

## **Slide 1 :Importance Of Nutrition For Optimal Short And Long Term Outcome In Preterm Infants**

- **Slide 2: Introduction**

- 27 million babies are born in India each year of which 3.6 million (13% ) babies are born preterm. As many as 0.76 million babies die in the neonatal period. Prematurity is the major cause , accounting for 35% of neonatal deaths .
- More than 80% premature babies born in our country, are born between 32 - 37 weeks, also termed as moderate/late preterm. Many of these babies die needlessly for lack of simple, essential care such as warmth and feeding support.

- **Slide 3 Objectives Of This Webinar**

- In this webinar we shall learn about :
- Recommended Nutritional Goal For Preterm Babies
- What is extra uterine growth restriction and its long term adverse effects
- Issues In VLBW Feeding including choice of Milk, How early to start feeds  
How much to start with, how to scale up feeds for ELBW & sick babies , how to administer the feeds.  
How to maintain mother's milk output
- Nutritional concerns of VLBW babies and their management.

- **Slide 4 Recommended Nutritional Goal For Preterm Babies**

- Premature infants have greater nutritional needs to achieve optimal growth in the neonatal period than at any other time in life.
- **The AAP** recommends that extra uterine growth of a preterm baby should parallel the intrauterine growth trajectory of a fetus of comparable GA without stressing the developing metabolic or excretory system.

## **Slide 5 Inherent Limitations Of The Preterm Baby**

- However there are certain inherent limitations of the VLBW baby precluding optimal nutritional intake and optimal growth. These include:
- Limited nutrient stores ,
- High metabolic needs
- Catabolic effects of illness due to associated problems like RDS, sepsis apnea
- Immature metabolic pathways & osmolar limitations
- Immature GI tract,
- Incoordination of suck swallow breathe cycle.
- Requirement for increased nutrient intake for rapid growth

Hence the preterm baby is very likely to develop cumulative deficits in protein & energy resulting in slower growth. Large proportion of ELBW & VLBW babies develop Extra Uterine Growth Restriction EUGR defined as weight, < 10<sup>th</sup> centile at 36 weeks PMA or at discharge.

### **Slide 6 Problems Associated Extra Uterine Growth Restriction**

Extra Uterine Growth Restriction is associated with several problems including

- Long term adverse neuro-developmental sequelae
- Increased risk of ROP
- Poor bone health
- Lower final weight & height at 20 years of age.
- Increased Post Natal Growth: Adult metabolic syndrome.

Lets us understand the risks involved in a little more detail.:

### **Slide 7: Neuro-developmental Sequelae Associated With EUGR**

The preterm brain is very vulnerable to undernutrition which may permanently affect later cognitive attainment. A, a study by Ehrenkranz based on weight gain quartiles in 495 VLBW babies showed significantly higher, neuro developmental impairment, MDI, PDI scores less than 70 & cerebral palsy rates in VLBWs who had the lowest quartile of weight gain of 12gm / kg / day compared to babies with weight gain in the highest quartile of 21.2 gm / kg /day.

## **Slide 8 EUGR & ROP**

Coming to the association of EUGR & ROP: An Increased risk of type 1 ( Severe type) of ROP in extremely low gestational age newborns was observed when intake of total calories, lipids, and carbohydrates as well as the growth velocity in the first month were in the lowest quartile . Improving the early nutrition in ELGAN babies may help prevent development of sight-threatening ROP.

## **Slide 9 EUGR & Lower Final Weight & Height.**

EUGR & Lower Final Weight & Height. Prematurity & LBW also increase the risk of underweight, stunting and wasting . One study showed that at 6 months of age, 28% of the study cohort of VLBW babies showed underweight and stunting and 22% had wasting.

In a study by Hack, VLBW infants were twice as likely to have final height less than the third percentile at 20 years of age, than normal birth weight controls (10 versus 5 %)

## **Slide 10 Long Term Adverse Effects of Rapid Catch Up Growth**

Though rapid catch up growth is associated with better neuro developmental outcomes, studies have shown that babies with low weight in neonatal period, showing rapid catch up growth in infancy, show a high incidence of coronary heart disease, Type II diabetes mellitus, Hypercholesterolemia, Hypertension & stroke in adulthood also known as the metabolic syndrome.

## **Slide 11 Issues In VLBW Feeding**

common Issues that need to be addressed In VLBW feeding include:

- Which Milk?
- How early to start feeds ?
- How much to start with ?
- How to maintain mother's milk output
- Adequacy of pre-term mother's milk to sustain adequate growth.

## **Slide 12 Choice Of Milk For Preterm Babies :Mothers own milk (MOM)**

Choice Of milk for preterm babies is definitely mothers own milk (MOM)

Mothers own milk (MOM) is best suited to specific nutritional needs of the preterm baby , especially for initial few weeks as it has higher protein ,sodium, chloride & magnesium levels, adequate taurine and cysteine for growth & neuronal & retinal maturation, enzymes, including lipases that enhance lipolysis and fat absorption ,LCPUFA for cerebral and retinal functions & oligosaccharides for neuronal development, somatic growth, and development of intestinal immunity

## **Slide 13 Choice Of Milk for Early Nutrition Contd:**

Preterm milk also has numerous antimicrobial factors, nucleotides, growth factors and hormones resulting in lower incidence of sepsis, feed intolerance, necrotizing enterocolitis, bronchopulmonary dysplasia, retinopathy of prematurity, lower mortality rates, fewer hospital readmissions for illness in infancy, Lower neurodevelopmental disabilities & better MDI, PDI Human milk fed VLBW babies also show better intellectual performance scores at 7.5 to 8.0 compared to preterm formula fed babies .

## **Slide 14 Alternative Milk Till MOM Available :**

WHO, AAP & ESPGHAN recommend Pasteurized Donor Human Milk (PDHM) as next best alternative to mother's own milk. Compared to preterm formula PDHM fed babies also show reduced risk of LOS, NEC, greater feeding tolerance, fewer days of stay in neonatal intensive care units, and substantial cost saving .

## **Slide 15 Alternative If MOM ,PDHM Not Available**

If MOM / DHM are not available, WHO recommends term formula as an alternative for VLBW babies. If growth unsatisfactory, preterm formula may be given.

## **Slide 16 Time Of Onset Of Feeds – How Early?**

Coming to the issue of Time Of Onset Of Feeds ,

Well preterms with cardio pulmonary stability weighing 1200 – 1500 grams can be started on full enteral feeds soon after birth.

Those between 1000- 1250 grams should be started on IV Fluids & TPN ,small enteral feeds are generally started by 24 hours and gradually increased over the next 5-7 days.

Babies < 1000 grams & babies with AN dopplers showing absent / reversal of umbilical arterial diastolic flow need IV fluids, TPN, trophic feeds by day 2-3 & gradually increase of feeds over 7-14days.

Start with fluid total fluid / feed intake of 60 – 80 cc / kg / day on D1 increase to 160 - 180 cc / kg / day by day 7 -10.

#### **Slide 17 :Enteral feeding of ELBW /Sick Babies:**

In such babies, Trophic Feeding - Minimal Enteral Nutrition (MEN) , consisting of nutritionally inconsequential amounts of enteral feeds may be initiated on day 1-2. MEN promotes maturation of gut function and prevent gut mucosa atrophy. It is also associated with reduced number of days to reach full enteral feeding, lesser incidence of sepsis, reduced hyperbilirubinaemia & reduced length of hospital stay.

#### **Slide 18 Increments of feeds :How rapidly ?**

Regarding rate of daily increments of feeds, studies of increments of 35 vs 15 cc/kg / day have shown that with fast advancement, full intake as well as weight gain is achieved earlier , without a difference in the incidence of NEC. Generally, increments of 20ml/kg /day are considered safe.

#### **Slide 19 : Method Of Feeding:**

At the onset, preterm babies <32 weeks gestation need to be fed by gavage or tube feeding.

Let us now view the video on how to insert an infant feeding tube and how to administer gavage feeds.

**Slide 20 : Transition To Wati Spoon / Paladai Feeding:**

Intermediate & late preterms may be put to the breast right from birth, however initially many of these babies may require to be fed by wati & spoon or by paladai.

- For the very preterm babies, during their course in hospital, at a corrected GA of around 32 -34weeks, as their activity and periods of wakefulness increase, wati-spoon / paladai feeds can be attempted when the baby is awake . The feeding tube should be left in situ to feed the remaining volume of milk not accepted by mouth.
- As the intake by mouth increases, the tube feeding volumes are decreased. It is safe to remove the feeding tube when all feeds are accepted by mouth & the baby does not demonstrate weight loss.

**Slide 21 Transition To Breastfeeding**

- Effective breastfeed may take days or weeks . BF can be tiring & may need to be supplemented with mother's own EBM by wati spoon or paladai in order to avoid growth faltering, till velocity of weight gain is good.
- As a general rule, babies with good rooting and sucking reflex are able to breastfeed.

**Slide 22 :Measures to Enhancing Preterm Lactation & Transition To BF include**

Non nutritive Sucking i.e Suckling at the empty breast

“Rooming In” Under Supervision &

provision of KMC.

Let us now view videos on all these three manoevers.

**Slide 23. Growth Monitoring in VLBW Babies.**

Initial weight loss in preterm babies is around 7-10%. Birth weight should be regained by 10- 14 days. Once birth weight is re gained, the desired goals are:

- Wt. Gain :15- 20 gm/kg/day. .
- Length:0.9 cm/ week.

- H. C.: 0.9cm/week.

(Anderson DM.Clin Perinatol:29,2002.)

#### **Slide 24: Preterm Milk : Nutritional Concerns .**

For VLBW babies unfortified mature human milk may fall short of

- Energy
- Proteins
- Sodium
- Ca & P
- Fat soluble vitamins.

#### **Slide 25 : Nutritional Interventions**

Include :

- Use of Hind milk
- Supplementation of individual nutrients: Ca, P, Multivitamins
- Multi-nutrient fortifiers HMF

#### **Slide 26: Mineral Supplements for Pre terms on Mother's Milk**

All preterm babies need to be supplemented with the following minerals

- ☞ Calcium :100-150mg/kg/day
- ☞ Phosphorous : 50-75mg/kg/day
- ☞ Iron : 2-4 mg/kg/day
- ☞ Zinc :0.6mg/kg/day

#### **Slide 27:Vitamin Supplements**

All preterm babies need to be supplemented with the following vitamins

- ☞ Vitamin A 1000-1500 IU
- ☞ Vitamin D 400 IU
- ☞ Vitamin E 25 IU
- ☞ Vitamin C 40-50 mg
- ☞ Vitamin B1 1000 µg
- ☞ Vitamin B12 3-5 µg
- ☞ Niacin 5-10 mg
- ☞ Folic acid 50 µg

*Start when enteral intake 100-150 ml/kg/day*

#### **Slide 28: Causes Of Poor Weight Gain**

- ☞ Inadequate protein, calorie intake
- ☞ Chronic cold stress
- ☞ Anemia
- ☞ Hyponatremia
- ☞ Metabolic acidosis
- ☞ Infection especially urinary tract infection or fungal infection
- ☞ Inborn errors of metabolism (rare)

#### **Slide 29: Multi Component Fortified Preterm Milk**

- Improvements in short-term growth.
- Protein and energy supplementation associated with improved rates of weight gain.

Increased bone mineralization and linear growth ,

Less feed intolerance, NEC , Infections compared to formula.

**Slide 30: Fortification of Human Milk: Which Babies?**

- Babies < 1250 gms especially < 1000gms
- Babies with a difficult perinatal course
- Babies requiring fluid restriction.
- “Failure to thrive” despite intake of 180 ml/kg/day.

**Slide 31: Human Milk Fortifiers Available In India**

<b>Per 1 gm sachet</b>	<b>Lactodex HMF</b>	<b>Hijam</b>
<b>Calories ( Kcal)</b>	<b>3.63</b>	<b>3.5</b>
<b>Carbohydrates (g)</b>	<b>0.42</b>	<b>0.05</b>
<b>Proteins(g)</b>	<b>0.28</b>	<b>0.25</b>
<b>Fats (g)</b>	<b>0.04</b>	<b>0.25</b>
<b>Calcium (mg)</b>	<b>15.8</b>	<b>25</b>
<b>Phosphorus (mg)</b>	<b>7.8</b>	<b>12.5</b>
<b>Iron (mg)</b>	<b>0.3</b>	<b>0.36</b>
<b>Vitamin D (IU)</b>	<b>133</b>	<b>100</b>

1gm sachet of lactodex / 25 ml EBM provides additional

1.12 gm protein /100 ml, 14.22Kcal /100 ml of EBM

Hijam is it also in 25 ml EBM ( not sure, please add)

**Slide 32: Key Messages**

- Early enter al nutrition is important for VLBW babies optimal growth

- Poor nutrition associated with EUGR
- EUGR causes poor ND outcomes, increased risk of ROP, BPD
- Preterm mothers milk is the best choice, PDHM next best alternative
- Early Trophic feeding of EBM important in sick preterms & ELBW.
- Mineral & multi vitamin supplements essential
- Fortification of breastmilk may be needed for ELBW & smaller VLBW infants.