

Foetal Neuro-Protection-Role of Magnesium Sulphate

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Pre maturity (delivery before 37 weeks of gestation) is one of the leading causes of perinatal death.^{1,2} An estimated 15 million babies are born pre mature every year in Pakistan.^{2,3} Pakistan is on 7th number, among the top ten countries with highest rate of pre mature births per 100 live births, i-e; 15.8%.³

Over the past few years there is increasing trend in pre term births, the possible reason for this includes rising number of sub fertility treatment leading to multiple gestations, increase in maternal age, increase obesity leading to medical disorders like, pregnancy induced hypertension (PIH), gestational diabetes Mellitus (GDM), and changes in the obstetrics practices such as more caesarean sections before term.^{2,4,5}

Prematurity leads to breast feeding problems, temperature regulation, neurological disabilities, respiratory distress and more chances of infection and metabolic disorders. Preventing death and complications from pre maturity starts with healthy pregnancy and antenatal care. In case of pre term labour, World Health Organization (WHO) has developed guidelines to take care, includes ante natal steroids, magnesium sulphate administration to prevent neurological impairment and shift to the hospital with all the facilities available to take care of such pre term babies, such as thermal care, feeding support, kangaroo mother care, safe oxygen care and other treatment to help the babies breath.^{5,6}

It was first time in 1980s when two studies published that preterm babies delivered to mothers with eclampsia had a lower risk of adverse neurological outcome then gestational age matched neonates born to mothers without preeclampsia.³ Several researches started to know the cause and then in 1995 the data derived from California cerebral palsy project demonstrated an association between antenatal magnesium sulphate administrations prior to preterm birth and reduce incidence of cerebral palsy among infants born <1500gms.⁷

From 2002 to 2008 5 randomised controlled trial studied magnesium sulphate for foetal neuro-protection and in 2009 a publication of three meta-analysis, all concluded that magnesium sulphate for neuro-protection decreases risk of childhood cerebral palsy.^{6,7}

Magnesium sulphate is an intra cellular cation essential for normal cellular function. It is an important cofactor for more than 300 enzymatic reactions.⁵ It is stored in bones, muscles and soft tissues. Its haemostasis is controlled by intestinal absorption, bone storage and renal excretion. Magnesium has an inhibitory effects on neuronal synopsis leading to its use is an anti convulsant particularly in eclamptic seizure.⁵ As an endogenous calcium antagonist, magnesium sulphate regularizes neuronal synopsis. It antagonizes calcium at pre-synoptic junction reducing acetyle choline surge and stimulation at neuro-muscular junction. It has voltage dependant block of N-methyle de-aspartate receptor.⁵ These receptors are abundant in preterm white matter so it may be the mechanism that magnesium sulphate reduces neurological impairment in pre mature babies, if administered ante-natally to the mother.

Magnesium sulphate is administered intravenously or intramuscularly as a loading dose followed by maintenance dose. Intravenous administration of loading dose is 4gm IV diluted stat, followed by 1gm IV per hour in infusion of 0.9% saline.⁸ Intramuscular regime includes 4gm diluted IV stat and 5gm in each buttock followed by 5gm in alternate buttocks every 4 hourly. Minor side effects include hot flushes, nausea, vomiting and light-headedness, when given in therapeutic dose. Serious side effects are loss of patellar reflexes, respiratory depression and cardiac arrest. So whenever magnesium sulphate is given, the patient is observed for patellar reflexes, respiratory rate, blood pressure monitoring and urine output.⁸ Monitoring of the magnesium sulphate levels in serum is not recommended but if urine output is less than 30ml/hour, loss of patellar reflexes and dropping of blood pressure more than 15mmhg from baselines then monitoring of serum magnesium levels are advised. In case of sign and symptoms of magnesium sulphate toxicity like; arrhythmias,

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hypotonia or oliguria one should call for medical help. The immediate management will be to give 8 to 12 litres of oxygen, calcium gluconate, do ECG to exclude heart block serum electrolytes and serum magnesium levels.⁸

Magnesium sulphate has promising results in prevention of cerebral palsy, and if one prevents a single case, can spare a lot of financial burden on family and government. Similarly it is a safe drug used for decades for the prevention and treatment of eclampsia. Now it is gaining popularity for prevention of cerebral palsy in pre term and premature babies, giving hopes to parents to have a normal healthy baby.

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