Administration in children.
Licensed indications and doses of levetiracetam in children vary from country to country, see Uses and Administration, above, and Administration in Renal Impairment, below.
Leviracetam is mainly used for partial and myoclonic seizures, and in idiopathic generalised epilepsy, often as an adjunct. It has also been tried in children with status epilepticus. A retrospective review' of 122 children aged from 1 month to 2 years given levetiracetam either as monotherapy (48 patients) or adjunctive therapy (74 patients) found that 70 achieved seizure remission. Of these, a longer duration of remission was seen in those receiving less than 30 mg/kg daily of levetiracetam. A case series 2 of 3 infants aged from 2 days to 3 months reported that levetiracetam 30 mg/kg daily was effective in the treatment of refractory neonatal seizures. A randomised multicentre study' of 1 1 6 children aged from 1 month to under 4 years with refractory partial seizures found that adjunctive levetiracetam significantly reduced the frequency of seizures and was generally well tolerated.

Administration in renal impairment.
Reduced doses of levetiracetam are recommended for patients with renal impairment. Suitable daily doses for adults and adolescents weighing more than 50 kg according to UK and US licensed product information and based on creatinine clearance (CC) per 1 .73 m2, are:
CC 50 to 79 mL/minute: 1 to 2 g
CC 30 to 49 mL/minute: 0.5 to 1.5 g
CC less than 30 mL/minute: 0.5 to 1 g
Patients receiving dialysis may be given a loading dose of 750 mg when starting levetiracetam followed by doses of 0.5 to 1 g once daily; a supplemental dose of 250 to 500 mg is recommended after dialysis
UK licensed product information also gives suitable daily doses for children weighing less than 50 kg with renal impairment:
In children aged from 6 months:
CC 50 to 79 mL/minute: 20 to 40 mg/kg
CC 30 to 49 mL/minute: 10 to 30 mg/kg
CC less than 30 mL/minute: 1 0 to 20 mg/kg
Those receiving dialysis may be given a loading dose of 15 mg/kg when starting levetiracetam followed by doses of 10 to 20 mg/kg once daily; a supplemental dose of 5 to 10 mg/kg is recommended after dialysis In children aged 1 month to less than 6 months:
CC 50 to 79 mL/minute: 14 to 28 mg/kg
CC 30 to 49 mL/minute: 7 to 2 1 mg/kg
CC less than 30 mL/minute: 7 to 1 4 mg/kg
Those receiving dialysis may be given a loading dose of 10.5 mg/kg when starting levetiracetam followed by doses of 7 to 14 mg/kg once daily; a supplemental dose of 3.5 to 7 mg/kg is recommended after dialysis
Doses may be given orally or intravenously, as necessary, in 2 divided doses.
See also above for dosage recommendations in those patients with severe hepatic impairment and concomitant renal impairment.

Interactions
Evidence of significant interactions between levetiracetam and other antiepileptics is mostly lacking. However, for the effects of levetiracetam on carbamazepine,

Adverse effects:-
The most commonly reported adverse effects associated with levetiracetam are somnolence, weakness, and dizziness. Anorexia, diarrhoea, dyspepsia, nausea, weight gain or loss, myalgia, ataxia, headache, amnesia, depression, emotional lability, insomnia, nervousness, tremor, vertigo, diplopia, and rash (see below) may occur less frequently.
Other adverse effects include paraesthesia, pancreatitis, hepatic failure, and hepatitis. A raised incidence of mild infections, such as the common cold and upper respiratorytractinfections has been reported. Alopecia may also develop; in some cases, stopping levetiracetam has resulted in regrowth of hair.
Other adverse effects reported include abnormal behaviour, aggression, anger, anxiety, confusion, hallucinations, irritability, and psychotic disorders; these adverse effects may be more common in children than in adults.
Blood dyscrasias such as neutropenia, pancytopenia, and thrombocytopenia may develop. Severe skin reactions including erythema multiforme, Stevens-Johnson syndrome, and toxic epidermal necrolysis have occurred rarely.
Levetiracetam should be used with caution in patients with renal impairment, and/or severe hepatic impairment.
Care is required when withdrawing levetiracetam therapy-see also Uses and Administration.

Overdose
There is no specific antidote for overdose with levetiracetam. If indicated, elimination of unabsorbed drug should be attempted by emesis or gastric lavage; usual precautions should be observed to maintain airway. General supportive care of the patient is indicated including monitoring of vital signs and observation of the patient's clinical status. A Certified Poison Control Center should be contacted for up to date information on the management of overdose with levetiracetam.
Standard hemodialysis procedures result in significant clearance of levetiracetam (approximately 50% in 4 hours) and should be considered in cases of overdose. Although hemodialysis has not been performed in the few known cases of overdose, it may be indicated by the patient's clinical state or in patients with significant renal impairment.

Lactation
Levetiracetam is excreted in human milk. There are no data on the effects of levetiracetam on the breastfed infant, or the effects on milk production.
The developmental and health benefits of breastfeeding should be considered along with the mother's clinical need for Levetiracetam and any potential adverse effects on the breastfed infant from levetiracteam or from the underlying maternal condition.

Storage: - Store at 20° to 25° C.(68° to 77° F) (See U.S.P. controlled room temperature)
Improper Storage may deteriorate the product
Keep the medicine out of reach of children.

Presentation: -Each pack contain
Each vial contains 5 ml glass vial of Levetiracetam Injection USP (500 mg/ 5 ml)

Manufactured by:
AMERICAN REMEDIES©
Care & Cure with Research
American Remedies Healthcare Pvt. Ltd.
(An ISO 9001-2015 Certified Company)
ICO: American Remedies LLC, DE, USA
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For the use only of a Registered Medical Practitioner of a Hospital or a Laboratory

℞ Levetiracetam Injection U.S.P

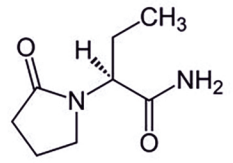
AMERICAN
Levecan
Injection

To be diluted Prior to Intravenous Infusion

Composition:-
Each ml Contains:-

Levetiracetam	IP	100 mg
Water for Injection	IP	q.s

Description:-
Levetiracetam injection, USP is an antiepileptic drug available as a clear, colorless, sterile solution (100 mg/mL) for intravenous administration.
The chemical name of levetiracetam, a single enantiomer, is (-)-(S)-α-ethyl-2-oxo-1-pyrrolidine acetamide, its molecular formula is $C_8H_{14}N_2O_2$ and its molecular weight is 170.21. Levetiracetam is chemically unrelated to existing antiepileptic drugs (AEDs). It has the following structural formula:



Levetiracetam

Levetiracetam is very soluble in water (104.0 g/100 mL). It is freely soluble in chloroform (65.3 g/100 mL) and in methanol (53.6 g/100 mL), soluble in ethanol (16.5 g/100 mL), sparingly soluble in acetonitrile (5.7 g/100 mL) and practically insoluble in n-hexane. (Solubility limits are expressed as g/100 mL solvent.)

Levetiracetam injection contains 100 mg of levetiracetam per mL. It is supplied in single-dose 5 mL vials containing 500 mg levetiracetam, in water for injection. Levetiracetam injection must be diluted prior to intravenous infusion

PHARMACOLOGY
Pharmacokinetics
Levetiracetam is readily absorbed from the gastrointestinal tract with a bioavailability of almost 100%; peak plasma concentrations usually occur within 1.3 hours of oral doses and steady state after 2 days. Plasma protein binding is minimal at less than 10 %. Levetiracetam is not extensively metabolised; about 25 % of a dose is metabolised by hydroxylation to inactive metabolites. Around 95 % of a dose is excreted as unchanged drug and metabolites in the urine. The plasma elimination half-life has been reported to be about 7 hours in adults and children aged 12 years and over; the half-life may be shorter in younger children. Levetiracetam is distributed into breast milk.

Dosage and Administration
Levetiracetam is an analogue of piracetam used in the treatment of epilepsy (below). Details of licensed indications, ages at which levetiracetam may be used, and the route employed, vary from country to country. The following indications and age limits apply to oral use. It is used as an adjunct in the treatment of partial seizures with or without secondary generalisations in adults and children from 1 month of age. Adults and adolescents aged 16 years and over may also be given levetiracetam as monotherapy in the treatment of partial seizures with or without secondary generalisation. In addition, levetiracetam is licensed in both the UK and the USA for adjunctive use in the treatment of myoclonic seizures in adults and children aged 12 years and over with juvenile myoclonic epilepsy. It is also licensed for use as an. adjunct in the treatment of primary generalised tonic-clonic seizures in adults and children with idiopathic generalised epilepsy; for this indication, in the UK, licensed use is restricted to children aged 12 years and over, whereas in the USA, it is licensed from 6 years of age.
The daily oral dose of levetiracetam is given in two divided doses.
The initial adult dose when used as an adjunct is 1 g on the first day of treatment; thereafter, the daily dose may be increased in steps of 1 g every 2 to 4 weeks until effective antiepileptic control is achieved, up to a maximum dose of 3 g daily.
The initial dose in children aged from 1 month to less than 6 months is 14 mg/kg daily which may be increased in steps of 14 mg/kg every 2 weeks to a maximum of 42 mg/kg daily.
The initial dose in children aged from 6 months and weighing less than 50 kg is 20 mg/kg daily which may be increased in steps of 20 mg/kg every 2 weeks to a maximum of 60 mg/kg daily.
Children and adolescents weighing 50 kg or more should be given the usual adult dose (see above).
When used as monotherapy, t h e initial dose of levetiracetam is 500 mg daily, increased after 2 weeks to l g daily. Further increases may be made in steps of 500 mg every 2 weeks up to a maximum of 3 g daily.
A modified-release preparation is available for once-daily dosing as an adjunct in the treatment of partial seizures in patients aged 16 years and over.
When oral use is not feasible, levetiracetam may be given by intravenous infusion over 15 minutes in doses similar to those used orally. As with the oral formulation, details of licensed uses and ages may vary from country to country; in the UK, it is licensed in adults and children from 4 years of age, whereas in the USA, use is restricted to those aged 1 6 years and over. UK licensed product information states that there has been no experience with the use of intravenous levetiracetam for more than 4 days. Reduced doses are recommended in renal and severe hepatic impairment (see below).
As with other antiepileptics, withdrawal of levetiracetam therapy or transition to or from another type of antiepileptic therapy should be made gradually to avoid precipitating an increase in the frequency of seizures.
UK licensed product information recommends reducing the daily dose in patients weighing more than 50 kg by 1 g every 2 to 4 weeks, and in those weighing less than 50 kg, the dose reduction should not exceed 20 mg/kg every 2 weeks. For a discussion on whether or not to withdraw antiepileptic therapy in seizure freepatients.

Preparation and administration
1. Withdraw the required dose and add to a suitable volume of compatible infusion fluid, e.g. a minimum of 100mL NaCl 0.9%).
2. The solution should be clear and colourless. Inspect visually for particulate matter or discoloration prior to administration and discard if present.
3. Give by IV infusion over 15 minutes.