ml, Tk. 25.00/50 ml.; Syrup, 1 mg/5 ml, Tk. 45.00/100 ml.; Tab., 1 mg, Tk. 2.00/Tab.
Toti (*Eskayef*), Syrup, 1 mg/5 ml, Tk. 45.00/100 ml.; Tab., 1 mg, Tk. 1.50/Tab.
Totifen (*Renata*), Syrup, 1 mg/5 ml, Tk. 40.00/100 ml.; Tab., 1 mg, Tk. 1.50/Tab.
Zadifen (*Unimed*), Tab., 1 mg, Tk. 1.50/Tab.; Syrup, 1 mg/5 ml, Tk. 35.00/100 ml
Zadit (*Popular*), Syrup, 1 mg/5 ml, Tk. 40.15/50 ml.; Tab., 1 mg, Tk. 1.51/Tab.

4.4.3 LEUKOTRIENE RECEPTOR ANTAGONISTS

The leukotriene receptor antagonists such as **montelukast** and **zafirlukast**, block the effects of cysteinyl leukotrienes in the airways. They may be considered as add-on therapy for patients with mild to moderate asthma which is not controlled with an inhaled corticosteroid and a short-acting beta2 -stimulant used

as required. The leukotriene receptor antagonists may be of value in exercise-induced asthma and those with concomitant rhinitis but they are less effective in those with severe asthma who are also receiving high doses of other drugs.

It is advised that leukotriene receptor antagonists should not be used to relieve an attack of acute severe asthma and that their use does not necessarily allow a reduction in existing corticosteroid treatment.

MONTELUKAST

Indication: prophylaxis of asthma

Cautions: pregnancy and lactation

Side-effects: gastrointestinal disturbances, dry mouth, dizziness, irritability, restlessness, headache, sleep disorders, upper respiratory tract infections, fever, arthralgia, myalgia, increased bleeding tendency, oedema and seizures

Dose: ADULT 10 mg daily at bedtime.
CHILD 2-5 years 4 mg daily at bedtime,
6-14 years 5 mg daily at bedtime

Proprietary Preparations

Aeron FT (*Healthcare*), Tab., 4 mg, Tk. 6/Tab.; 5 mg, Tk. 8/Tab.; 10 mg, Tk. 15/Tab.
Amekast (*Beacon*), Tab., 10 mg, Tk. 15/Tab.; Tab., 4 mg, Tk. 6/Tab.; 5 mg, Tk. 8/Tab.
Arokast (*Navana*), Tab., 10 mg, Tk. 10/Tab.; Tab., 4 mg, Tk. 5/Tab.; Tab., 5 mg, Tk. 7/Tab.
Arovent (*Orion*), Tab., 10 mg, Tk. 15/Tab.; 5mg, Tk. 8/Tab.
Asmatab (*Veritas*), Tab., Tk. 10/Tab.
Asmont (*Somatec*), Tab., 10 mg, Tk. 10/Tab.; 4 mg, Tk. 6/Tab; 5 mg, Tk. 7/Tab.
Brocast (*Concord*), Tab., 10 mg, Tk. 15/Tab.
Croma (*Sharif*), Tab., 10 mg, Tk. 12/Tab.; 4mg, Tk. 6/Tab.; 5 mg, Tk. 8/Tab.
Freegest (*Biopharma*), Tab., 10 mg, Tk. 15/Tab.; 4 mg, Tk. 6/Tab.; 5 mg, Tk. 8/Tab.
Liam (*Asiatic*), Tab., 10 mg, Tk. 10/Tab.
Lumenta (*Novartis*), Tab, 10 mg, Tk. 16/Tab.; Tab., 5 mg, Tk. 9/Tab.
Lumona (*Eskayef*), Tab, 10 mg, Tk. 12/Tab.; 5mg, Tk. 6/Tab ; Powder, 4 mg/Sachet, Tk. 6/Tab.
Maxair (*RAK*), Tab., 10 mg, Tk. 15/Tab.; Tab., 5 mg, Tk. 8/Tab.
Medikast (*Leon*), Tab., 10 mg, Tk. 15/Tab.
Metok (*MST*), Tab., 10 mg, TK. 13.00/Tab.

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M-Kast (*Drug Int.*), Tab., 10 mg, Tk. 12.00/Tab.; 40 mg, Tk. 12.00/Tab.; 4 mg, Tk. 5.00/Tab. 5 mg, Tk. 7.00/Tab.
M-Lucas (*Popular*), Susp., 10 mg, Tk. 12.00/Tab.; Tab., 4 mg, Tk. 6.00/Tab.; Tab., 5mg, Tk. 7.00/Tab.
Mokast (*Alco*), Tab., 10 mg, Tk. 10/Tab; 4 mg, Tk. 6/Tab.
Molukat (*Kemiko*), Tab., 10 mg, Tk. 12/Tab.; 4 mg, Tk. 6/Tab.; 5 mg, Tk. 8/Tab.
Monas (*Acme*), Tab., 10 mg, Tk. 15.05/Tab.; 4mg, Tk. 6.02/Tab.; 5 mg, Tk. 8.04/Tab.
Monkast (*Pharmasia*), Tab., 10 mg, Tk. 14.50/Tab.; 5 mg, Tk. 7.50/Tab.
Monkon (*Albion*), Tab., 4 mg, Tk. 7.00/Tab.
Monocast (*Beximco*), Tab., 10 mg, Tk. 14/Tab.; 4 mg, Tk. 5.50/Tab.; Powder, 4 mg/Sachet, Tk. 8/Sachet
Monovas (*White Horse*), Tab., 10 mg, Tk. 12/Tab.
Monprox (*Rangs*), Tab., 10 mg, Tk. 15/Tab.; 5 mg, Tk. 7.50/Tab.;
Montair (*Incepta*), Tab., 10 mg, Tk. 15/Tab.; 4mg, Tk. 6/Tab. ; 5 mg, Tk. 8/Tab.
Montek (*Sun*), Tab., 10 mg, Tk. 15/Tab.; 4 mg, Tk. 6/Tab.
Montekast (*Pacific*), Tab., 10 mg, Tk. 11.27/Tab.
Montela (*Delta*), Tab., 10 mg, Tk. 10.00/Tab.; Tab., 5 mg, Tk. 6.00/Tab.
Montelon (*Apex*), Tab., 10 mg, Tk. 15.00/Tab.
Monteluk (*Astra*), Tab., 10 mg, Tk. 15.00/Tab. ;5 mg, Tk. 8.00/Tab.
Montemax (*Doctor TIMS*), Tab., 10 mg, Tk. 16.00/Tab.; 5 mg, Tk. 8.00/Tab.
Montene (*Square*), Tab., 10 mg, Tk. 15.00/Tab.; Tab., 4 mg, Tk. 6.00/Tab.; 5 mg, Tk. 8.00/Tab.
Montex (*Ibn Sina*), Tab., 10 mg, Tk. 16.00/Tab.; Tab., 5 mg, Tk. 8.00/Tab.
Montifast (*Globe*), Tab., 10 mg, Tk. 15/Tab.; Chewable Tab., 4 mg, Tk. 7/Tab.
Montilab (*Labaid*), Tab., 10 mg, Tk. 15/Tab.
Montilet (*Amulet*), Tab., 10 mg, Tk. 15/Tab.
Montiluk (*Rephco*), Tab., 10 mg, Tk. 15/Tab.; 4 mg, Tk. 6/Tab.
Montiva (*Nipro JMI*), Tab., 10 mg, Tk. 10/Tab.
Montril (*Aristo*), Tab., 10 mg, Tk. 15/Tab.; Tab., 4 mg, Tk. 7/Tab.; Tab., 5 mg, Tk. 8/Tab.
Odmon (*Renata*), Tab., 10 mg, Tk. 15/Tab. ; Tab., 10 mg, Tk. 15/Tab.; 5 mg, Tk. 8/Tab.
Provair (*Unimed*), Tab., 10 mg, Tk. 15/Tab.; 4mg, Tk. 6/Tab.; 5 mg, Tk. 8/Tab.
Reversair (*ACI*), Tab., 10 mg, Tk. 15.06/Tab; 4 mg, Tk. 7.03/Tab.; 5 mg, Tk. 8.03/Tab. Tab., 5 mg, Tk. 7.50/Tab.
Telukast (*General*), Tab., 10 mg, Tk. 10/Tab.; 4 mg, Tk. 5.50/Tab.; 5 mg, Tk. 7.53/Tab.
Trilock (*Opsonin*), Tab., 10 mg, Tk. 11.32/Tab.; 4 mg, Tk. 4.53/Tab.; 5 mg, Tk. 6.04/Tab.; Powder, 4 mg/Sachet, Tk. 6.04/Tab.

ZAFIRLUKAST

Indication: prophylaxis of asthma.

Cautions: elderly, pregnancy, renal impairment.

Contra-indications: hepatic impairment, breast-feeding.

Side-effects: gastro-intestinal disturbances, respiratory tract infections in the elderly.

Dose : 20 mg twice daily. CHILD under 12 years, not recommended.

Generic Preparations

Tablet. 10mg; 20mg

4.5 PEAK FLOW METERS, INHALER & SPACING DEVICES, AND NEBULISER

PEAK FLOW METERS

It is particularly helpful to measure the peak flow for patients who are 'poor perceivers' and hence slow to detect deterioration in their asthma, and for those with moderate or severe asthma. Patients must be given clear guidelines as to the action they should take if their peak flow falls below a certain level.

INHALER AND SPACING DEVICES

A variety of spacing devices is now available for use with pressurised (aerosol) inhalers (metered dose inhalers). By providing a space between inhaler and mouth, they reduce the velocity of the aerosol and subsequent impaction on the oropharynx; in addition they allow more time for evaporation of the propellant so that a larger proportion of particles can be inhaled and deposited in the lungs; also co-ordination of inspiration with actuation of aerosol is less important. The size of the spacer is important and the larger spacing devices with a one-way valve are the most effective. Spacing devices are particularly useful for patients with poor inhalation technique for children, for patients requiring higher doses, for

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nocturnal asthma, and for patients prone to develop candidiasis with inhaled corticosteroids. Alternatively dry powder inhalers, activated by the patient's inspiration, are of value; some occasionally cause coughing.

USE AND CARE OF LARGE-VOLUME SPACER DEVICES. Patients should inhale from the spacer devices as soon as possible after actuation since the drug aerosol is very short-lived; single-dose actuation is recommended. The device is cleaned once a week by washing, rinsing and then allowing to dry in the air (wiping should be avoided since any electrostatic charge may affect drug delivery). Spacer devices should be replaced every 6-12 months.

NEBULISERS

A nebuliser is a converter of a solution of a drug into an aerosol for inhalation to deliver higher doses of drugs to the airways than is usual with standard inhalers. The main purpose for use of nebuliser are:

- To deliver **beta-adrenoreceptor** stimulant or **ipratropium** to a patient with an acute exacerbation of asthma.
- To deliver the drugs on regular basis to a patient with severe asthma.

The proportion of a nebuliser solution that reaches the lungs depends on the type of nebuliser. It can be as high as 30%, it is more frequently close to 10% and sometimes below 10%.

JET NEBULISERS. Most jet nebulisers require an optimum gas flow 6-8 litre/minute and in hospital can be driven by piped air or oxygen.

NEBULISER DILUENT. Nebulisation may be carried out using an undiluted nebuliser solution or it may require dilution beforehand. The usual diluent is sterile sodium chloride 0.9%.

4.6 OXYGEN THERAPY IN ASTHMA AND COPD

Oxygen should be regarded as a drug. It is prescribed for hypoxaemic patients to

increase alveolar oxygen tension and decrease the work of breathing necessary to maintain a given arterial oxygen tension.

HIGH CONCENTRATION OXYGEN THERAPY. In acute severe asthma, the arterial carbon dioxide (pCO_2) is usually sub normal, but as asthma deteriorates it may rise steeply, particularly in children. These patients require high concentration of oxygen, and 35% to 50% oxygen delivered through a conventional mask is recommended. If arterial carbon dioxide (pCO_2) remains high despite other treatment, intermittent positive pressure ventilation may be needed urgently. Acute asthma with long history of chronic bronchitis and probable respiratory failure may require a lower concentration (24% to 28%) oxygen to limit oxygen induced reduction of respiratory drive.

LOW CONCENTRATION OXYGEN THERAPY. Controlled low concentration oxygen therapy is reserved for patients with ventilatory failure due to chronic obstructive pulmonary diseases (COPD) or other causes. In such cases, the oxygen concentration should not exceed 28% and in some patients a concentration above 24% may be excessive. The aim is to provide the patient with just enough oxygen to improve hypoxaemia without worsening pre-existing carbon dioxide retention and respiratory acidosis. Treatment should be initial in hospital as repeated.

INTERMITTENT OXYGEN THERAPY. Oxygen is occasionally prescribed for episodes of hypoxaemia of short duration, for example in asthma and in chronic COPD to ease discomfort of breathing. It is important, however, that the patient does not rely on oxygen instead of obtaining medical help or taking more specific treatment. Oxygen is supplied through refillable cylinders. Oxygen flow can be controlled with attached oxygen flow meter (2-4 l/min).

PORTABLE OXYGEN CYLINDERS. Bangladesh Oxygen Company (BOC) supplies portable oxygen cylinders which have bull-nose fittings as normal

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domiliary headsets. The cylinder holds about 300 litres of oxygen which last approximately 2 hours at a standard flow rate of two litres/minute.

4.7 COUGH PREPARATIONS

- 4.7.1 Cough suppressants
- 4.7.2 Expectorant and demulcent cough preparations

4.7.1 COUGH SUPPRESSANT

Cough is usually a symptom of an underlying disorder e.g. asthma, gastroesophageal reflux disease, postnasal drip. Where there is no identifiable cause, cough suppressants may be useful. They may cause sputum retention and this may be harmful in patients with chronic bronchitis and bronchiectasis. **Codeine** may be effective but it is constipating and can cause dependence; **dextromethorphan** and **pholcodine** have fewer side-effects. **Bromhexine** which is a mucolytic agent is used in respiratory disorders associated with viscid or excessive mucus.

Note: The use of cough suppressants containing codeine or similar opioid cough suppressants is not generally recommended in children and should be avoided altogether in those under 1 year of age.

AMBROXOL HYDROCHLORIDE

Indications : acute & chronic diseases of respiratory tracts associated with viscid mucus including acute and chronic bronchitis; Productive cough; Laryngitis, Pharyngitis, sinusitis & rhinitis; Asthmatic bronchitis; Bronchiectasis, Chronic pneumonia

Interactions: see Appendix -2

Side-effects: gastrointestinal side-effects like epigastric pain, gastric fullness may occur occasionally

Cautions: it should be given cautiously to patients with gastric or duodenal ulceration or convulsive disorders. hepatic and renal impairment

Contraindications: contraindicated in known hypersensitivity to ambroxol or bromhexine

Dose: 10 years & ADULT 10ml (2 teaspoonful) 3 times a day; 5-10 yrs. CHILD 5ml (1 teaspoonful) 2-3 times a day

Proprietary Preparations

Acorex (Apex), Syrup, 15 mg/5 ml, Tk. 40/100 ml

Acticol (GSK), Syrup 15 mg/5 ml, Tk.

35.19/100 ml

Adebrox (Supreme), Syrup,

300mg/100ml, Tk. 40/100 ml

Ambolyt (Incepta), Syrup, 15mg/5ml, Tk.

40/100 ml; Paed. drops, 6mg/ml, Tk. 20/15 ml

Amboten (Eskayef), Syrup, 15mg/5ml, Tk.

40/100 ml; Syrup, 15mg/5ml, Tk. 30/15 ml

Ambozin (Rephco), Syrup, 15mg/5ml, Tk.

40/100 ml; SR Cap. 75 mg, Tk. 5/Cap.

Ambrotil (Orion), Syrup 15 mg / 5 ml, Tk.

40/100 ml; Paed. drops, 6 mg/ml, Tk. 25/15 ml

Ambrotol (Amico), Syrup, 15 mg/5 ml, Tk.

40/100ml

Ambroton (Organic), Syrup, 15 mg / 5 ml, Tk.

40/100 ml

Ambrox (Square), Paed. drops, 6 mg / ml, Tk.

30/15 ml; Syrup, 15 mg / 5 ml, Tk. 40/100 ml;

SR Cap. 75 mg, Tk. 5.01/Cap.

Ambroxol (Albion), Paed. drops, 6mg/ml,

20.07/15ml; Syrup, 15mg/5ml, Tk. 30.00/100ml

Ambroxol (Biopharma), Syrup, 6mg/ml, Tk.

40/100 ml; SR Cap. 75 mg, Tk. 5.00/Cap.

Ambryl (RAK), Syrup, 15mg/5ml, Tk. 40/100

ml; Paed. drops, 6 mg / ml, 30.00/15ml

Amsiv (Delta), Syrup, 15mg/5ml, Tk.

40.00/100 ml

Aroxol (Healthcare), Paed. drops, 6 mg / ml,,

Tk. 35.00/15 ml; Syrup 15mg/5ml, Tk.

45.00/100 ml

Boxol (Opsonin), Syrup, 15mg/5ml, Tk.

30.08/100ml; Paed. drops, 6mg/ml, Tk.

22.56/15ml; SR Cap., 75 mg, Tk. 3.77/Cap.

Broculyt (Nipro JMI), Syrup, 15mg/5ml, Tk.

40.00/100 ml

Brox (Navana), Syrup, 15mg/5ml Tk. 40/100

ml; Paed. drops, 6mg/ml, Tk. 30/15 ml

Broxidil (Ziska), Syrup, 15mg/5ml, Tk. 30/Tab.

Broxolin (Jayson), Syrup, 15mg/5ml, Tk.

40.00/100 ml

Broxolit (Pacific), Paed. drops, 6mg/ml, Tk.

14.29/15 ml; Syrup, 15mg/5ml, Tk. 30.08/100ml

Emulyt (Alco), Syrup, 15mg/5ml, Tk. 40/100 ml

Femex (Globe), Syrup, 15 mg / 5 ml, Tk.

40.00/100 ml

Hybrox (Kemiko), Syrup, 15 mg / 5 ml, Tk.

40.00/100 ml; Paed. drops, 6 mg/ml, Tk.

30.00/15 ml

Leucofil (Leon), Syrup, 15mg/5ml, Tk.

40.00/100 ml

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Lytex (*Ibn Sina*), SR Cap., 75 mg, Tk. 5.50/Cap. ; Syrup, 15mg/5ml, Tk. 40.00/100ml; Paed. drops, 6 mg/ml, Tk. 30.00/15ml;
M Boss (*Central*), Syrup, 15mg/5ml, Tk.40.00/100 ml
Maxof (*MST*), Syrup, 300 mg /100 ml, TK. 40/100 ml
Mbroxol (*Benham*), Syrup , 15 mg/5 ml, Tk.40.00/100 ml
Mucobrox (*Somatec*), Syrup, 15mg/5ml, Tk.40.00/100 ml; Paed. drops, 6 mg/ ml, Tk. 30.00/15ml
Mucosol (*Beximco*), Syrup, 15mg/5ml, Tk.40.00/100 ml; Paed. drops, 6 mg/ ml, Tk. 30.00/15ml
Mucovan (*Ad-din*), Syrup, 15mg/5ml, Tk. 30.00/100 ml
Myrox (*ACI*), Syrup, 15mg/5ml, Tk.40.00/100 ml; Paed. drops, 6 mg/ ml, Tk. 30.00/15ml; SR Cap., 75mg, Tk. 5.02/Cap.
Neobrox (*Concord*), Syrup, 15mg/5ml, Tk. 40.00/100 ml
Nexol (*Aristo*), Syrup, 15mg/5ml, Tk.40.00/100 ml; Paed. drops, 6 mg/ ml, Tk. 30.00/15ml
Recof (*Renata*), Syrup, 15mg/5ml, Tk.40.00/100 ml; Paed. drops, 6 mg/ ml, Tk. 30.00/15ml
Resol (*Sharif*), Syrup, 15mg/5ml, Tk. 40.00/100 ml
Safoxol (*Beacon*), Cap., 75 mg, Tk.5.00/Cap.
Winkof (*Chemist*), Syrup 100ml, 100ml, Tk. 40.00/100 ml
X-Cold (*Acme*), Syrup, 15mg/5ml, Tk.40.00/100 ml; Paed. drops, 6 mg/ ml, Tk. 30.00/15ml
Xerokof (*Pharmasia*), Syrup, 15mg/5ml, Tk. 40.00/100 ml

BROMHEXINE HYDROCHLORIDE

Indications: respiratory disorder associated with productive cough and dry eye syndromes (locally used).

Side-effects: headache, dizziness, skin rash, gastro-intestinal discomfort

Dose: bromhexine (as hydrochloride) ADULT 8-16 mg tds, CHILD more than 3 years 8mg three times daily, 1-3 years 4mg three times daily

Proprietary Preparations

A-Cold (*Acme*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml
Brolyt (*Alco*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml; Tab. , 4 mg, Tk. 0.70/Tab.; 8 mg, Tk. 1.00/Tab.
Bromotex (*Ibn Sina*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml

Bromoxol (*Healthcare*), Syrup, 4 mg/5 ml, Tk. 45.00/100 ml
Bronchodex (*Organic*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml
Brostin (*Rephco*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml; Tab. , 8 mg, Tk. 2.00/Tab.
Broxine (*General*), Syrup, 4 mg/5 ml, Tk. 30.11/100 ml
Clod-B (*Medimet*), Tab., 4 mg, Tk.0.70/Tab.
Coflyt (*Asiatic*), Syrup, 4 mg/5 ml, Tk. 30.00/100 ml
Expecto (*Aristo*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml
Mucodil (*Nipro JMI*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml
Mucola (*Amico*), Syrup, 4 mg/5 ml, Tk. 25.00/100 ml
Mucolyt (*Incepta*), Syrup, 80 mg/100 ml, Tk. 40.00/100ml; Tab. , 8 mg, Tk. 2.00/Tab.
Muconil (*Ziska*), Syrup, 4 mg/5 ml, Tk. 30.00/100ml
Mucospel (*Square*), Tab. , 8 mg, Tk. 2.01/Tab.; Syrup, 4 mg/5 ml , Tk. 28.00/100 ml; Tk. 40.00/100ml
Mucut (*Biopharma*), Syrup, 4 mg/5 ml , 100 ML, Tk. 40.00/100ml
Munil (*Opsonin*), Syrup, 4 mg/5 ml , Tk. 30.08/100 ml
Mytil (*Albion*), Syrup, 80 mg/100 ml, Tk. 30.00/100ml
Spulyt (*Beximco*), Syrup, 4 mg/5 ml, Tk. 40.00/100ml
X-pectoran (*Rangs*), Syrup, 4 mg/5 ml, Tk. 40.00/100 ml; Tab., 8 mg, Tk. 2.00/Tab.

DEXTROMETHORPHAN ^[CD]

Indication: unproductive cough

Cautions: asthma, hepatic and renal impairments; history of drug abuse; see *notes above*

Interactions: see *Appendix-2*

Side-effects: nausea, dizziness, respiratory depression in sensitive patients or if given large doses

Dose: ADULTS 10-15 ml (dextromethorphan as hydrobromide) 3 times daily

Proprietary Preparations

Brofex (*Square*), Syrup,, 10 mg/5 ml, Tk. 40.00/100 ml
Coldflu (*Amico*), Syrup,, 10 mg/5 ml, Tk. 23.00/100 ml
D-Cough (*Opsonin*), Syrup, 10 mg/5 ml, Tk. 26.32/100 ml
Dextromethorphan (*Beximco*), Syrup, 10 mg/5 ml, Tk. 35.00/100 ml
Dextromethorphan (*Albion*), Syrup,, 10 mg/5 ml, Tk. 18.75/100 ml

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Tomephen, (*Incepta*), Syrup, 10 mg/5 ml, Tk. 40.00/100 ml

PSEUDOEPHEDRINE HYDROCHLORIDE

Indications: nasal and sinus congestion

Cautions; Side-effects: occasional insomnia; see also under *Ephedrine Hydrochloride*

Interactions: other sympathomimetics, MAOIs

Dose: ADULT and CHILD above 12 years 60 mg (as tablet) 3–4 times daily; CHILD (as elixir 30mg/5ml) 2-5 years 15 mg, 6-12 years 30 mg

Proprietary Preparations

Pseudoephedrine (*Albion*), Tab. 60 mg, Tk. 2.00/Tab.

Sudorin (*Incepta*), Tab. 60 mg, Tk. 2.00/Tab.

4.7.2. COUGH EXPECTORANT AND DEMULCENT COUGH PREPARATIONS

PSEUDOEPHEDRINE Plus GUAIPHENESIN Plus TRIPROLIDINE

Indications: cough expectorant and decongestant

Dose: (combined cough expectorant as syrup, each 5 ml contains pseudoephedrine 30 mg + Guaiphenesin 100 mg + Triprolidine 1.25 mg), ADULT 2-3 teaspoonfuls 3-4 times daily; CHILD below 12 years not recommended

Proprietary Preparations

Abex (*Ibn Sina*), Syrup, Tk. 50.00/100 ml

Aquaphen (*Incepta*), Syrup, Tk. 42.00/100 ml

Brunex (*Rephco*), Syrup, Tk. 35.00/100 ml

Codyl (*Medimet*), Syrup, 2 mg+0.6 mg+.02 mg/5 ml, Tk.50.00/100 ml

Cofdil (*Central*), Syrup, Tk. 50.00/100 ml

Cofnil (*General*), Syrup, Tk. 50.00/100 ml

Cofrid (*Acme*), Syrup, Tk. 55.00/100 ml

Cofson (*Hudson*), Syrup, 2 mg+0.6 mg+.02 mg/5 ml, Tk.50.00/100 ml

Cophilex (*Opsonin*), Syrup, Tk. 41.35/100 ml

Expoten (*Eskayef*), Syrup, Tk. 55.00/100 ml

Extil (*Albion*), Syrup, Tk. 30.00/100 ml

Koftex (*Amico*), Syrup, Tk. 50.00/100 ml

Lurex (*Kemiko*), Syrup, Tk. 55.00/100 ml

Phendyl (*Sharif*), Syrup, Tk. 55.00/100 ml

Tricof (*Alco*), Syrup, Tk. 40.00/100 ml

Tridex (*Navana*), Syrup, Tk. 50.00/100 ml

Tripec (*Beximco*), Syrup, Tk. 55.00/100 ml

Tusca (*Square*), Syrup, Tk. 65.00/100 ml

Tussin (*Orion*), Syrup, Tk. 55.00/100 ml

Tyrex (*ACI*), Syrup, Tk. 55.00/100 ml

Combined cough expectorant as syrup, each 5 ml contains pseudoephedrine 30 mg + Guaiphenesin 100mg + dextromethorphan 10mg

Proprietary Preparations

A-Cof (*Acme*), Syrup, Tk. 70.00/100 ml

Alpoten (*Albion*), Syrup, Tk. 55.00/100 ml

Ankof (*General*), Syrup, Tk. 60.00/100 ml

Cofno (*Alco*), Syrup, Tk. 70.00/100 ml

Decoff (*Hudson*), Syrup, 10 mg + 30 mg + 1.25 mg/5 ml, Tk.55.00/100ml; Tk. 27.00/50ml

Dexdin (*Somatec*), Syrup, Tk. 60.00/100 ml

Dexpoten (*Eskayef*), Syrup, Tk. 70.00/100 ml

Dixxar (*ACI*), Syrup, Tk. 70.00/100 ml

Freecof (*Aristo*), Tk. 70.00/100 ml

Nilkof (*Ambee*), Syrup, 10 mg + 30 mg + 1.25 mg/5 ml, Tk. 50.19/ 100 ml

Ofkof (*Square*), Syrup Tk.70.00/100 ml

Prudex (*Beximco*), Syrup, Tk. 70.00/100 ml

Sudocof (*Incepta*), Syrup, Tk. 60.00/100 ml

Texco (*Globe*), Syrup, 10 mg + 30 mg + 1.25 mg/5 ml, 50.00/100 ml

Tusiva (*Opsonin*), Syrup, Tk. 52.63/100 ml

Tripolidine 2.5 mg+Pseudoephedrine 60 mg

Duo-5 (*Incepta*), Tab. Tk. 40.00/Tab.

Frenos (*Opsonin*), Tab. Tk. 2.64/Tab.

4.8 ANTIHISTAMINES, HYPOSENSITISATION, AND ALLERGIC EMERGENCIES

4.8.1 Antihistamines

4.8.2 Hyposensitivity reactions

4.8.3 Allergic emergencies

4.8.1 ANTIHISTAMINES

The term antihistamine is usually reserved for histamine H₁ receptor antagonists. They diminish or abolish H₁ mediated actions of histamine (vasodilatation, increased capillary permeability, flare and itching reactions in skin; bronchial and gut smooth muscle contraction). They can improve or relieve symptoms of allergic rhinitis (hay-fever), alleviate rhinorrhea and sneezing but are usually less effective for nasal congestion. Antihistamines are of value in preventing and treating urticaria, urticarial rashes, mild angioedema and

4. RESPIRATORY SYSTEM

pruritus, insect bites, stings and drug allergies. Because of their associated pharmacological actions, they are also used to control symptoms of motion sickness; vertigo and nausea associated with Meniere's disease, nausea and vomiting associated with migraine, pregnancy and surgery. Antihistamines are used topically in the eye (see sec. 10.3), nose (see sec. 11.2.1) and insect bites. Antihistamines differ in their duration of action and incidence of sedation and anti-muscarinic effects.

The older antihistamines such as **diphenhydramine**, **pheniramine** and **promethazine** are short-acting and have unwanted sedative action; comparatively, **chlorpheniramine** is less sedative.

Newer antihistamines such as **acrivastine**, **cetirizine**, **levocetirizine** (an iso-mer of cetirizine), **loratadine** and **desloratadine** are longer acting (once-daily dose); they cause less sedation and psychomotor impairment than older antihistamines because they penetrate poorly into the brain. **Fexofenadine**, an active metabolite of terfenadine, has been introduced recently. **Mebhydrolin** is not a long-acting antihistamine but is less sedative than older antihistamines.

NON-SEDATIVE ANTIHISTAMINES

ACRIVASTINE

(see also section 11.2.1)

Indications: symptomatic relief of allergy such as hay fever, urticaria

Side-effects: incidence of sedation and antimuscurinic effects low

Interactions: see Appendix-2.

Dose: 8 mg three times daily

Proprietary Preparation

Semprex⁽¹⁾ (GSK), Cap. 8 mg, Tk.7.65/Cap

CETIRIZINE HYDROCHLORIDE

(see also section 11.2.1)

Indications: symptomatic relief of allergy such as hay fever, urticaria

Cautions: renal impairment

Interactions: see Appendix-2

Side-effects: incidence of sedation and antimuscurinic effects low

Dose : ADULT and CHILD over 6 years, 10 mg daily or 5 mg twice daily. CHILD 2-6 years 5 mg daily or 2.5 mg twice daily

Proprietary Preparations

see section 12.5

DES Loratadine

Indications: symptomatic relief of allergic rhinitis (seasonal and perineal), chronic idiopathic urticaria

Cautions: pregnancy, lactation, elderly, renal or hepatic impairment

Contraindications: hypersensitivity to loratadine, pregnancy, breast-feeding, elderly

Side-effects: fatigue, dry mouth, headache;

Proprietary Preparations

see section 12.5

FEXOFENADINE HYDROCHLORIDE

Indications: relief of symptoms associated with seasonal allergic rhinitis, uncomplicated skin manifestations of chronic idiopathic urticaria in ADULT and CHILD above 12 years

Cautions: elderly, liver disease, renal impaired patients, pregnancy and lactation.

Side-effects: headache, dyspepsia, drowsiness, dizziness, nausea, chest tightness and dyspnoea

Interactions: see Appendix-2

Proprietary Preparations

see section 12.5

LEVOCETIRIZINE DIHYDROCHLORIDE

Indications: symptomatic relief of allergy such as hay fever, urticaria

4. RESPIRATORY SYSTEM

Cautions; Interaction & Side-effects:

see under *Cetirizine Hydrochloride*

Dose: ADULT and CHILD over 6 years, 5 mg daily

Proprietary Preparations

see section 12.5

LORATADINE

Indications: symptomatic relief of allergy like hay fever and urticaria

Side-effects: sedation and antimuscarinic effects low

Interactions: see *Appendix-2*

Dose: ADULT and CHILD over 12 years, 10 mg daily; CHILD 2-12 years 5mg daily

Proprietary Preparations

see also section 12.5

Pseudoephedrine Hcl+Loratadine

Coderin (ACI), Tab., 5 mg + 120 mg,

Tk.4.02/Tab.;10 mg + 240 mg, Tk. 6.02/Tab.

Kevil Plus (Kemiko), Tab., 10 mg + 240 mg, Tk.6.00/Tab.

Lodin Plus (Amico), Tab., 10 mg + 240 mg, Tk.6.00/Tab.

Lora Plus (Opsonin), Tab., 10 mg + 240 mg,

Tk.4.53/Tab.;5 mg + 120 mg, Tk.3.20/Tab.

Lorafast Plus (Albion), Tab., 10 mg + 240 mg, Tk.8.00/Tab.

Loratin Plus (Square), Tab., 10 mg + 240 mg, Tk.8.00/Tab.

L-Plus (Popular) Tab., 10 mg + 240 mg, Tk.7.00/Tab.

Oradin Plus (Eskayef), Tab, 10 mg + 240 mg, Tk. 7.00.00/Tab.

Pretin D (Beximco), Tab., 10 mg + 240 mg, Tk.6.00/Tab.

Sudamin (Ibn Sina), Tab., 10 mg + 240 mg, Tk.6.00/Tab.

MEBHYDROLIN NAPADYSYLATE

Indications: allergic disease or symptoms, such as urticaria pruritus of different origins, eczema, drug rash, allergic conjunctivitis, dermatitis of nutritional origin, hay fever, vasomotor rhinitis, allergic asthma

Cautions: caution is required while driving or operating machinery

Side-effects: sleepiness, drowsiness, mild gastro-intestinal disturbances

Contra-indications: patient to whom Mebhydrolin has previously been proved to cause agranulocytosis and neutropenia; 1st trimester of pregnancy

Dose: ADULT and CHILD above 12 years 50-100 mg 2-3 times daily; CHILD below 12 years 50-100 mg daily in divided doses

Proprietary Preparations

Aexidal (Albion), Tab., 50 mg, Tk. 1.50/Tab.

Bexidal (Beximco), Tab., 50 mg, Tk. 3/Tab.

Dayhista (Medimet), Tab. 50 mg, Tk. 2.50/Tab.

Mebastin (Incepta), Tab., 50 mg, Tk. 2/Tab.

Mebidal (Eskayef), Tab, 50 mg, Tk. 2/Tab.

Mebolin (Acme), Tab., 50 mg, Tk. 2.01/Tab.

Medrolin (Opsonin), Tab.,50 mg, Tk. 1.14/Tab.

SEDATIVE ANTIHISTAMINES

CHLORPHENAMINE MALEATE

Indications: symptomatic relief of allergy such as hay fever, urticaria; emergency treatment of anaphylactic reactions

Cautions: injection may be irritant; drowsiness may affect skilled tasks such as driving

Interactions: see *Appendix-2*

Side-effects: exfoliative dermatitis, tinnitus reported and injection may cause transient hypotension or CNS stimulation

Dose: *by mouth*, 4 mg every 4-6 hours, max. 24mg daily. CHILD 1-2 years, 1 mg twice daily; 2-5 years 1 mg every 4-6 hourly, max. 6 mg daily; 6-12 years 2 mg every 4-6 hours, max. 12 mg daily

By intramuscular injection, 10-20 mg, repeated if necessary up to 40 mg daily. *By intravenous injection*, 10-20 mg over 1 minute.

Proprietary Preparations

Alerjess (Ad-din), Tab., 4mg, Tk. 0.20/Tab.; Syrup, 2mg/5ml, Tk. 20.00/100ml

Antista (Square), Syrup, 2 mg/5 ml, Tk. 21.78/100 ml

Biocin (Biopharma), Syrup, 2 mg/5 ml, Tk. 21.78/100 ml ;Tab. .4 mg, Tk. 0.20/Tab.

Centagan (Central), Syrup, 2 mg/5 ml, Tk. 9.50/60 ml ;Tk. 12.00/100 ml

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Chlorpheniramine (*Popular*), Tab., 4 mg, Tk. 0.20/Tab.

Chlorpheniramine maleate (*Medimet*), Tab., 4mg, Tk.0.18/Tab.

Clomin(*Alco*), Syrup, 2 mg/5 ml, Tk. 13.00/100 ml

Cloramin (*Orion*), Syrup, 2 mg/5 ml, Tk. 21.78/100 ml

Cytacin (*Albion*), Tab., 4 mg, Tk. 0.20/Tab.

G-Antihistamine (*Gonoshasthaya*), Tab., 4 mg, Tk. 0.20 /Tab ;Syrup, 2 mg/5 ml, Tk. 17.00/100 ml; Tk. 11.70/60 ml

Hisnul (*Somatec*), Syrup, 2 mg/5 ml, Tk. 21.78/100 ml

Histacin (*Jayson*), Inj. 10 mg/ml, Tk. 3.34/Amp.;Syrup, 2 mg/5 ml, Tk. 14.90/60 ml; Tk. 21.78/100 ml; Tab., 4 mg,Tk. 0.29/Tab.

Histaco(*Supreme*), Syrup, 2 mg/5 ml, Tk. 11.70/60 ml; Tab., 4 mg, Tk. 0.20/Tab.;Tab., 4 mg,Tk. 0.20/Tab.

Histal (*Opsonin*), Syrup, 2 mg/5 ml, Tk. 10.34/60 ml

Histalex (*Acme*), Syrup, 2 mg/5 ml, Tk. 21.78/100 ml;Tab., 4 mg, Tk. 0.3/Tab.

Histam (*Maks*), Syrup, 2 mg/5 ml, Tk. 11.70/60 ml ;Tk. 21.75/100 ml

Histanol (*Chemist*), Syrup, 100 ml, Tk. 13.30/100 ml; Tab., 4 mg, Tk. 0.21/Tab.

Histason (*Hudson*), Syrup, 2mg/5ml, Tk.18.00/100 ml; Tab., 4mg, Tk.0.22/Tab.

Hitagen (*General*), Syrup, 2 mg/5 ml, Tk. 14.03/100 ml;Tk. 8.03/60 ml;Tab., 4 mg, Tk. 0.20/Tab.

Penamin (*APC*), Tab., 4 mg, Tk. 0.20/Tab. ; Syrup, 2 mg/5 ml, Tk. 11.70/60 ml

Pheramin (*Amico*), Tab., 4 mg, Tk. 0.20/Tab.

Piriton (*GSK*), Syrup, 2 mg/5 ml, Tk. 19.13/100 ml ;Tab., 4 mg,Tk.0.18/Tab.

Safamin (*Benham*), Syrup, 2 mg/5 ml, Tk. 21.00/100 ml

Sinamin (*Ibn Sina*), Syrup, 2 mg/5 ml, Tk. 21.78/100 ml; Tab., 4 mg, Tk. 0.20/Tab.

Winkol (*Globe*), Syrup, 2 mg /5 ml , Tk. 8.00/60 ml; Tk. 21.78/100 ml

DIPHENHYDRAMINE HYDROCHLORIDE

Indications: see under *Chlorphenamine maleate*; also to aid relief of temporary sleep disturbance in adults

Cautions & Side-effects: see under *Chlorphenamine maleate*

Dose: ADULT 25 mg 3 times daily, 50 mg at bedtime for temporary relief of sleep disturbance; CHILD 6-12 years, 10-20 mg 2-3 times daily

Proprietary Preparations

see section 12.5

HYDROXYZINE HYDROCHLORIDE

Indications: pruritus and other allergic conditions (chronic urticaria), atopic and contact dermatitis, anxiety (short-term)

Cautions: pregnancy, lactation, glaucoma, difficulty in urination; caution required while driving or operating machinery

Side-effects: constipation, dry mouth drowsiness, visual disturbances, mental confusion in elderly patients

Proprietary Preparations

see section 12.5

PHENIRAMINE HYDROGEN MALEATE

Indications: hay fever, sneezing attack, itching, running nose, conjunctivitis urticaria with pruritus, reddening and swelling of skin, eczema

Cautions: pregnancy and lactation; drowsiness may affect skilled tasks such as driving; sedating effects enhanced by alcohol

Side-effects: occasionally drowsiness, Gastro-intestinal complaints, dry mouth, palpitations urinary retention, restlessness, confusion in high dose, agitation in small children, rise in intraocular pressure.

Interactions : see *Appendix-2*

Proprietary Preparations

Aerovil (*Beximco*), Syrup, 15 mg/5 ml, Tk. 20.07/100 ml

Alervil (*Incepta*), Syrup, 15 mg/5 ml, Tk. 25.00/75 ml

Amarin (*Opsonin*), Syrup, 15 mg/5 ml , Tk. 15.09/100 ml;Tab., 22.7 mg, Tk. 0.35/Tab.Inj., 45.5 mg/2 ml, Tk. 5.65/Amp.

Avil (*Sanofi*), Tab., 22.7 mg, Tk. 1.51/Tab; Tab., 22.7 mg, Tk. 1.51/Tab.; Syrup, 15 mg/5ml, Tk. 20.08/100 ml ; Tk. 25.00/75 ml; Inj., 45.5 mg/2 ml, Tk. 7.53/amp.; Retard Tab., 75 mg, Tk. 2.01/Tab.

4. RESPIRATORY SYSTEM

PROMETHAZINE HCL^[ED]

Indications: symptomatic relief of allergy such as hay fever, urticaria; emergency treatment of anaphylactic reactions

Cautions: intramuscular injection may be painful; drowsiness may affect skilled tasks such as driving; sedating effects enhanced by alcohol

Dose: *by mouth*, 25 mg at night increased to 25 mg twice daily if necessary or 10-20 mg 2-3 times daily. CHILD, 2-5 years 5-15 mg daily in divided doses, 5-10 years 10-25 mg daily in 2 divided doses

By deep intramuscular injection, 25-50 mg, max. 100 mg; CHILD 5-10 years 6.25-12.5 mg.

By slow intravenous injection, 25-50 mg as a solution containing 2.5mg/ml in water for injection; max. 100 mg.

Proprietary Preparations

see section 12.5

4.8.2 HYPOSENSITISATION

Except for wasp and bee sting allergy, specific hypersensitivity reactions with allergen extract vaccines have usually shown little benefit to asthma. The benefit of hyposensitisation, if any, needs to be balanced against the significant risk of anaphylaxis, particularly in patients with asthma.

4.8.3 ALLERGIC EMERGENCIES

An anaphylactic shock is a sudden catastrophic allergic reaction that involves the whole body. Urticaria is an allergic skin rash sometimes called 'nettle rash'. Acute urticaria is often caused by an allergy and can last between several hours and six weeks.

Anaphylactic shock and conditions such as angioedema are medical emergencies that can result in cardiovascular collapse, and even death. Such conditions need immediate treatment of laryngeal oedema, bronchospasm and hypotension. Atopic

individuals are susceptible. Insect bites and certain foods such as eggs, fish and some vegetables are also a risk for sensitized persons. Some therapeutic substances may cause anaphylaxis such as blood products, vaccines, hyposensitizing preparations like allergen, some antibiotic especially penicillins, iron injections, heparin, and neuromuscular blocking drugs. Anaphylaxis is more likely to occur after parenteral administration. Resuscitation facilities should always be available when injecting a drug associated with the risk of anaphylactic reactions.

First line treatment includes **adrenaline** injection for keeping airway open and restoring blood pressure. Adrenaline should immediately be given by intramuscular injection and should be repeated every 10 minutes until blood pressure and pulse have stabilized. An antihistamine such as **chlorpheniramine** is a useful adjunctive treatment given after adrenaline injection and continued for 24-48 hrs to reduce the severity and duration of symptoms and to prevent relapse. Intravenous corticosteroid such as **dexamethasone** should be given to help to prevent later deterioration in severely affected patients. Administration of **oxygen** is of primary importance. Further treatment of anaphylaxis may include **intravenous fluids**, intravenous vasopressor such as **dopamine**, intravenous **aminophylline** or a nebulized bronchodilator such as **Salbutamol**. If there is reversible airways obstruction, it may be necessary to give **ephedrine**.

Adrenaline 1 in 1000 solution (1mg/ml) may be given by intramuscular or subcutaneous injection. The dose for an adult is 500 micrograms to 1 mg (0.5-1 ml); for children 6-12 years 500 micrograms (0.5ml); children 5 years 400 micrograms (0.4ml); infant 2 years 200 micrograms (0.2ml); 1 year 100 micrograms (0.1ml); and those under 1 year 50 micrograms (0.05ml). The above doses may be repeated several times if necessary at 10 minutes intervals, according to blood pressure, pulse, and

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respiratory function until improvement occurs (may be repeated several times).

Chlorpheniramine maleate given by slow intravenous injection (over 1 minute) in a dose of 10-20 mg is a useful adjunctive treatment after the adrenaline. It may be continued for 24 to 48 hours to prevent relapse (max. 40mg in 24 hours). It may also be given by slow subcutaneous or intramuscular injection over 1 minute

Dexamethasone Phosphate (sodium salt) 4 mg/ml may be given by slow intravenous injection or by infusion; the dose for ADULT is 0.5-20mg; CHILD 200-500 micrograms/kg. Alternately, hydro-cortisone (as sodium succinate)

may be given by slow intravenous injection.

ADRENALINE ^[ED]

Indications: emergency treatment or acute anaphylaxis, angoedema, cardiopulmonary resuscitation

Cautions: hyperthyroidism, diabetes mellitus, ischaemic heart disease, hypertension, elderly patients

Dose: acute anaphylaxis, by *intramuscular or subcutaneous injection* of 1 in 1000 solution; see notes above and also section 3.7.3

Proprietary Preparations
see section 3.7.3