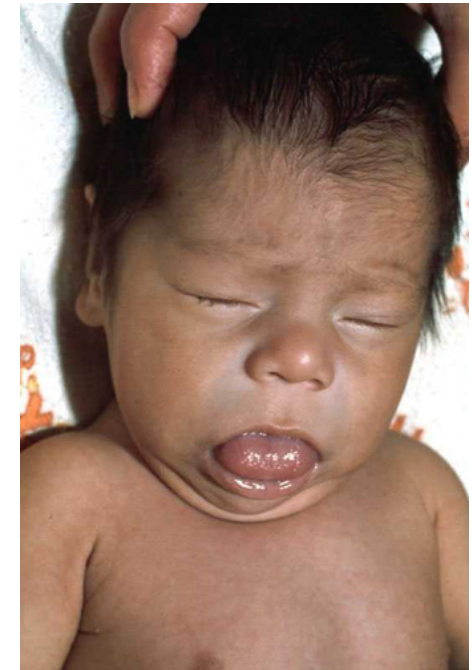


Need for urgent screening for Congenital hypothyroidism- a malady for India



**Dr Sumaira Khalil, Assistant Professor, Department of Pediatrics
Maulana Azad Medical College & Assoc. LNH, New Delhi, India**

Area Involved

- HUGE-A state larger than some countries
 - Total Area of 3,287,240 sq. km.
 - India: 2.4 % of the total surface area of the world
 - **Seventh largest country of the world**
-
- **MAGNITUDE HUGE**



Current Population

- NHFS3 Data (2006, last census)- **1.27 billion**
- Second largest country in the world after China in terms of population
- By 2030, the population of India will be largest in the world estimated ~ 1.53 billion



Birth Rate & magnitude of newborn population

- Annual Birth Rate (NHFS 3) 22.17 births/1000 population
- Population Growth rate 1.58%
- **Annual number of newborns ~ 2,53,00,000**
- **2851 births per hour!!**
- **47 births per min!!**
- Rural population: 72.18%
- Urban population: 27.82%
- Janani Suraksha Yojna



States of India

- Total Number of states- 30
- Multiple cultural backgrounds
- Multilingual
- Different ethnicity
- Variable vernacular languages
- Numerous cultural taboos
- **Health budget under the state**



Targets for Screening: Criteria

- **Wilson and Jungner criteria:**
 1. Biochemically well identified disorder
 2. Known incidence in the population
 3. Disorder associated with significant morbidity and mortality
 4. Effective treatment available
 5. Period before which intervention improves outcome
 6. Availability of an safe, simple and robust screening test

Wilson JMG, Jungner F. Principles and Practice of screening for disease. Public health papers, No. 34. Geneva, Switzerland: World Health Organization; 1968

Congenital Hypothyroidism

| | |
|--|--|
| Biochemically well identified disorder? | Yes |
| Incidence in population | 1:1130(ICMR, Delhi, 2012) 1:3400(Kaur et al. 2010) 1:600 (Sahai et al. 2011) |
| Morbidity- the DALYs | IDD- 486000; CH- not available Most common preventable cause of mental retardation |
| Effective treatment available? | Yes |
| Latent period | Age at diagnosis: 35.2 ± 25.9 (12-132) months Time to diagnosis: 51 months (Sanghvi et al 2008) |
| Availability of safe, robust test | Yes |



Congenital Hypothyroidism

| Year of study | Study Period | Author | No. of babies screened | Incidence |
|----------------------|---------------------|-------------------|--------------------------------------|------------------|
| 1973,1992 | | Kochupillai et al | | |
| 1987 | | Desai et al | 12407 (cord blood TSH) | 1:2481 |
| 1994 | | Desai et al | 25244 (filter paper T4 at 24-94 hrs) | 1:2804 |
| 2008 | Oct 06-Sep 07 | Sanghvi et al | 2964 | 2.1 per 1000 |
| 2010 | May 07-July 09 | Kaur G et al | 6813 | 1:3400 |
| 2011 | | Sahai et al | | 1:600 |
| 2012 | | Seth et al | | 1:3400 |
| 2013 | | ICMR Task force | | 1:1130 |

Newborn Screening in New Delhi

- Newborn screening for congenital hypothyroidism, congenital adrenal hyperplasia under ICMR (2009-2012)
- G6PD deficiency
- **Beyond 2012 we continued**
- Screening tests offered free of cost
- All expenditure borne by the Delhi government
- Emphasis on awareness, counseling and maximum participation

Dr Seema Kapoor, MAMC & LNJP, New Delhi

Primary Objective

- To evaluate the feasibility of newborn screening for congenital hypothyroidism (CH) in a tertiary care hospital in New Delhi
- An attempt to define the incidence CH in our population

Primary Objective: Testing & Long term management

- Any child diagnosed needs lifelong management

The management has to be

- Feasible
- Available
- **Affordable**
- **Socially acceptable**
- Specific and sensitive

Sampling



- For newborn screening
- 2-3 drops of blood
- Heel prick on a special filter paper card (903 S & S)
- After 24 hours of life for normal delivery & 72 hours of life for sections
- Air dried on designed drying stands & drying required 1-2 hrs in summer & 3-4 hrs in winter
- Specially designed silver foil pouches for transport
- For preterm and sick neonates sample was taken within 7 days of birth

Sample collection



Technology



Department of Pediatrics MAMC & LN Hospital

Newborn Screening Filterpaper

ALLOW BLOOD TO SOAK THROUGH AND COMPLETELY
FILL EACH CIRCLE APPLY BLOOD ONLY TO
ONE SIDE OF THE FILTER PAPER



| | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|---------------|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--------------------|--|--|
| Mother's Name- Last Name, First Name | | | | | | | | | | | | Date of First Feeding Day Month Year | | | Time of First Feeding | | | | | | | | |
| Infant's Date of Birth Day Month Year | | | Time of Birth | | | Birth Weight (in Grams) | | | Multiple Births Birth Order A, B, C, etc. : | | | Gestational Weeks No: | | | Sex M or F: | | | Date of Collection Day Month Year | | | Time of Collection | | |
| Type of Feeding Breast TPN FORMULA- Trade Name | | | | | | | | | Special Circumstances Second Home Test Birth Antibiotics Transfused | | | | | | Date of Transfusion Day Month Year | | | | | | | | |
| Hospital No. | | | | | | Risk Factors Sick Baby Congenital Anomalies | | | Yes No Material Pregnancy Complications Yes No (e.g. AFLP, HELLP) | | | Yes No Deceased Sibling Yes No | | | Other | | | | | | | | |
| Father's Name - Last Name, First Name | | | | | | | | | | | | Mother's Date of Birth Day Month Year | | | | | | | | | | | |
| Address - City, State | | | | | | | | | | | | Contact Phone Number City Code Number | | | | | | | | | | | |
| Type of clinical Presentation | | | | | | Physician Responsible for Infant Follow-up after Discharge | | | | | | Physician's Phone Number City Code Number | | | | | | Physician's Fax Number City Code Number | | | | | |

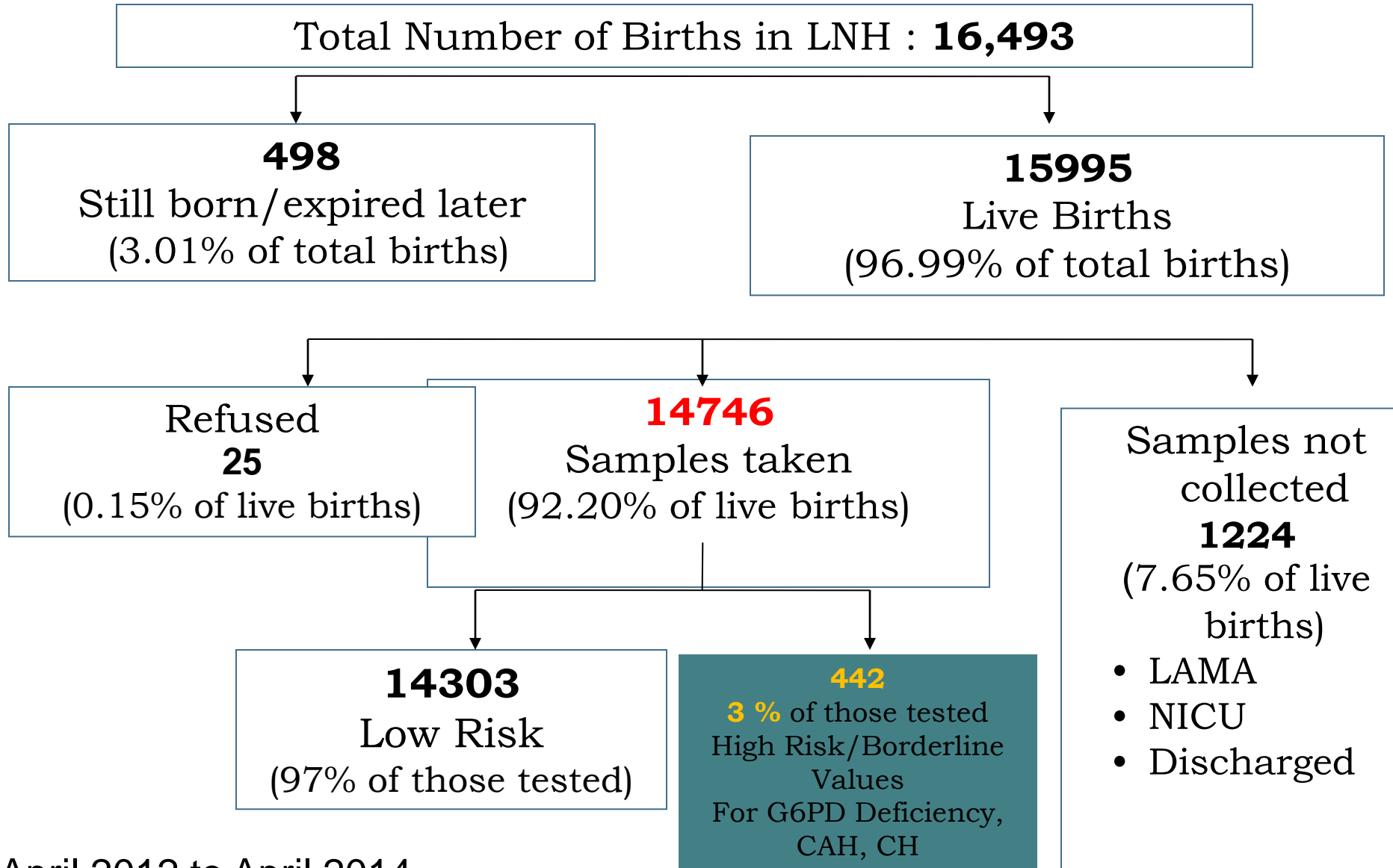
Gentic Lab. MAMC Bhadurshah Zafar Marg, Darya Ganj, Delhi

Use 24 Hour Clock (Noon = 1200, Midnight = 2400)
All information must be printed firmly with ballpoint pen

Methodology

- Two site fluoroimmunoassay on Victor 2D platform
- External quality control with CDC Atlanta
- screen positive cases: repeat serum & filter paper sample were analysed
- TSH >20 $\mu\text{U}/\text{L}$ taken as abnormal
- TSH $10 - 20$ $\mu\text{U}/\text{L}$ as ambiguous zone
- Confirmed CH: bone age estimation (x ray Knee), ultrasound and Tc 99 M thyroid scan
- Levothyroxine @ $10-15$ $\mu\text{g}/\text{kg}/\text{day}$

Newborn screening for CH, MAMC & LN Hospital



April 2012 to April 2014

| INDICATOR | 2012 - 2013 | 2013 - 2014 | Total |
|-----------------------|---|--------------------|--------------|
| Total Live births | 8250 | 7745 | 15995 |
| Number collected | 7600 | 7146 | 14746 |
| No with Malformations | Does not include neonates with gross congenital malformations who died < 24 hours | | 12 |
| Missed samples(%) | 9% (742) | 7.1% (549) | 7.65% (1224) |
| Discharge < 24 hours | 124 | 121 | 245 |
| Refusal of Consent | 10 | 15 | 25 |
| Blood transfusion | 2 | 5 | 7 |

| Indicator | Since April 2012 |
|--------------------------------------|-------------------------|
| No screened for CH | 14746 |
| No positive for CH | 52 |
| No confirmed for CH | 12 |
| False positive rate | 0.271% |
| Recall rate | 0.08% |
| Lost to follow up after screen | 1 |
| Lost to follow up after confirmation | 1 |

Secondary Objective

To calculate the

- *turnover reporting time,

- *time for final diagnosis and

- *appropriateness of drawn follow up and

- *management guidelines

Other Feasibility Indicators

| Indicator | Since April 2012 |
|--|------------------------------------|
| Turn around time | Varied from 1.3 weeks to 2.6 weeks |
| Number of samples not layered/insufficient | TSH=33 |
| Other issues | 646 |
| Incidence CH | 1 : 1500 |

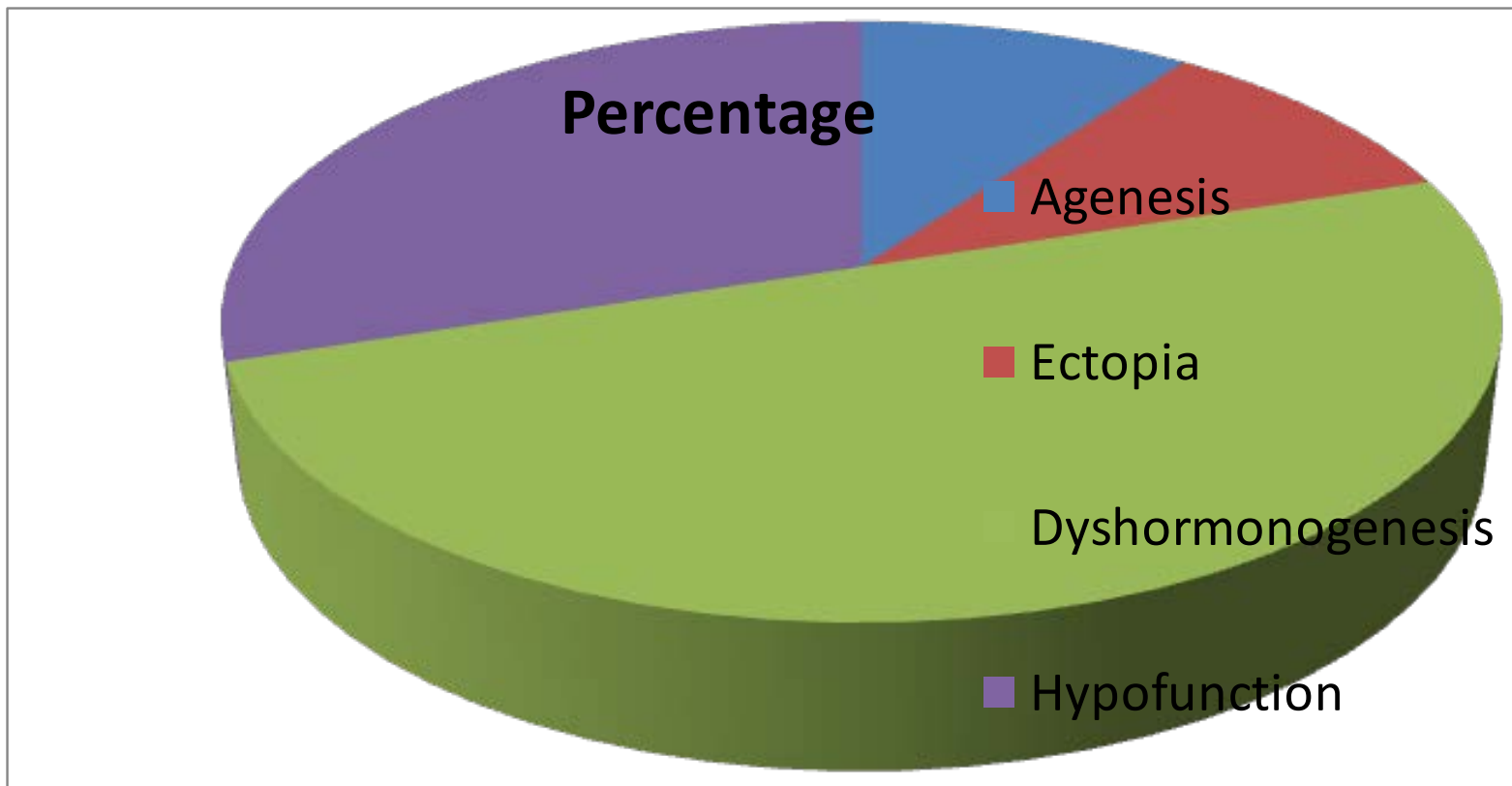
Secondary Objectives

- To evaluate appropriateness of the drawn follow up and management guidelines

Other Feasibility Indicators

| Weight Gain | Height percentiles | Weight percentiles | HC Gain | Bone Age percentiles | DQ percentiles |
|--------------------|---------------------------|---------------------------|----------------|-----------------------------|-----------------------|
| 12 | 75-90% | 75-90% | 16.8 | BA= CA | 96 |
| 9.6 | 75-90% | 75-90% | 12 | BA= CA | 108 |
| 12.7 | 75-90% | 75-90% | 17.5 | BA= CA | 86 |
| 6.6 | 75-90% | 75-90% | 13 | BA= CA | 110 |
| 5.5 | 75-90% | 75-90% | 12.2 | BA= CA | 90 |
| 4.7 | 75-90% | 75-90% | 9.4 | BA= CA | 96 |
| 4.8 | 75-90% | 75-90% | 8.9 | BA= CA | 108 |
| 9.1 | 75-90% | 75-90% | 11 | BA= CA | 102 |
| 13 | 75-90% | 75-90% | 15 | BA= CA | 112 |
| 7.5 | 75-90% | 75-90% | 12.8 | BA= CA | 96 |

Follow up of CH: Etiology



Co morbidities & Maternal status

- Down syndrome
- Corpus callosum agenesis

- Maternal hypothyroidism (2)

South East Asia: requirement of Consent

| Country | Disorder | Mandate |
|------------------------|-----------------|---------------------|
| China | CH | Mandatory |
| Philippines | CH | Mandatory |
| Taiwan | CH | Mandatory |
| Vietnam | CH | Mandatory |
| Hong kong | CH | Mandatory |
| Sri Lanka | CH | Nearly 95% coverage |
| Pakistan | CH | ?Pilot |
| India | CH | Heterogeneous |
| Myanmar, Bangladesh | CH | ?Pilot |

Prevalence of CH in South East Asia



| Country | Study Period | Prevalence |
|-------------|--------------|------------|
| China | 1982-2001 | 1:6467 |
| Indonesia | 2000-2002 | 1:3469 |
| Malaysia | 2000-2002 | 1:3029 |
| Vietnam | 2000-2002 | 1:2500 |
| Philippines | 1996-2003 | 1:3284 |
| Bangladesh | 2000-2002 | 1:2042 |
| Pakistan | 2000-2002 | 1:1000 |
| Thailand | 1996-2001 | 1:3314 |

India



| State | Disorder | Mandate/Pilot |
|---------------------|-----------------|----------------------|
| Goa | CH | Included |
| Kerala | CH | Approved |
| Maharashtra | CH | Court Verdict |
| Districts of Gujrat | CH | Implemented |
| Delhi | CH | Started |

Challenges

- **Weekend deliveries**
- **Consent was not properly understood**
- **Difficult recall**
- **Pre test and Post test counseling was very challenging**

Achievements

- Creation of a network of committed Paediatricians and Geneticists
- Awareness and training
- Trained Paediatricians who had exposure
- Strong laboratory expertise & QA
- Feasibility
- Data on Large sample size
- lacunae and Solutions
- **What needs to be done now.....**

Viabile option

- **Help from the other countries**
- **Include 3 other important disorders CAH, G6PD, Biotinidase deficiency**

IF THERE IS A WILL THERE WILL BE A WAY

THANK YOU

